Reference Manual: Commands

Adaptive Server® Enterprise

15.7

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Contents

CHAPTER 1 Commands

This volume describes commands, clauses, and other elements used to construct a Transact-SQL statement.

alter database

Description

Increases the amount of space allocated to a database, as well as to the modified pages section of an archived database. Alters one or more database-wide properties such as DML logging level, defaults for compression, in-row large object (LOB) storage, and so on.

Syntax

```
alter database database_name
        [on {default | database_device} [= size]
            [, database_device [= size]]...]
        [log on {default | database_device} [= size]
            [, database_device [= size]]...]
        set { [durability = { no_recovery | at_shutdown | full}]
            [[,] dml_logging = {full | minimal} ]
            [[,] template = { database_name | NULL}]
        [, compression = {none | row | page}]
        [, lob_compression = {compression_level | off}]
        [,] inrow_lob_length = value [log off database_device
            [= size | [from logical_page_number] [to logical_page_number]]
        [, database_device
        [= size | [from logical_page_number] [to logical_page_number]]
        [with override]
        [for load]
        [for proxy_update]
```

Parameters

database_name

is the name of the database. The database name can be a literal, a variable, or a stored procedure parameter.

on

indicates a size and location for the database extension. If you have your log and data on separate device fragments, use on for the data device and log on for the log device.

default

indicates that alter database can put the database extension on any default database devices (as shown by the sp_helpdevice stored procedure in Chapter 1, "System Procedures," in *Reference Manual: Procedures*). To specify a size for the database extension without specifying the exact location, use:

```
on default = size
```

To change a database device's status to default, use sp_diskdefault.

database_device

is the name of the database device on which to locate the database extension. A database can occupy more than one database device with different amounts of space on each. Use disk init to add database devices to Adaptive Server®.

size

is the amount of space to allocate to the database extension. The following are example unit specifiers, using uppercase, lowecase, single and double quotes interchangeably: “k” or “K” (kilobytes), “m” or “M” (megabytes), “g” or “G” (gigabytes), and “t” or “T” (terabytes). Sybase® recommends that you always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier. If you do not provide a unit specifier, the value provided is presumed to be in megabytes.

If you do not specify a value, alter database extends a database by 1MB or 4 allocation unit, whichever is larger. Minimum amounts are:

Server’s logical page size	Database extended by
2K	1MB
4K	1MB
8K	2MB
16K	4MB

log on

indicates that you want to specify additional space for the database’s transaction logs. The log on clause uses the same defaults as the on clause.

durability

determines the durability level of the database, and is one of:

- full – all transactions are written to disk. This is the default if you do not specify a durability level when you create the database, and ensures full recovery from a server failure. All system databases except tempdb use this durability level (the traditional durability level for disk-resident databases). tempdb uses a durability level of no_recovery.
- no_recovery – transactions are durable only while the server is running. All durability is lost if the server fails or is shut down politely. For disk-residents databases with durability set to no_recovery, Adaptive Server periodically writes data at runtime to the disk devices, but in an uncontrolled manner. After any shutdown (polite, impolite, or server failure and restart) a database created with no_recovery is not recovered, but is re-created from the model or, if defined, the template database.
- at_shutdown – transactions are durable while the server is running and after a polite shutdown. All durability is lost if the server fails.

compression

indicates the level of compression alter database applies to newly created tables in this database.

- none – the data is not compressed.
- row – compresses one or more data items in an individual row. Adaptive Server stores data in a row-compressed form only if the compressed form saves space compared to an uncompressed form.
- page – when the page fills, existing data rows that are row-compressed are then compressed using page-level compression to create page-level dictionary, index, and character-encoding entries.

  Adaptive Server compresses data at the page level only after it has compressed data at the row level, so setting the compression to page implies both page and row compression.

lob_compression = off | *compression_level*

Determines the compression level for the newly created table. Selecting off means the table does not use LOB compression.

compression_level

Table compression level:

- 0 – the lob column is not compressed.
- 1 through 9 – Adaptive Server uses ZLib compression. Generally, the higher the compression number, the more Adaptive Server compresses the LOB data, and the greater the ratio between compressed and uncompressed data (that is the greater the amount of space savings, in bytes, for the compressed data versus the size of the uncompressed data).

  However, the amount of compression depends on the LOB content, and the higher the compression level , the more CPU-intensive the process. That is, level 9 provides the highest compression ratio but also the heaviest CPU usage.
- 100 – Adaptive Server uses FastLZ compression. The compression ratio that uses the least CPU usage; generally used for shorter data.
- 101 – Adaptive Server uses FastLZ compression. A value of 101 uses slightly more CPU than a value of 100, but uses a better compression ratio than a value of 100.

inrow_lob_length = *value*

specifies the number of bytes for an in-row text or image LOB column, and the number of characters for an in-row Unitext LOB column.

log off *database_device*

removes unwanted portions of the log for the database from the specified database device. Using log off decreases the amount of space allocated to the log of a database, as well as to the modified pages section of an archive database.

You cannot use log off with any other alter database parameter, including log on, for load, or with override.

= *size*

specifies the amount of space at the end of the device that the command should affect. For this purpose, the end of a device is the highest-numbered logical page used by this database on that device. This command specifies physical storage, removing every log page on the specified device from the database:

```
alter database sales_db log off mylogdev
```

Size specifications round up to fit an exact number of allocation units. In an installation using a 16KB logical page size, you remove 52MB, not 50, because each allocation unit on that server is 4MB. The only time Adaptive Server removes less space than specified is when the database's log segment uses less than that much space on that device.

from *logical_page_number*
identifies the first page number affected by this command. Adaptive Server automatically adjusts the number to indicate the allocation page's page ID. The default from location is the lowest-numbered logical page on the device.

to *logical_page_number*
identifies the last page affected by the command. Only complete allocation units (multiples of 256 pages) can be removed, so Adaptive Server automatically adjusts the page number upwards to the last page in the allocation unit. If *logical_page_number* is the exact page number of an allocation page (that is, it is divisible by 256), that allocation unit is unaffected. For example, to 512 affects pages up to but not including page 512.

The default to location is the highest-numbered logical page on the device.

dml_logging
indicates the level of logging for insert, update, and delete commands. full (the default) records all changes to the log for a complete record of all transactions. If the database uses minimal logging, Adaptive Server attempts to not log row or page changes to syslogs. However, Adaptive Server may generate some in-memory logging activity to support run-time operations such as rolling back transactions.

set template
determines the template the database uses. One of:

- *database_name* – user database that is disk-resident at full durability, and in a usable state.
- NULL – removes the binding to the current template database. The database uses model as its template database during subsequent server restarts.

with override

forces Adaptive Server to accept your device specifications, even if they mix data and transaction logs on the same device, thereby endangering up-to-the-minute recoverability for your database. If you attempt to mix log and data on the same device without using this clause, the alter database command fails. If you mix log and data, and use with override, you are warned, but the command succeeds.

for load

is used only after create database for load, when you must re-create the space allocations and segment usage of the database being loaded from a dump.

for proxy_update

forces the resynchronization of proxy tables within the proxy database.

Examples

Example 1 Adds 3MB (1,536 pages) to a user database configured for 2K logical pages on a default database device:

```
alter database mydb
```

Example 2 Adds 3MB to the space allocated for the pubs2 database on the database device named newdata:

```
alter database pubs2 on newdata = 3
```

Example 3 Adds 10MB of space for data on userdata1 and 2MB for the log on logdev for a server configured for 2K logical pages:

```
alter database production
on userdata1 = "10M"
log on logdev = '2.5m'
```

Example 4 Changes the durability level of pubs5_rddb, a relaxed-durability database to change it to a regular database with full durability:

```
alter database pubs5_rddb
set durability = full
```

Example 5 Alters the template for the pubs3 database:

```
alter database pubs3
set template = new_pubs_template_db
```

Example 6 Changes the durability level of a disk-resident database with relaxed durability:

```
alter database pubs7 set durability=at_shutdown
```

Example 7 Changes the DML logging level for the model database, which is set to a durability level of full. Any databases created from model after this change inherit the minimal logging level property:

```
alter database model set dml_logging = minimal
```

Example 8 Changes pubs2 database to page-level compression:

```
alter database pubs2
set compression = page
```

Example 9 Changes the pubs2 database to use LOB compression:

```
alter database pubs2 set lob_compression = 100
```

Example 10 This example modifies the pubs database to change the length of its in-row LOB columns to 400 bytes:

```
alter database pubs
  set inrow_lob_length = 400
```

Example 11 Removes 50MB of database sales_db from device mylogdev:

```
alter database sales_db log off mylogdev='50M'
```

This example removes the highest-numbered logical pages of sales_db that are on mylogdev, up to a maximum of 50MB.

Example 12 Removes space for database sales_db from device mylogdev, specifying exactly which pages are to be removed:

```
alter database sales_db log off mylogdev from 7168 to
    15360
```

Because logical page 15360 is an allocation page, this example affects all logical pages on mydev from 7168 through 15359. It does not, however, affect page 15360, nor does it affect any pages in the named range that are not physically located on mylogdev.

Usage

Restrictions

- Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier.
- Adaptive Server reports an error if the total size of all fixed-length columns, plus the row overhead, is greater than the table's locking scheme and page size allows.
- Because Adaptive Server allocates space for databases for create database and alter database in chunks of 256 logical pages, these commands round the specified size down to the nearest multiple of allocation units.
- You can specify the *size* as a float datatype, however, the size is rounded down to the nearest multiple of the allocation unit.

- Although Adaptive Server does create tables in the following circumstances, you will receive errors about size limitations when you perform data manipulation language operations:
  - If the length of a single variable-length column exceeds the maximum column size.
  - For data-only locked tables, if the offset of any variable-length column other than the initial column exceeds the limit of 8191 bytes.
- If Adaptive Server cannot allocate the requested space, it comes as close as possible per device and prints a message telling how much space has been allocated on each database device.
- You must be using the master database, or executing a stored procedure in the master database, to use alter database.
- You can expand the master database only on the master device. An attempt to use alter database to expand the master database to any other database device results in an error message. For example, use:

  ```
  alter database master on master = 1
  ```
- Each time you allocate space on a database device with create database or alter database, that allocation represents a device fragment, and the allocation is entered as a row in sysusages.
- If you use alter database on a database that is being dumped, alter database cannot complete until the dump finishes. Adaptive Server locks the in-memory map of database space use during a dump. If you issue alter database while this in-memory map is locked, Adaptive Server updates the map from the disk after the dump completes. If you interrupt alter database, Adaptive Server instructs you to run sp_dbremap. If you do not run sp_dbremap, the space you added does not become available to Adaptive Server until you restart the server.
- You can use alter database on database_device on an offline database.

Using *alter database* for archive databases

You can use alter database to add space to the modified pages section of an archive database at any time, not only when space runs out. Increasing the space in the modified pages section allows a suspended command to resume operation. The syntax is:

alter database *database_name*
  [on *database_device* [= *size*]
    [, *database_device* [= *size*]]...]

Altering in-memory and relaxed durability databases

- You cannot set specify model, master or sybsystemdb as the template database.
- Setting the database name in the use template claue to NULL removes the binding to any existing template database, and defines model as the template database.
- Altering the template definition of a database that appears earlier in the database recovery order sequence than its template database automatically reorders the recovery order so the new template database appears prior to its dependent database in the database recovery order when you restart the server.
- If you change the settings for durability or dml_logging, alter database automatically attempts to set the databases to single-user mode before executing the command. You can manually set the database to single-user mode before you issue alter table.
- Databases must be in single-user mode before you can change the durability level setting.
- You can increase the size of an in-memory database only on in-memory storage caches that already host the in-memory database.
- You cannot change the durability level of system, template, or local temporary databases.
- The load sequence is broken when you change the durability level of the database to full. For example, for a disk-resident database using full durability, if you:

  a. Dump a database.

  b. Perform a dump transaction.

  c. Perform a second dump transaction.

  d. Changed the durability to no_recovery.

  e. Changed the durability to full.

  You cannot perform a third dump transaction. Instead, you must perform a full dump database.

Backing up *master* after allocating more space

- Back up the master database with dump database after each use of alter database. This makes recovery easier and safer in case master becomes damaged.

- If you use alter database and do not back up master, you may be able to recover the changes with disk refit.

Placing the log on a separate device

- To increase the amount of storage space allocated for the transaction log when you have used the log on extension to create database, give the name of the log's device in the log on clause when you issue alter database.
- If you did not use the log on extension of create database to place your logs on a separate device, you may not be able to recover fully in case of a hard disk failure. In this case, you can extend your logs by using alter database with the log on clause, then using sp_logdevice to move the log to its own devices.

Altering databases for compression

- set compression specifies the database-wide compression level, which applies only to newly created tables.
- You can use set lob_compression by itself or with other set subclauses. However, other set subclauses require the database to be in single-user mode (for example, if you change the durability level of the database).

In-row LOB columns

- Use inrow_lob_length to increase or decrease the in-row LOB length database-wide.
- Changing the inrow_lob_length affects the creation of LOB columns in future create table or alter table add column commands. The valid values are within the range of 0 to the logical page size of the database.

Shrinking log space

Regarding the log off variant of alter database:

- Although the log off option specifies the range the range of pages to be removed as logical pages, it is the associated physical pages that are actually removed. The logical pages remain in the database as unusable since they form a hole. A hole is one or more allocation units for which there is no associated physical storage.
- Information about which allocation units—space that is divided into units of 256 data pages when you create a database or add space to a database—exist on the devices that are available in the master.dbo.sysusages table, which lists disk pieces by database ID, starting logical page number, size in logical pages, device ID, and starting offset in the device.

- If the specified to page is less than the from page, the pages are switched—that is, the to page becomes the from page, and vice versa. If from and to name the same page, the command affects only the allocation unit containing that page. The command does not adjust the to page in a way that causes a command error.
- The entire device is affected if you do not provide any clauses. This is equivalent to log off*device* from 0. This command specifies physical storage, removing every log page on the specified device from the database:

```
alter database sales_db log off mylogdev
```

- If alter database detects an error, it does not execute, and returns a message indicating the reason, such as:
  - The database log becomes too small.
  - The fragments to be removed contain pages that are allocated to syslogs. That is, the active log occupies space in the log fragments to be removed.
  - The amount of log free space after the fragment is removed is too small to accommodate the last chance threshold.

Getting help on space usage

- To see the names, sizes, and usage of device fragments already in use by a database, execute sp_helpdb *dbname*.
- To see how much space the current database is using, execute sp_spaceused.

The *system* and *default* segments

- The system and default segments are mapped to each new database device included in the on clause of an alter database command. To unmap these segments, use sp_dropsegment.
- When you use alter database (without override) to extend a database on a device already in use by that database, the segments mapped to that device are also extended. If you use the override clause, all device fragments named in the on clause become system/default segments, and all device fragments named in the log on clause become log segments.

Using *alter database* to awaken sleeping processes

- If user processes are suspended because they have reached a last-chance threshold on a log segment, use alter database to add space to the log segment. The processes awaken when the amount of free space exceeds the last-chance threshold.

Using *for proxy_update*

- If you enter the for proxy_update clause with no other options, the size of the database is not extended; instead, the proxy tables, if any, are dropped from the proxy database and re-created from the metadata obtained from the path name specified during create database ... with default_location = 'pathname'.
- If you use alter database with other options to extend the size of the database, the proxy table synchronization is performed after the size extensions are made.
- for proxy_update provides the database administrator with an easy-to-use, single-step operation with which to obtain an accurate and up-to-date proxy representation of all tables at a single remote site.
- Resynchronization is supported for all external data sources, not just the primary server in a high availability-cluster environment. Also, a database need not have been created with the for proxy_update clause. If a default storage location has been specified, either through create database or with sp_defaultloc, the metadata contained within the database can be synchronized with the metadata at the remote storage location.
- To make sure databases are synchronized correctly so that all the proxy tables have the correct schema to the content of the primary database you just reloaded, you may need to run the for proxy_update clause on the server hosting the proxy database.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

alter database permission defaults to the database owner. System administrators can also alter databases. Only the database owner or a login with sa_role can use alter database to change the database-wide logging setting.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
2	alter	alter database	• *Roles* – current active roles • *Keywords or options* – alter size • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a set proxy is in effect

See also

Commands create database, disk init, drop database, load database

System procedures sp_addsegment, sp_dropsegment, sp_helpdb, sp_helpsegment, sp_logdevice, sp_renamedb, sp_spaceused

alter encryption key

Description

Changes the current password, adds and drops a key copy, regenerates an encryption key.

For more information about encrypted columns, see the *Encrypted Column Users Guide*.

Syntax

Altering the master key:

```
alter encryption key [dual] master
    with char_string { add encryption
        {with passwd char_string for user user_name [for recovery]
        | for automatic_startup}
    | modify encryption { with passwd char_string [for recovery]
        | for automatic_startup }
    | drop encryption
        { for user user_name | for recovery | for automatic_startup }
    | regenerate key
        [ with passwd char_string] | recovery encryption
        with passwd char_string | modify owner user_name }
```

Altering the syb_extpasswdkey service key:

```
alter encryption key syb_extpasswdkey
    [ with { static key | master key}]
        { regenerate key [ with { static key | master key }]
        | modify encryption [ with { static key | master key }] }
```

Altering the column encryption key:

```
alter encryption key [[database.][owner].] keyname
    { [ as | not default ]
    [dual] master
        [ with { static key | master key} ]
        regenerate key
        [ with { static key | master key [no] dual_control} ] | [with passwd
        'password' | system_encr_passwd | login_passwd  |
            'base_key_password']
    modify encryption
        [ with {passwd {'password' |  system_encr_passwd |
                login_passwd } | master key }]
        [[no] dual_control] for automatic startup
    add encryption [ with passwd 'password' | 'key_copy_password']
        for user user_name
        [for [login_association | recovery | automatic_startup]]
    drop encryption for { user user_name | recovery
        [ for recovery ] | [ for automatic_startup ]}
        | [ with passwd 'password ']
    recover encryption with passwd 'password'
            | modify owner user_name }
```

Parameters

keyname
is the name for a column encryption key.

as [not] default
indicates that the database default property should be assigned to, or unassigned from, this key.

[dual] master
database level keys used to encrypt other keys within the database in which they are defined. These keys are not used to encrypt data.

static key | master key
The first instance of the with {static key | master key} clause is merely an assertion of how the syb_extpasswdkey is currently encrypted. Because Adaptive Server knows how syb_extpasswdkey is currently encrypted, this clause is optional.

The second instance of with {static key | master key} clause following the regenerate key action allows the administrator to change the encryption on the regenerated key from static to dynamic, or vice versa. If the clause is omitted, the regenerated key is encrypted as it was prior to this command being issued.

The third instance of with {static key | master key} clause following the modify encryption action changes the protection on the existing key to use the static key or the master key as specified. If the clause is omitted, the static key is used by default.

[no] dual_control
indicates whether dual control is used to create the master key.

regenerate key
indicates you are regenerating the key

with passwd ['*password*' | *system_encr_passwd* | *login_password* '*base_key_password*']

specifies the current password Adaptive Server uses to decrypt the column encryption key, and a new password for one of the following purposes:

- Modify the encryption of a key or a key copy.
- Encrypt a newly-added key copy. The key owner can add key copies for individual users that are accessible through a private password or a login password.
- Recover the encryption key after losing a password.

Adaptive Server supports the following passwords for keys:

- *password* – a character string up to 255 bytes long.
- *login_passwd* – tells Adaptive Server to use the session's login password.
- *system_encr_passwd* – system encryption password for the current database.
- '*base_key_password*' – the password used to encrypt the base key, and may be known only by the key custodian. The password can be upto 255 bytes in length. Adaptive Server uses the first password to decrypt the base column-encryption key.

If you do not specify with passwd, the default is *system_encr_passwd*.

modify encryption

indicates you are modifying the encryption key or key copy.

for automatic startup

indicates that the key copy is to be used to access the master or dual master key after the server is restarted with automatic master key access enabled.

add encryption

adds an encrypted key copy for a designated user.

key_copy_password – the password used to encrypt the key copy. The password cannot be longer than 255 bytes. Adaptive Server makes a copy of the decrypted base key, encrypts it with a key encryption key derived from the *key_copy_password*, and saves the encrypted base key copy as a new row in sysencryptkeys.

for user *user_name*

specifies the user for whom you are adding or dropping a key copy.

for login_association
indicates that the key copy being added will later be encrypted by the assigned user's login password during his or her first access to this key.

for recovery
indicates that the key copy is to be used to recover the master key in case the password is lost.

drop encryption
indicates that you are dropping the key copy for the specified user.

recover encryption
makes the base key accessible through a new password. Does not apply to key copies.

modify owner
changes the key's owner to the specified user.

Examples

Example 1 Changes my_key to the default encryption key:

```
alter encryption key my_key as default
```

You must have the sso_role or keycustodian_role to change the default property of a key. If the command above is executed by:

- The system security officer (SSO), Adaptive Server removes the default property unconditionally from the previous default key, if one exists.
- The key custodian, he or she must own `my_key`. The key custodian must own the previous default key, if one exists.

To remove the default property from `my_key`, the SSO or the key custodian, as owner of the key, executes:

```
alter encryption key my_key as not default
```

If my_key is not the default key, this command returns an error.

Example 2 Changes the password on the important_key encryption key:

```
alter encryption key important_key
     with passwd 'oldpassword'
     modify encryption
     with passwd 'newpassword'
```

If this command is executed by:

- The key owner – the command reencrypts the base key
- The user assigned a key copy – the command reencrypts that key copy.

Example 3 Changes the password on a key copy to the current session's login password (can be executed only by a user who has been assigned a key copy):

```
alter encryption key important_key
     modify encryption
     with passwd login_passwd
```

You can encrypt only key copies with a login password. Adaptive Server returns an error if you attempt to encrypt the base key with a login password.

Example 4 Changes the password for the important_key encryption key to the system password:

```
alter encryption key important_key
     with passwd 'ReallyBigSecret'
     modify encryption with passwd system_encr_passwd
```

This command can be executed only by the key owner or a user with sso_role, and is allowed only if a key has no key copies. (Base keys with copies must be encrypted by a user-specified password.) This example modifies the encryption of the base key.

Example 5 Changes the password for the important_key encryption key from the system encryption password to a new password. Because the system encryption password is the default password, it need not be specified in the statement:

```
alter encryption key important_key
     modify encryption
     with passwd 'ReallyNewPassword'
```

Example 6 Adds encryption for user "ted" for the important_key encryption key with the password "just4now":

```
alter encryption key important_key
     with passwd 'TopSecret'
     add encryption with passwd 'just4now'
     for user 'ted'
```

You must be a key owneror a user with the sso_role to execute this command. Adaptive Server uses "TopSecret" to decrypt the base key, making a copy of the raw key and encrypting it for Ted using the password "just4now."

Example 7 Modifies the encryption for Ted to use a new password. Only Ted can execute this command:

```
alter encryption key important_key
     with passwd 'just4now'
     modify encryption
     with passwd 'TedsOwnPassword'
```

Example 8 Drops encryption for user "ted" for the important_key encryption key (you must have the sso_role or be the key owner to execute this command):

```
alter encryption key important_key
     drop encryption for user 'ted'
```

Example 9 Modifies the owner of important_key to new owner, "tinnap" (you must have the sso_role or be the key owner to execute this command):

```
alter encryption key important_key modify owner tinnap
```

Example 10 Uses the master key to encrypt an existing CEK "k2":

```
alter encryption key k2
        with passwd 'goodbye'
        modify encryption
        with master key
```

Example 11 Re-encrypt an existing CEK "k3" that is currently encrypted by the master key, to use dual control:

```
alter encryption key k3
        modify encryption
        with master key
        dual_control
```

Example 12

Example 13 Sets up the recovery key copy and uses it for key recovery after losing a password.

1 The key custodian originally creates a new encryption key protected by a password:

```
create encryption key key1 for AES passwd 'loseitl8ter'
```

2 The key custodian adds a special encryption key recovery copy for key1 for Charlie:

```
alter encryption key key1 with passwd 'loseitl8ter'
     add encryption
     with passwd 'temppasswd'
     for user charlie
     for recovery
```

3 Charlie assigns a different password to the recovery copy and saves this password in a locked drawer:

```
alter encryption key key1
     with passwd 'temppasswd'
     modify encryption
     with passwd 'finditl8ter'
```

```
        for recovery
```

4. If the key custodian loses the password for base key, he can obtain the password from Charlie and recover the base key from the recovery copy of the key using:

```
alter encryption key key1
     with passwd 'finditl8ter'
     recover encryption
     with passwd 'newpasswd'
```

Usage

- If the SSO issues alter encryption key to set the key as the database default, the specified key replaces any existing key as the default.
- If the key custodian issues alter encryption key to set a key as the database default, the specified key and the current default key (if it exists) must be owned by the key custodian.
- Keys are owned and managed by users with keycustodian_role, the sso_role, or by users who are explicitly granted permission for the create encryption key command. Keys are used by all users who have permissions to process and see the data from encrypted columns. How Adaptive Server protects keys affects how they are accessed:

  a. The key owner creates the key for encryption by the system encryption password– when users access the encrypted data, Adaptive Server decrypts the base key using the system encryption password. The key owner does not create individual key copies for users.

  b. The key custodian encrypts the base key with an explicit password – rather than create key copies, the key custodian shares this password with all users who process encrypted data. Users or applications must supply this password with the set encryption passwd command to access data. See set encryption passwrd.

  c. The key custodian adds key copies for end users so that users do not have to share passwords. Users must enter their key copy's password using set encryption passwd to access encrypted columns. Alternatively, the key custodian can set up key copies for encryption by the key assignee's login password. This password does not have to be entered through set encryption passwd.

- When you create a key using create encryption key, Adaptive Server saves the key in encrypted form, along with the key's properties, as a row in sysencryptkeys. This row represents the base key. The key owner can choose to allow access to encrypted data exclusively through the base key, or use alter encryption key to add key copies for individual users.

- If you do not include the with passwd parameter with alter encryption, Adaptive Server uses the system encryption password.
- You cannot use the system encryption password to alter the base key of a key that has copies, and you cannot encrypt copies of keys with the system encryption password.
- Users assigned key copies modify only their own key copies.
- If you specify for *login_association*, Adaptive Server temporarily encrypts the key copy with the system encryption password. The key copy is reencrypted by the copy owner's login password when he or she encrypts or decrypts data with that key.
- You cannot specify for recovery and *login_association* for the same key copy.

Permissions

You must be the system security officer or a user with the keycustodian_role to execute alter encryption key as default or not default. This permission cannot be granted to other users.

You must be the system security officer or the key owner to:

- Use alter encryption key to add or drop key copies, recover the key, and modify the key owner.
- Execute alter encryption key to modify the password of the base key. You must be the user assigned the key copy to modify the key copy password. You implicitly have permission to modify your own key copy's password.

Auditing

For information about auditing encrypted columns, see Chapter 6, "Auditing Encrypted Columns," in the *Encrypted Columns Users Guide*.

See also

create encryption key, drop encryption key, and sp_encryption.

alter login

Description

Changes the attributes of a login account.

Syntax

```
alter login login_name
        { [modify attribute_value_pair_list ]
        | [add auto activated roles role_name [, role_name_list ]]
        | [drop auto activated roles { ALL | role_name [, role_name_list ]}]
        | [drop attribute_name_list ]
        | [ with password caller_password
        modify password [immediately] new_loginName_password ] }
```

Parameters

login_name

specifies the name of the login account to be changed.

modify

changes attribute values to the new values specified if the attributes exist. If the attributes do not exist, the specified list of attributes and corresponding values are added to the login account. The *attribute_value_ pair_list* is an attribute name and a specified value. Specify one or more from the following:

Parameter	Parameter Value	Description
login profile	Valid values: • *login_profile_name* • ignore • default	• *login_profile_name* binds the specified login profile to the specified login account. If a login profile binding already exist, it will be replaced with the specified login profile. • ignore eliminates any login profile binding. If a login profile binding exist, it will be removed. A default login profile will not be applicable and attributes will be applied as they were prior to release 15.7. • default default removes an existing login profile binding and associates the default login profile with the login account. If login profile *login_profile_name* is not specified and a default login profile exists, then the default login profile will be associated with the login account.
fullname	*name_value*	Full name of user who owns the login account. Adds a full name or modifies an existing name. Default is NULL.
password expiration	Valid range: 0 to 32767 days	Password expiration interval. Default is 0, meaning the password never expires.

Parameter	Parameter Value	Description
min password length	Valid range: 0 to 30.	Minimum password length required. Default is 6.
max failed attempts	Valid range: -1 to 32767.	Number of login attempts allowed, after which the login account is locked. -1 indicates the failed count is tracked but not locked. Default is 0, meaning the failed count is not tracked and the account is not locked due to failed login attempts.
authenticate with V	alid values: ASE, LDAP, PAM, KERBEROS, ANY	Specifies the mechanism used for authenticating the login account. When ANY is used, Adaptive Server checks for a defined external authentication mechanism. If one is defined, Adaptive Server uses the defined mechanism., otherwise the ASE mechanism is used. If authenticate with *authentication mechanism* is not specified, ANY will be used for the login account.
default database	*default_database_name*	Specifies a database to be the default. Default is Master.
default language	*default_language*	Specifies a language to be the default. Default is us_english
login script	*login_script_name*	Specifies a valid stored procedure. Limited to 120 characters for a login script.
exempt inactive lock	Valid values: TRUE or FALSE.	Specifies whether or not to exempt login accounts from being locked due to inactivity. Default is FALSE which indicates account are not exempt.

add auto activated roles
: specifies the previously granted, non-password protected user defined roles that must be automatically activated on login.

drop auto activated roles
: specifies the previously granted user defined roles must not be automatically activated on login. ALL specifies all granted user defined roles.

drop

drops specified attributes from the login account. Specify one or more of the following attributes to be dropped:

Parameter	
login profile	Removes the login profile binding from the specified login account. If the login profile ignore parameter has been specified, the parameter is removed and existing default login profile is no longer ignored.
fullname	Removes the name associated with the login account.
password expiration	Removes any password expiration values.
min password length	Removes any restrictions for a minimum password length.
max failed attempts	Removes restrictions for the number of failed attempts allowed.
authenticate with	Removes specifications for authentication mechanisms.
default database	Removes specifications for a default database.
default language	Removes specifications for a default languages.
login script	Removes specifications to apply a login script.
exempt inactive lock	Removes specifications indicating whether or not to lock login accounts due to inactivity. Sets the default value of FALSE where login accounts are not exempt.

with password *caller_password* modify *new_loginName_password*

changes the login password to the new specified password.

immediately

specifies whether a password immediately takes effect on users who are logged in. If you:

- Specify immediately – the password changes immediately in the syslogins table, and users who are logged in get their passwords updated while they are still logged in.
- Do not specify immediately – all users—with an exception to the caller—who are logged, in keep their old passwords until they reconnect.

Examples

Example 1 Binds the login profile emp_lp to the login account ravi.

```
alter login ravi modify login profile emp_lp
```

Example 2 When ignore is specified, all login profiles are ignored, whether it is a login profile that has been bound to the users_1 login account or a defined default login profile.

```
alter login users_1 modify login profile ignore
```

Example 3 Creates two login profiles; the first is general_lp which is a default login profile and the second is a login profile name emp_lp which is defined for a specific group of employees. After the login profiles are created, attributes from both login profiles are applied to a login account. See "Applying login profile and password policy attributes" in the *Security Administration Guide* for information about the order in which attributes are applied.

```
create login profile general_lp as default with default database master
default language us_english
track lastlogin true authenticate with ASE

create login profile emp_lp with default database empdb autheticate with
LDAP
```

The following binds the login profile emp_lp to the login account users_2. The default language and track lastlogin are not defined in login profile emp_lp but are defined in the default login profile. Therefore, the default language and track lastlogin values are applied from general_lp.

```
alter login users_22 modify login profile emp_lp
```

Example 4 Creates two login profiles; the first is newEmployee_lp for new employees and the second is default_lp for existing employees.

```
create login profile newEmployee_lp with login script "newEmp_script"

create login profile default_lp as default with login script "def_script"
```

The following applies the login script newEmp_script to employee_new upon login.

```
create login employee_new with password myPasswd33 login profile
"newEmployee_lp"
```

The login profile default_lp is applied upon login to existing accounts that do not have a login script specified through a login profile.

Example 5 Shows how to enforce different roles that are granted and automatically activated for contract employees and full time employees:

```
create login profile contractEmp_lp
grant role access_role to contractEmp_lp
alter login profile contractEmp_lp add auto activated roles access_role
create login contractEmp_emp1 with password c_Emp43 login profile
"contract_lp"
create login contractEmp_emp2 with password c_Emp44 login profile
"contract_lp"
create login contractEmp_emp3 with password c_Emp44 login profile
"contract_lp"
```

Usage

Precedence rules determine how login account attributes will be applied when attributes are taken from different login profiles or when values have been specified using sp_passwordpolicy.

For precedence rules, see "Applying login profile and password policy attributes" in the *Security Administration Guide*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must have sso_role privileges to alter login accounts. The exception to sso_role is only when you change your own password and full name.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
138	login_admin	alter login	Keywords contain: • MODIFY *attribute_value_pair_list* • DROP *attribute_name_list* • MODIFY PASSWORD • ADD AUTO ACTIVATED ROLES *role1* [*role2*][... [*roleN*]...]] • DROP AUTO ACTIVATED ROLES {ALL | *role1* [, *role2* [... [, *roleN*] ...]] }

See also

Commands create login, create login profile, alter login profile, drop login, drop login profile

Documents For information about altering login accounts, see the *Security Administration Guide*.

Functions lprofile_id, lprofile_name

System procedures sp_passwordpolicy, sp_displaylogin, sp_displayroles, sp_locklogin

alter login profile

Description

Changes the attributes of a login profile.

Syntax

alter login profile *login_profile_name*
{ [as [not] default]
| [modify *attribute_value_pair_list*]
| [add auto activated roles *role_name* [, *role_name_list*]]
| [drop auto activated roles { ALL | *role_name* [, *role_name_list*]}]
| [drop *attribute_name_list*] }

Parameters

as [not] default

as default modifies the login profile to be the default login profile. as not default removes the default property of the specified login profile.

login_profile_name

specifies the name of the login profile to be changed.

modify

attribute values are changed to the new values specified if the attributes exist. If the attributes do not exist, the specified list of attributes and corresponding values are added to the specified login profile. The *attribute_value_ pair_list* is an attribute name and a specified value. Specify one or more of the following attributes:

Parameter	Parameter Value	Description
default database	*default_database_name*	Specifies a database in Adaptive Server. The default is master.
default language	*default_language*	Specifies a language. The default is us_english
login script	*login_script_name*	Specifies a valid stored procedure. Limited to 120 characters for a login script.
authenticate with V	alid values: ASE, LDAP, PAM, KERBEROS, ANY	Specifies the mechanism used for authenticating the login account. When ANY is used, Adaptive Server checks for a defined external authentication mechanism. If one is defined, Adaptive Server uses the defined mechanism., otherwise the ASE mechanism is used. If authenticate with *authentication mechanism* is not specified, ANY will be used for the login account.
track lastlogin	Valid values: TRUE, FALSE.	Enables last login updates. The default is TRUE, which is to update.
stale period	1 .. 32767 days. Duration: D (days), W (weeks), M (months), Y (years)	Indicates the duration a login account is allowed to remain inactive before it is locked due to inactivity. The default is D (days).

add auto activated roles
specifies the previously granted non-password protected user defined roles that must be automatically activated on login. An error is generated if the role specified is not granted to the login. By default, user defined roles are not automatically activated on login.

drop auto activated roles
specifies the previously granted user defined roles must not be automatically activated on login. ALL specifies all granted user defined roles.

drop *attribute_name_list*
removes the following:

- default database – removes the default database specification.
- default language – removes thedefault languages specification.
- login script– removes specifications to apply a login script.
- authenticate with – removes specifications for authentication mechanisms that are associated with the account.
- track last login – removes specifications that enable last login updates.
- stale period – removes any restrictions that have been specified for the login account to remain inactive before it is locked.

Examples

Example 1 Configures eng_lp as the default login profile. If there is anexisting default login profile, its default property is removed.

```
alter login profile eng_lp as default
```

Example 2 Alters the login profile mgr_lp to automatically activate the previously granted program_role, product_role, and admin_role, roles on login if they are not password protected.

```
alter login profile mgr_lp add auto activated roles
program _role, product_role, admin_role
```

Example 3 Alters the login profile mgr_lp to remove the automatic activation of the previously granted role admin_role on login.

```
alter login profile mgr_lp drop auto activated roles
admin_role
```

Example 4 Alters the login profile mgr_lp to remove the login script attribute. Once removed, a login account associated with mgr_lp will use the values of a default login script, if one is defined. If one is not defined, the login script attribute be set to the default value, which is no login script with be invoked on login.

```
alter login profile mgr_lp drop login script
```

Usage

- Precedence rules determine how login account attributes will be applied when attributes are taken from different login profiles or when values have been specified using sp_passwordpolicy. For precedence rules, see "Applying login profile and password policy attributes," in the *Security Administration Guide*.
- You can specify a login script to be invoked at login. For more information, see "Invoking a login script," in the Security Administration Guide.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only a system security officer can execute alter login profile.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
140	security_profile	alter login profile	Keywords contain: • DEFAULT • NOT DEFAULT • DROP *attribute_name_list* • MODIFY *attribute_value_pair_list* • ADD AUTO ACTIVATED ROLES *role1* [*role2*][... [*roleN*]...]] • DROP AUTO ACTIVATED ROLES {ALL | *role1* [, *role2* [... [, *roleN*] ...]] }

See also

Commands create login, create login profile, alter login, drop login, drop login profile

Documents For information about altering login profiles, see the *Security Administration Guide*.

Functions lprofile_id, lprofile_name

System procedures sp_passwordpolicy, sp_displaylogin, sp_displayroles, sp_locklogin

alter...modify owner

Description

Transfers the ownership of database objects from one owner to another.

Syntax

```
alter { object_type | all } [owner.]{object_name | * }
    modify owner
    { name_in_db | loginame only login_name }
    [ preserve permissions ]
```

Parameters

object_type

the type of object whose ownership is to be explicitly transferred. Specify one of the following object types:

- table – user tables and proxy tables
- view – views
- procedure – stored procedures
- function – user-defined functions
- default – defaults defined separately from the creation of tables
- rule – rules
- type – user-defined datatypes
- encryption key – encryption keys

all

all permitted object types. When specified as all *owner*.*, the ownership of all permitted objects owned by the specified owner are transferred. When specified as all *owner*.*object_name*, the ownership of permitted objects with name *object_name* owned by the specified owner are transferred.

owner.

indicates the current owner of the object which is determined by the owner's database user ID (uid). Specifying *owner* is optional when the user is transferring the ownership of objects owned by themselves. Ownership of objects in the sysobjects table are associated with the owner's login name and uid.

object_name

indicates the name of the object in which the ownership is to be transferred. An attempt to transferred the ownership of an object with *object_name* set to the same owner results in an error message.

*
all objects owned by *owner* and specified by *object_type* . When *object_type* is all, all objects owned by *owner* are transferred. When *owner* is the database owner, * is not allowed.

name_in_db
the database user name of the new owner to whom the ownership transfered. The user specified by *name_in_db* must be an existing user and cannot be a guest, role, group, or an alias.

loginame only *login_name*
transfers only the loginame field in sysobjects of objects involved to *login_name*. *login_name* must be a valid login in the syslogins table.

preserve permissions
indicates whether or not to preserve explicitly granted or revoked permissions on the objects whose ownership are being transferred:

- When specified – all explicitly granted or revoked permissions on the objects are preserved and the *grantor* of the permissions is changed to the new owner.

  For example, bill granted select permission on table `bill_table` to mark with grant option. Mark then granted select permission on table `bill_table` to john. If the ownership of the table is then transferred to eric with preserve permissions specified, mark and john will retain their permission on `bill_table`.

- When not specified – all existing explicitly granted and revoked permissions on the objects are removed from the system, and as a result, rows in the sysprotects table that correspond to the object are deleted.

Implicit permissions on objects are not preserved for previous owners. New owners will acquire all implicit permissions.

For example, bill is the owner of bill_table and possesses the implicit alter, delete, insert, references, select, and update permissions and explicit decrypt permission on bill_table. After an ownership transfer to eric with preserve permission specified, bill will only retain decrypt permission on bill_table.

Examples

Example 1 Transfers ownership of the table named bill.author to eric:

```
alter table bill.author
    modify owner eric
```

Example 2 Transfers ownership of the view named bill.vw_author_in_ca to eric without removing all existing explicitly granted permissions:

```
alter view bill.vw_author_in_ca
```

```
        modify owner eric
        preserve permissions
```

Example 3 Transfers ownership of all tables owned by bill to eric:

```
alter table bill.*
    modify owner eric
```

Example 4 Transfers ownership of all objects owned by bill to eric:

```
alter all bill.*
    modify owner eric
```

Example 5 The command fails when the new owner cindy already owns an table named cindy.publisher.

```
alter table bill.publisher
    modify owner cindy
```

Example 6 An error results when an attempt is made to transfer the ownership of bill.publisher to cindy because bill.publisher is not a stored procedure.

```
alter procedure bill.publisher
    modify owner cindy
```

Usage

Implicit Transfer of Objects

The ownership of the following dependant objects is implicitly transferred when the ownership of the objects they depend on have been transferred:

- trigger – ownership of triggers are updated along with the dependent table when the owners are the same. The ownership of a DBO owned trigger cannot be altered if the trigger was created for a non DBO owned table or view.
- Declarative objects, which are defined during the table or view creation.
    - Defaults
    - Decrypt defaults
    - Dheck constraints
    - Reference constraints
    - Partition constraints
    - Computer columns

Objects in System Databases

Caution should be use when transferring ownership of objects in the following system databases: sybsecurity, sybsystemdb, model, sybsystemprocs, sybsyntax, dbccdb, and tempdb.

Do not transfer ownership of system objects supplied and managed by Sybase, such as but not limited to, user tables with spt_ prefix, system stored procedures with the sp_ prefix, and monitor tables. Doing so can render the system database unusable.

Encryption Keys

Transfer of encryption keys to an owner who owns a copy of the key is not allowed and the command will fail.

Changing the owner of encryption keys does not effect the assignees of the encryption key copies.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

- System security officer (SSO) users are allowed to use this command to transfer the ownership of objects.
- Only SSO users and encryption key owners can transfer the encryption key ownership.
- Database owner (DBO) users and users who are explicitly or implicitly aliased to the DBO are allowed to transfer the ownership of objects with a type other than encryption keys with the following restrictions:
  - Database owners are not allowed to transfer the ownership of objects they concretely own. An object is identified as concretely owned by the database owner if it includes DBO_UID for the value of sysobjects.uid, and NULL or the database owner's login name for the value of sysobjects.loginame.
  - The functionality of transferring the ownership of multiple objects in one command is disabled for safety reasons and the transfer of DBO objects must be in the form of dbo.*object_name*.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo

124	alter	alter .. modify owner	• *Roles* – current active roles
			• *Keywords or options* – One of:
			  • USER TYPE *owner.obj_name* – if you are changing user-defined types' ownership
			  • NEW OWNER – *name_in_db*
			  • PRESERVE PERMISSIONS – if the option is specified
			  • NEW LOGINAME – *login_name*, if LOGINAME ONLY *login_name* is specified
			• *Previous value* – NULL
			• *Current value* – NULL
			• *Other information* – NULL
			• *Proxy information* – original login name, if set proxy is in effect

alter role

Description

Defines mutually exclusive relationships between roles; adds, drops, and changes passwords for roles; specifies the password expiration interval, the minimum password length, and the maximum number of failed logins allowed for a specified role. alter role also locks and unlocks roles.

Syntax

```
alter role role1 {add | drop} exclusive
        {membership | activation} role2

alter role role_name [add passwd "password" |
        drop passwd] [lock | unlock]

alter role {role_name | "all overrides"}
        set {passwd expiration | min passwd length |
        max failed_logins} option_value
```

Parameters

role1
is one role in a mutually exclusive relationship.

add
adds a role in a mutually exclusive relationship; adds a password to a role.

drop
drops a role in a mutually exclusive relationship; drops a password from a role.

exclusive
makes both named roles mutually exclusive.

membership
does not allow you to grant users both roles at the same time.

activation
allows you to grant a user both roles at the same time, but does not allow the user to activate both roles at the same time.

role2
is the other role in a mutually exclusive relationship.

role_name
is the name of the role for which you want to add, drop, or change a password. Use *role_name* to specify the password expiration interval, the minimum password length, and the maximum number of failed logins.

passwd
adds or drops a password to a role.

password
is the password to add to a role. You cannot use variables for passwords. For rules on passwords, see Chapter 14, “Managing Adaptive Server Logins, Database Users, and Client Connections,” in the *System Administration Guide, Volume 1*.

lock
locks the specified role.

unlock
unlocks the specified role.

all overrides
applies the setting that follows to the entire server rather than to a specific role.

set
activates the option that follows it.

passwd expiration
specifies the password expiration interval in days. It can be any value between 0 – 32767, inclusive.

min passwd length
specifies the minimum length allowed for the specified password.

max failed_logins
specifies the maximum number of failed login attempts allowed for the specified password.

option_value
specifies the value for passwd expiration, min passwd length, or max failed_logins. To set all overrides, set the value of *option_value* to -1.

Examples

Example 1 Defines intern_role and specialist_role as mutually exclusive at the membership level:

```
alter role intern_role add exclusive membership
    specialist_role
```

Example 2 Defines roles as mutually exclusive at the membership level and at the activation level:

```
alter role specialist_role add exclusive membership
    intern_role
alter role intern_role add exclusive activation
    surgeon_role
```

Example 3 Adds a password to an existing role:

```
alter role doctor_role add passwd "physician"
```

Example 4 Drops a password from an existing role:

```
alter role doctor_role drop passwd
```

Example 5 Locks physician_role:

```
alter role physician_role lock
```

Example 6 Unlocks physician_role:

```
alter role physician_role unlock
```

Example 7 Changes the maximum number of failed logins allowed for physician_role to 5:

```
alter role physician_role set max failed_logins 5
```

Example 8 Sets the minimum password length for physician_role, an existing role, to five characters:

```
alter role physician_role set min passwd length 5
```

Example 9 Overrides the minimum password length of all roles:

```
alter role "all overrides" set min passwd length -1
```

Example 10 Removes the overrides for the maximum failed logins for all roles:

```
alter role "all overrides" set max failed_logins -1
```

Usage

- The alter role command defines mutually exclusive relationships between roles, and adds, drops, and changes passwords for roles.
- The all overrides parameter removes the system overrides that were set using sp_configure with any of the following parameters:
  - passwd expiration
  - max failed_logins
  - min passwd length

  Dropping the role password removes the overrides for the password expiration and the maximum failed logins options.
- When you use alter role to lock or unlock roles, you set (or unset) the locksuid, lockdate, and lockreason columns that are added to syssrvroles.

Mutually exclusive roles

- You need not use any particular order to specify the roles in a mutually exclusive relationship or role hierarchy.

- You can use mutual exclusivity with role hierarchy to impose constraints on user-defined roles.
- Mutually exclusive membership is a stronger restriction than mutually exclusive activation. If you define two roles as mutually exclusive at membership, they are implicitly mutually exclusive at activation.
- If you define two roles as mutually exclusive at membership, defining them as mutually exclusive at activation has no effect on the membership definitions. Mutual exclusivity at activation is added and dropped independently of mutual exclusivity at membership.
- You cannot define two roles as mutually exclusive property after granting both roles to users or roles. Revoke either granted role from existing grantees before attempting to define the roles as mutually exclusive at the membership level.
- If two roles are defined as mutually exclusive at activation, the system security officer can assign both roles to the same user, but the user cannot activate both roles at the same time.
- If the system security officer defines two roles as mutually exclusive at activation, and users have already activated both roles or, by default, have set both roles to activate at login, Adaptive Server makes the roles mutually exclusive, but issues a warning message naming specific users with conflicting roles. The users' activated roles do not change.

Changing passwords for roles

To change the password for a role, first drop the existing password, then add the new password, as follows:

```
alter role doctor_role drop passwd
alter role doctor_role add passwd "physician"
```

Note Passwords that existed before Adaptive Server version 12.x and that are attached to user-defined roles do not expire.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only a system security officer can execute alter role.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
85	roles	create role, drop role, alter role, grant role, or revoke role	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands create role, drop role, grant, revoke, set

Documents For more information on altering roles, see the *System Administration Guide*.

Functions mut_excl_roles, proc_role, role_contain, role_id, role_name

System procedures sp_activeroles, sp_displaylogin, sp_displayroles, sp_modifylogin

alter table

Description

- Adds new columns to a table; drops or modifies existing columns; adds, changes, or drops constraints; changes properties of an existing table; enables or disables triggers on a table, changes the compression level of a table.
- Supports adding, dropping, and modifying computed columns, and enables the materialized property, nullability, or definition of an existing computed column to be changed.
- Partitions and repartitions a table with specified partition strategy, or adds partitions to a table with existing partitions.

Syntax

```
alter table [[database.][owner].table_name
        {add column_name datatype}
            [default {constant_expression | user | null}]
            {identity | null | not null [not materialized]}
            [off row | in row]
            [[constraint constraint_name]
            {{unique | primary key}
                [clustered | nonclustered]
                [asc | desc]
                [with {fillfactor = pct,
                    max_rows_per_page = num_rows,
                    reservepagegap = num_pages]
                [on segment_name]
            | references [[database.]owner.]ref_table
                [(ref_column)]
                [match full]
            | check (search_condition)]
            [encrypt [with [database.[owner].] keyname]
                [decrypt_default {constant_expression | null}]]
            [compressed = compression_level | not compressed]
            [, next_column]...
        | add [constraint constraint_name]
            {unique | primary key}
                [clustered | nonclustered]
                 (column_name [asc | desc][, column_name [asc | desc]...])
                [with {fillfactor = pct,
                    max_rows_per_page = num_rows,
                    reservepagegap = num_pages}]
                [on segment_name]
            | foreign key (column_name [{, column_name}...])
                references [[database.]owner.]ref_table
                [(ref_column [{, ref_column}...])]
            [match full]
        | add lob-colname { text | image | unitext }
            [null] [ in row [ (length) ] ]
        | check (search_condition)}
```

```
| set dml_logging = {full | minimal | default} |
      [, compression = {none | page | row}]}
      [lob_compression = off | compression_level]
| drop {column_name [, column_name]...
      | constraint constraint_name}
| modify column_name
      [datatype [null | not null]]
      [[[encrypt [with keyname] [decrypt_default [value]]
            | decrypt
      ]
      [[not] compressed]
      [compressed = compression_level | not compressed]
      | modify lob-column [ in row (length)]
                  [, next_column]...
| replace column_name
      default {constant_expression | user | null}
      | decrypt_default {constant_expression | null}
      | drop decrypt_default|
lock {allpages | datarows | datapages} }
| with exp_row_size=num_bytes
      transfer table [on | off]}
| partition number_of_partitions
| unpartition
| partition_clause
| add_partition_clause
```

alter table syntax for partitions:

```
partition_clause::=
      partition by range (column_name[, column_name]...)
            ([partition_name] values <= ({constant | MAX}
                  [, {constant | MAX}] ...) [on segment_name]
                  [compression_clause] [on segment_name]
                  [, [partition_name] values <= ({constant | MAX}
                        [, {constant | MAX}] ...) [on segment_name]]...)

      | partition by hash (column_name[, column_name]...)
            { (partition_name [on segment_name]
                  [, partition_name [on segment_name]]...)
                  [compression_clause] [on segment_name]
            | number_of_partitions
                  [on (segment_name[, segment_name] ...)]}

      | partition by list (column_name)
            ([partition_name] values (constant[, constant] ...)
                  [on segment_name]
                  [compression_clause] [on segment_name]
                  [, [partition_name] values (constant[, constant] ...)
                        [on segment_name]] ...)

      | partition by roundrobin
            { (partition_name [on segment_name]
```

```
                [, partition_name [on segment_name]]...)
                [compression_clause] [on segment_name]
            | number_of_partitions
                [on (segment_name [, segment_name]...)]}

    add_partition_clause::=
        add partition
            { ([partition_name] values <= ({constant | MAX}
                [, {constant | MAX}]...)
                [on segment_name]
                [compression_clause] [on segment_name]
                [, [partition_name ] values <= ({constant | MAX}
                    [, {constant | MAX}] ...)
                    [on segment_name]]...)
            | modify partition {partition_name [, partition_name . . .] }
            set compression [= {default | none | row | page}]

            | ([partition_name] values (constant[, constant] ...)
                [on segment_name]
                [, [partition_name] values (constant[, constant] ...)
                    [on segment_name]] ...)}
```

alter table syntax for computed columns:

```
    alter table
        add column_name {compute | as}
            computed_column_expression...
                [materialized | not materialized]
        drop column_name
        modify column_name {null | not null |
            {materialized | not materialized} [null | not null] |
            {compute | as} computed_column_expression
                [materialized | not materialized]
                [null | not null]}
```

alter table syntax for dropping partitions:

```
    alter table table_name drop partition
        partition_name [, partition_name]...
```

Parameters

table_name
is the name of the table to change. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

add
specifies the name of the column or constraint to add to the table. If CIS is enabled, you cannot use add for remote servers.

column_name

is the name of a column in that table. If Java is enabled in the database, the column can be a Java-SQL column.

datatype

is any system datatype except bit, or any user-defined datatype except those based on bit.

If Java is enabled in the database, *datatype* can be the name of a Java class installed in the database, either a system class or a user-defined class. See *Java in Adaptive Server Enterprise*.

default

specifies a default value for a column. If you specify a default and the user does not provide a value for this column when inserting data, Adaptive Server inserts this value. The default can be a *constant_expression*, user (to insert the name of the user who is inserting the data), or null (to insert the null value).

Adaptive Server generates a name for the default in the form of *tabname_colname_objid,* where *tabname* is the first 10 characters of the table name, *colname* is the first 5 characters of the column name, and *objid* is the object ID number for the default. Setting the default to null drops the default.

If CIS is enabled, you cannot use default for remote servers.

constant_expression

is a constant expression to use as a default value for a column. It cannot include global variables, the name of any columns, or other database objects, but can include built-in functions. This default value must be compatible with the datatype of the column.

user

specifies that Adaptive Server should insert the user name as the default if the user does not supply a value. The datatype of the column must be char(30), varchar(30), or a type that Adaptive Server implicitly converts to char; however, if the datatype is not char(30) or varchar(30), truncation may occur.

null | not null

specifies the Adaptive Server behavior during data insertion if no default exists.

null specifies that a column is added that allows nulls. Adaptive Server assigns a null value during inserts if a user does not provide a value.

The properties of a bit-type column must always be not null.

not null specifies that a column is added that does not allow nulls. Users must provide a non-null value during inserts if no default exists.

If you do not specify null or not null, Adaptive Server uses not null by default. However, you can switch this default using sp_dboption to make the default compatible with the SQL standards. If you specify (or imply) not null for the newly added column, a default clause is required. The default value is used for all existing rows of the newly added column, and applies to future inserts as well.

materialized | not materialized

indicates whether you are creating a materialized or nonmaterialized column.

encrypt [with *keyname*]

specifies an encrypted column and the key used to encrypt it.

keyname identifies a key created using create encryption key. The table owner must have select permission on *keyname*. If *keyname* is not supplied, the server looks for a default key created using create encryption key or alter encryption key.

See Chapter 4, "Encrypting Data" in the User Guide for Encrypted Columns for a list of supported datatypes.

decrypt_default *constant_expression*

specifies that this column returns a default value for users who do not have decrypt permissions, and *constant_expression* is the value Adaptive Server returns on select statements instead of the decrypted value. The value can be NULL on nullable columns only. If the decrypt_value cannot be converted to the column's datatype, Adaptive Server catches the conversion error only when the query executes.

decrypt

decrypts the encrypted column.

compressed = *compression_level* | not compressed

indicates if the data in the row is compressed and to what level.

compression_level

Level of compression. The compression levels are:

- 0 – the row is not compressed.
- 1 through 9 – Adaptive Server uses ZLib compression. Generally, the higher the compression number, the more Adaptive Server compresses the LOB data, and the greater the ratio between compressed and uncompressed data (that is the greater the amount of space savings, in bytes, for the compressed data versus the size of the uncompressed data).

  However, the amount of compression depends on the LOB content, and the higher the compression level , the more CPU-intensive the process. That is, level 9 provides the highest compression ratio but also the heaviest CPU usage.
- 100 – Adaptive Server uses FastLZ compression. The compression ratio that uses the least CPU usage; generally used for shorter data.
- 101 – Adaptive Server uses FastLZ compression. A value of 101 uses slightly more CPU than a value of 100, but uses a better compression ratio than a value of 100.

The compression algorithm ignores rows that do not use LOB data.

identity

indicates that the column has the IDENTITY property. Each table in a database can have one IDENTITY column with a datatype of:

- Exact numeric and scale of 0, or
- Any of the integer datatypes, including signed or unsigned bigint, int, smallint, or tinyint.

IDENTITY columns are not updatable and do not allow nulls.

IDENTITY columns store sequential numbers, such as invoice numbers or employee numbers that are automatically generated by Adaptive Server. The value of the IDENTITY column uniquely identifies each row in a table.

off row | in row

specifies whether the Java-SQL column is stored separately from the row, or in storage allocated directly in the row.

The storage for an in row column cannot exceed 16K bytes, depending on the page size of the database server and other variables. The default value is off row.

constraint

introduces the name of an integrity constraint. If CIS is enabled, you cannot use constraint for remote servers.

constraint_name

is the name of the constraint, which must conform to the rules for identifiers and be unique in the database. If you do not specify the name for a table-level constraint, Adaptive Server generates a name in the form of *tabname_colname_objectid*, where *tabname* is the first 10 characters of the table name, *colname* is the first 5 characters of the column name, and *objectid* is the object ID number for the constraint. If you do not specify the name for a unique or primary key constraint, Adaptive Server generates a name in the format *tabname_colname_tabindid*, where *tabindid* is a string concatenation of the table ID and index ID.

Constraints do not apply to the data that already exists in the table at the time the constraint is added.

unique

constrains the values in the indicated column or columns so that no two rows can have the same non-null value. This constraint creates a unique index that can be dropped only if the constraint is dropped. You cannot use this option with the null option.

primary key

constrains the values in the indicated column or columns so that no two rows can have the same value and so that the value cannot be NULL. This constraint creates a unique index that can be dropped only if the constraint is dropped.

clustered | nonclustered

specifies that the index created by a unique or primary key constraint is a clustered or nonclustered index. clustered is the default (unless a clustered index already exists for the table) for primary key constraints; nonclustered is the default for unique constraints. There can be only one clustered index per table. See create index for more information.

asc | desc

specifies whether the index is to be created in ascending (asc) or descending (desc) order. The default is ascending order.

with fillfactor=*pct*

specifies how full to make each page when Adaptive Server creates a new index on existing data. "pct" stands for percentage. The fillfactor percentage is relevant only when the index is created. As data changes, pages are not maintained at any particular level of fullness.

Warning! Creating a clustered index with a fillfactor affects the amount of storage space your data occupies, since Adaptive Server redistributes the data as it creates the clustered index.

The default for fillfactor is 0; this is used when you do not include with fillfactor in the create index statement (unless the value has been changed with sp_configure). When specifying a fillfactor, use a value between 1 and 100.

A fillfactor of 0 creates clustered indexes with completely full pages and nonclustered indexes with completely full leaf pages. It leaves a comfortable amount of space within the index B-tree in both clustered and nonclustered indexes. There is seldom a reason to change the fillfactor.

If the fillfactor is set to 100, Adaptive Server creates both clustered and nonclustered indexes, with each page 100 percent full. A fillfactor of 100 makes sense only for read-only tables—tables to which no data will ever be added.

fillfactor values smaller than 100 (except 0, which is a special case) cause Adaptive Server to create new indexes with pages that are not completely full. A fillfactor of 10 might be a reasonable choice if you are creating an index on a table that will eventually hold a great deal more data, but small fillfactor values cause each index (or index and data) to take more storage space.

transfer table [on | off]

alters a table's eligibility for incremental transfer. The default value is to make no change, whether the table is marked for transfer or not. If the alter table command specifies set transfer table, and the selection of on or off differs from the current value, the table's eligibility is changed.

max_rows_per_page = *num_rows*

limits the number of rows on data pages and the leaf-level pages of indexes. Unlike fillfactor, the max_rows_per_page value is maintained until it is changed with sp_chgattribute.

If you do not specify a value for max_rows_per_page, Adaptive Server uses a value of 0 when creating the index. When specifying max_rows_per_page for data pages, use a value between 0 – 256. The maximum number of rows per page for nonclustered indexes depends on the size of the index key; Adaptive Server returns an error message if the specified value is too high.

For indexes created by constraints, a max_rows_per_page setting of 0 creates clustered indexes with full pages, and nonclustered indexes with full leaf pages. A setting of 0 leaves a comfortable amount of space within the index B-tree in both clustered and nonclustered indexes.

If max_rows_per_page is set to 1, Adaptive Server creates both clustered and nonclustered leaf index pages with one row per page at the leaf level. You can use this to reduce lock contention on frequently accessed data.

Low max_rows_per_page values cause Adaptive Server to create new indexes with pages that are not completely full, use more storage space, and may cause more page splits.

Warning! Creating a clustered index with max_rows_per_page can affect the amount of storage space your data occupies, since Adaptive Server redistributes the data as it creates the clustered index.

---

reservepagegap = *num_pages*

specifies a ratio of filled pages to empty pages to be left during extent I/O allocation operations for the index created by the constraint. For each specified *num_pages*, an empty page is left for future expansion of the table. Valid values are 0 – 255. The default value, 0, leaves no empty pages.

on *segment_name*

specifies the segment on which the index exists or is to be placed. When using on *segment_name*, the logical device must already have been assigned to the database with create database or alter database, and the segment must have been created in the database with sp_addsegment. See your system administrator or use sp_helpsegment for a list of the segment names available in your database.

If you specify clustered and use the on *segment_name* option, the entire table migrates to the segment you specify, since the leaf level of the index contains the actual data pages.

For partitions, on *segment_name* specifies the segment on which to place the partition.

references

specifies a column list for a referential integrity constraint. You can specify only one column value for a column constraint. By including this constraint with a table that references another table, any data inserted into the *referencing* table must already exist in the *referenced* table.

To use this constraint, you must have references permission on the referenced table. The specified columns in the referenced table must be constrained by a unique index (created by either a unique constraint or a create index statement). If no columns are specified, there must be a primary key constraint on the appropriate columns in the referenced table. Also, the datatypes of the referencing table columns must exactly match the datatype of the referenced table columns.

If CIS is enabled, you cannot use references for remote servers.

foreign key

specifies that the listed columns are foreign keys in this table for which the matching primary keys are the columns listed in the references clause.

ref_table

is the name of the table that contains the referenced columns. You can reference tables in another database. Constraints can reference as many as 192 user tables and internally generated worktables. Use sp_helpconstraint to check a table's referential constraints.

ref_column

is the name of the column or columns in the referenced table.

match full

specifies that if all values in the referencing columns of a referencing row are:

- Null – the referential integrity condition is true.
- Non-null values – if there is a referenced row where each corresponding column is equal in the referenced table, then the referential integrity condition is true.

If they are neither, then the referential integrity condition is false when:

- All values are non-null and not equal, or
- Some of the values in the referencing columns of a referencing row are non-null values, while others are null.

check

specifies a *search_condition* constraint that Adaptive Server enforces for all the rows in the table. If CIS is enabled, you cannot use check for remote servers.

search_condition

is a Boolean expression that defines the check constraint on the column values. These constraints can include:

- A list of constant expressions introduced with in
- A set of conditions, which may contain wildcard characters, introduced with like

  An expression can include arithmetic operations and Transact-SQL functions. The *search_condition* cannot contain subqueries, aggregate functions, parameters, or host variables.

next_column

includes additional column definitions (separated by commas) using the same syntax described for a column definition.

set dml_logging

determines the amount of logging for insert, update, and delete (DML) operations. One of:

- full – Adaptive Server logs all transactions,
- minimal – Adaptive Server does not log row or page changes
- default – logging is set to the table default.

add *lob-colname* { text | image | unitext }
adds the LOB column with the specified datatype.

[null] [in row [(*length*)]]
specifies the maximum length for the LOB column to remain in-row. If you do not specify length, Adaptive Server applies the database-wide setting in effect for in-row length.

If you do not use in row (*length*), and the database-wide setting is not in effect, the LOB column is added with off-row storage of the data.

modify *lob-column* in row [(*length*)]
changes only the property of the LOB column to in-row, up to the specified length. When you run this command, no data moves.

You can also use this option to increase the length of an in-row LOB column.

Note You cannot use this option to decrease the length of a LOB column, nor can you specify 0 as the length. Depending on the amount of space available on the page, the off-row LOB data is moved in-row up to the specified in-row length during updates that occur after this modification.

---

set compression
indicates the level of compression to be applied to the table or partition. The new compression level applies to newly inserted or updated data:

- default – resets the compression level for the specified partitions to the compression level of the table.
- none – the data in this table or partition is not compressed. For partitions, none indicates that data in this partition remains uncompressed even if the table compression is altered to row or page compression.
- page – when the page fills, existing data rows that are row-compressed are then compressed using page-level compression to create page-level dictionary, index, and character-encoding entries. Set page compression at the partition or table level.

  Adaptive Server compresses data at the page level only after it has compressed data at the row level, so setting the compression to page implies both page and row compression.
- row – compresses one or more data items in an individual row. Adaptive Server stores data in a row compressed form only if the compressed form saves space compared to an uncompressed form. Set row compression at the partition or table level.

set lob_compression = *compression_level*
changes the compression level for a table that uses LOB datatypes.

drop
specifies the name of a column or constraint to drop from the table. If CIS is enabled, you cannot use drop for remote servers.

modify
specifies the name of the column for which you are changing the datatype or nullability.

[not] compressed
indicates if the modified column is compressed.

replace
specifies the column for which to replace the default value with the new value specified by a following default clause. If CIS is enabled, you cannot use replace for remote servers.

enable | disable trigger
enables or disables a trigger. See the *System Administration Guide* for information about triggers.

lock datarows | datapages | allpages
changes the locking scheme to be used for the table.

with exp_row_size=*num_bytes*
specifies the expected row size. You can apply this parameter only:

- To datarows and datapages locking schemes.
- To tables with variable-length rows.
- When alter table performs a data copy, such as with alter table add or modify. You cannot use with exp_row_size=*num_bytes* with alter table lock change operations.

Valid values are 0, 1, and any value between the minimum and maximum row length for the table. The default value is 0, which means a server-wide setting is applied.

partition *number_of_partitions*
adds (*number_of_partitions* –1) empty partitions to an unpartitioned table (round-robin-partitioned table with a single partition). Thus, the total number of partitions for the table becomes *number_of_partitions*. If Component Integration Services (CIS) is enabled, you cannot use partition for remote servers.

unpartition
changes a round-robin-partitioned table without indexes, to an unpartitioned table. If CIS is enabled, you cannot use unpartition for remote servers.

partition by range
specifies that records are to be partitioned according values in the partitioning column or columns. Each partitioning column value is compared with sets of user-supplied upper and lower bounds to determine partition assignment.

column_name
when used in the *partition_clause*, specifies a partition key column. A partition key column cannot be an encrypted column.

partition_name
specifies the name of a new partition on which table records are to stored. Partition names must be unique within the set of partitions on a table or index. Partition names can be delimited identifiers if set quoted_identifier is on. Otherwise, they must be valid identifiers.

If *partition_name* is omitted, Adaptive Server creates a name in the form *table_name_partition_id*. Adaptive Server truncates partition names that exceed the allowed maximum length.

values <= *constant* | MAX

specifies the inclusive upper bound of values for a named partition. Specifying a constant value for the highest partition bound imposes an implicit integrity constraint on the table. The keyword MAX specifies the maximum value in a given datatype.

on *segment_name*

when used in the *partition_clause*, specifies the segment on which the partition is to be placed. When using on *segment_name*, the logical device must already have been assigned to the database with create database or alter database, and the segment must have been created in the database with sp_addsegment. See your system administrator or use sp_helpsegment for a list of the segment names available in your database.

partition by hash

specifies that records are to be partitioned by a system-supplied hash function. The function computes the hash value of the partition keys that specify the partition to which records are assigned.

partition by list

specifies that records are to be partitioned according to literal values specified in the named column. The partition key contains only one column. You can list as many as 250 constants as the partition values for each list partition.

partition by round-robin

specifies that records are to be partitioned in a sequential manner. A round-robin-partitioned table has no partitioning key. Neither the user nor the optimizer knows in which partition a particular record resides.

add partition

applies only to range- or list-partitioned tables:

- For range-partitioned tables – adds one or more partitions to the upper end of a range partitioned table.
- For list-partitioned tables – adds one or more partitions with a new set of values.

modify partition

specifies the partitions for which you are modifying the compression level.

compute | as

adds or drops a new computed column. Follow the same rules defined for the create table command and the alter table add rules.

computed_column_expression

is any valid Transact-SQL expression that does not contain columns from other tables, local variables, aggregate functions, or subqueries. It can be one or a combination of column name, constant, function, global variable, or case expression, connected by one or more operators. You cannot cross-reference between computed columns, except when virtual computed columns reference materialize computed columns. You cannot reference encrypted column in a *computed_column_expression*.

materialized | not materialized

specifies whether a computer column is materialized or not. These are reserved keywords in the modify clause that specify whether the computed column is materialized, or physically stored in the table. By default, a computed column is not materialized (that is, not physically stored in the table). You can also use this parameter to change the definitions of existing virtual computed columns; that is, to materialize them.

table_name drop partition *partition_name* [, *partition_name*]...

drops one or more list or range partitions. You cannot use alter table to drop a hash or round-robin partition.

For each partition you drop, Adaptive Server:

- Deletes all data on the partition
- Deletes the partition definition from the system catalog
- Drops all corresponding local index partitions that refer to this data partition
- Regenerates the partition condition object of the base table and each local index
- Deletes all statistics information on this partition
- Rebuilds all global indexes

Note If you attempt to drop a partition from a table that is referenced by another table, and the partition to be dropped and the referencing table are not empty, the command fails because of possible violations with the foreign-key constraint, and Adaptive Server displays error message 13971.

Examples

Example 1 Adds a column to a table. For each existing row in the table, Adaptive Server assigns a NULL column value:

```
alter table publishers
add manager_name varchar (40) null
```

Example 2 Adds an IDENTITY column to a table. For each existing row in the table, Adaptive Server assigns a unique, sequential column value. The IDENTITY column can be type numeric or integer, and have a scale of zero. The precision determines the maximum value (10^5 -1, or 99,999) that can be inserted into the column:

```
alter table sales_daily
add ord_num numeric (5,0) identity
```

Example 3 Adds a primary key constraint to the authors table. If there is an existing primary key or unique constraint on the table, you must drop the existing constraint first (see next example):

```
alter table authors
add constraint au_identification
primary key (au_id, au_lname, au_fname)
```

Example 4 Drops the au_identification constraint:

```
alter table titles
    drop constraint au_identification
```

Example 5 Creates an index on authors; the index has a reservepagegap value of 16, leaving 1 empty page in the index for each 15 allocated pages:

```
alter table authors
add constraint au_identification
primary key (au_id, au_lname, au_fname)
with reservepagegap = 16
```

Example 6 Removes the default constraint on the phone column in the authors table. If the column allows NULL values, NULL is inserted if no column value is specified. If the column does not allow NULL values, an insert that does not specify a column value fails:

```
alter table authors
    replace phone default null
```

Example 7 Modifies the emp table to encrypt the ssn column and specifies decrypt default:

```
alter table emp modify ssn encrypt with key1
    decrypt_default '000-00-0000'
```

Example 8 Decrypts credit card data that is longer sensitive:

```
alter table stolen_ccards
     modify ccard decrypt
```

If card was encrypted by a key protected by a user-defined password, precede this command with the set encryption key command.

Example 9 Adds an encrypted column to an existing table. Because keyname is omitted, Adaptive Server looks for the database default encryption key:

```
alter table sales_mgr
     add bonus money null encrypt
```

Example 10 Sets the password for the ssn_key encryption key and encrypts the ssn column in the existing employee table.

```
set encryption passwd '4evermore' for key ssn_key
alter table employee modify ssn
         encrypt with ssn_key
```

If ssn in this example is an existing encrypted column encrypted by "key1" the alter table would cause Adaptive Server to decrypt ssn using "key1" and reencrypt ssn using "ssn_key".

Example 11 Adds a decrypt default to the salary column, which is already encrypted:

```
alter table employee replace salary
    decrypt_default $0.00
```

Example 12 Removes the decrypt default for salary without removing the encryption property:

```
alter table employee replace salary drop
    decrypt_default
```

Example 13 Changes an unpartitioned table to a range-partitioned table with three partitions, each of which is on a different segment:

```
alter table titles partition by range (total_sales)
    (smallsales values <= (500) on seg1,
    mediumsales values <= (5000) on seg2,
    bigsales values <= (25000) on seg3)
```

Example 14 Adds another range partition to the titles table:

```
alter table titles add partition
     (vbigsales values <= (40000) on seg4)
```

Example 15 Alters the titles table in the pubs2 database to use row-level compression:

```
alter table titles set compression = row
```

Example 16 Changes the Y2009 partition of the sales table to use page-level compression:

```
alter table sales modify partition Y2009
set compression = page
```

Example 17 Changes the locking scheme for the titles table to datarows locking:

```
alter table titles lock datarows
```

Example 18 Adds the not-null column author_type to the authors table with a default of primary_author:

```
alter table authors
    add author_type varchar (20)
    default "primary_author" not null
```

Example 19 Drops the advance, notes, and contract columns from the titles table:

```
alter table titles
    drop advance, notes, contract
```

Example 20 Modifies the city column of the authors table to be a varchar(30) with a default of NULL:

```
alter table authors
    modify city varchar (30) null
```

Example 21 Modifies the stor_name column of the stores table to be NOT NULL. Its datatype, varchar(40), remains unchanged:

```
alter table stores
    modify stor_name not null
```

Example 22 Modifies the type column of the titles table and changes the locking scheme of the titles table from allpages to datarows:

```
alter table titles
    modify type varchar (10)
    lock datarows
```

Example 23 Modifies the notes column of the titles table from varchar(200) to varchar(150), changes the default value from NULL to NOT NULL, and specifies an exp_row_size of 40:

```
alter table titles
    modify notes varchar (150) not null
    with exp_row_size = 40
```

Example 24 Adds the incremental transfer attribute to mytable:

```
alter table mytable set transfer table on
```

Example 25 Removes the incremental transfer attribute from mytable:

```
alter table mytable set transfer table off
```

Example 26 Adds, modifies, and drops a column, and then adds another column in one query. Alters the locking scheme and specifies the exp_row_size of the new column:

```
alter table titles
    add author_type varchar (30) null
    modify city varchar (30)
    drop notes
    add sec_advance money default 1000 not null
    lock datarows
    with exp_row_size = 40
```

Example 27 Modifies the description column of mymsgs table to support in-row LOB 400 bytes long:

```
alter table mymsgs modify description in row (400)
```

Example 28 Adds a virtual computed column:

```
alter table authors
    add fullname compute au_fname + ' ' + au_lname
```

Example 29 Changes a virtual computed column to a materialized computed column:

```
alter table authors modify fullname materialized
```

Usage

- You cannot use alter table on a segment that includes a virtually hashed table.
- You cannot use alter table on a segment that includes the VHASH table, since a virtually hashed table must take only one exclusive segment, which cannot be shared by other tables or databases.
- Before you add, modify, or drop columns on a table, run sp_depends to see if there are any stored procedures that depend on the table you are changing. If such stored procedures exist, drop, then re-create the stored procedures as necessary after changing table schema.
- If stored procedures using select * reference an altered table, no new columns appear in the result set, even if you use the with recompile option. You must drop the procedure and re-create it to include these new columns. Otherwise, the wrong results may be caused by insert into table1 select * from table2 in the procedure when the tables have been altered and new columns have been added to the tables.

- When the table owner uses alter table, Adaptive Server disables access rules during the execution of the command and enables them upon completion of the command. The access rules are disabled to avoid filtering of the table data during alter table.
- If you specify clustered and use the on *segment_name* option, the entire table migrates to the segment you specify, since the leaf level of the index contains the actual data pages.
- alter table. . . transfer table involves data copy (similar to adding or removing a column): it is a very expensive command in terms of performance.
- alter table performs error checking for check constraints before it alters the table.
- When using on *segment_name* for partitions, the logical device must already have been assigned to the database with create database or alter database, and the segment must have been created in the database with sp_addsegment. See your system administrator or use sp_helpsegment for a list of the segment names available in your database.

Restrictions

Warning! Do not alter the system tables.

- You cannot add a column of datatype bit to an existing table if you specify a default value. This default value must be 0 or 1.
- The maximum number of columns in a table is:
  - 1024 for fixed-length columns in both all-pages-locked (APL) and data-only-locked (DOL) tables
  - 254 for variable-length columns in an APL table
  - 1024 for variable-length columns in a DOL table
- alter table raises an error if the number of variable-length columns in an APL table exceeds 254.
- Drop, then re-create compiled objects after changing a table’s lock schema.
- The maximum length for in-row Java columns is determined by the maximum size of a variable-length column for the table’s schema, locking style, and page size.

- When converting a table to a different locking scheme, the data in the source table cannot violate the limits of the target table. For example, if you attempt to convert a DOL table with more than 254 variable-length columns to an APL table, alter table fails because an APL table is restricted to having no more than 254 variable-length columns.
- Columns with fixed-length data (for example char, binary, and so on) have the maximum sizes shown in Table 1-1:

Table 1-1: Maximum row and column length—APL and DOL tables

Locking scheme	Page size	Maximum row length	Maximum column length
APL tables	2KB (2048 bytes)	1962	1960 bytes
	4KB (4096 bytes)	4010	4008 bytes
	8KB (8192 bytes)	8106	8104 bytes
	16KB (16384 bytes)	16298	16296 bytes
DOL tables	2KB (2048 bytes)	1964	1958 bytes
	4KB (4096 bytes)	4012	4006 bytes
	8KB (8192 bytes)	8108	8102 bytes
	16KB (16384 bytes)	16300	16294 bytes – if table does not include any variable length columns.
	16KB (16384 bytes)	16300 (subject to a max start offset of varlen = 8191)	8191-6-2 = 8183 bytes – if table includes at least one variable-length column.*

* This size includes 6 bytes for the row overhead and 2 bytes for the row-length field.

- The maximum number of bytes of variable-length data per row depends on the locking scheme for the table. The following describes the maximum size columns for an APL table:

Page size	Maximum row length	Maximum column length
2KB (2048 bytes)	1960	1960
4KB (4096 bytes)	4008	4008
8KB (8192 bytes)	8104	8157
16KB (16384 bytes)	16296	16227

The following describes the maximum size columns for a DOL table:

Page size	Maximum row length	Maximum column length
2KB (2048 bytes)	1960	1958
4KB (4096 bytes)	4008	4006
8KB (8192 bytes)	8157	8102
16KB (16384 bytes)	16294	16294

- You cannot use alter table to add a declarative or check constraint and then insert data into the table in the same batch or procedure. Either separate the alter and insert statements into two different batches or procedures, or use execute to perform the actions separately.
- You cannot use the following variable in alter table statements that include defaults:

```
declare @a int
select @a = 2
alter table t2 add c3 int
default @a
```

  Doing so results in error message 154; `Variable is not allowed in default.`
- SQL user-defined functions are not currently supported with create proxy table, create table at remote server, or alter table.

Note The execution of SQL functions requires the syntax username.functionname().

alter table and encrypted columns

- When used to add or modify an encrypted column, alter table may take a significant amount of time if the table contains a large number of rows.
- Modifying a column for encryption may cause the row size of the table to increase.
- You cannot use alter table to encrypt or decrypt a column:
  - If the column belongs to a clustered or placement index. To encrypt or decrypt such a column, drop the index, alter the column, and re-create the index.
  - If the table has a trigger defined. Drop the trigger before you modify the column. Afterwards, re-create the trigger:
- If you modify the type of an encrypted column belonging to a clustered or placement index, the index is out of order, and alter table displays an error. Drop the index before modifying the type. Afterwards, re-recreate the index.
- You can encrypt these datatypes:
  - int, smallint, tinyint
  - unsigned int, unsigned smallint, unsigned tinyint

    - bigint, unsigned bigint
    - decimal and numeric
    - float4 and float8
    - money, smallmoney
    - date, time, smalldatetime, datetime, bigdatetime
    - char and varchar
    - unichar, univarchar
    - binary and varbinary
    - bit

- The underlying datatype of encrypted data on disk is varbinary. Null values are not encrypted.
- Modifying the datatype of the encrypted column belonging to a clustered or placement index results in the index being out of order, and alter table displays an error. Drop the index before modifying the type, after which you re-create the index.
- alter table reports an error if you:
    - Change a computed column to an encrypted column, or change an encrypted column to a computed column
    - Enable a column for encryption where the column is referenced in an expression used by a computed column
    - Change a computed column to reference an encrypted column.
    - Encrypt a column that is a member of a functional index
    - Specify an encrypted column as a partition key
    - Enable a column for encryption that is already used as a partition key

---

Note Referential integrity between encrypted columns is supported when the columns are encrypted with the same key. For details, see Chapter 3, "Encrypting Data" in the *Encrypted Columns Users Guide*.

Altering a table's compression

- Use set compression to change the compression level of the table for future data inserts or updates. set compression does not affect existing data rows and pages that are already compressed, but does require exclusive access to the table.
- You cannot change a partition's compression level in the same command in which you are altering a table's compression level. You must perform these operations as independent commands
- You may use set compression with other set parameters.
- Changing the table's compression level affects only those partitions that do not already have an explicitly defined compression level. All partitions without an explicitly defined compression level implicitly inherit the table's compression level. For example, if you modify a table's compression level from uncompressed to row-level compression, all partitions that had a compression level of none do not change, but partitions for which their compression level was undefined are changed to row-level compressed.
- Altering a table's compression level does not change the compression level for existing columns. For example, if my_table and its columns are uncompressed, when you alter the compression level of my_table, its columns initially remain uncompressed. However, Adaptive Server compresses these columns individually when they fill with enough data to trigger the compression mechanism.
- The default behavior for newly added columns depends on the table's compression setting. For compressed tables, the column's datatype determines its compression level. For uncompressed tables, new columns are uncompressed.
- You may add compressed materialized computed columns to a table or compress them later.

Interactions between compression and other alter table parameters

When a command requires data movement, Adaptive Server compresses any uncompressed data rows in the source partitions if the target partition is compressed. When you include a compression clause, alter table includes these interactions between the parameters:

- set – you:
  - Cannot combine set with add, drop, or modify clauses.

- Cannot combine the modify partition set clause with other modify *column_name* parameters.
- Cannot use the all keyword with modify partition and include partition names in the clause.

- add:
  - You may add nullable and non-nullable compressed columns to existing tables. Adding non-nullable columns requires data movement.
  - Columns added to a compressed table use row compression if they are configured for an appropriate datatype.
  - Modifying a column's datatype to one that is eligible for row compression in a compressed table does not change the column's compression level.
  - If you do not specify not compressed for a new column, it inherits the table's compression level. For example, if the table is row-level compressed, any column you add to the table uses row-level compression as well.
- drop:
  - Dropping a compressed column causes data movement.
  - If the other columns in a table or partition are not compressed, or cannot be compressed, you must change the compression state to none before dropping the last compressed column.
- modify:
  - You can modify a compressed column in an existing table to not compressed and vice versa.
  - You can change a column's datatype simultaneously with its compression level. However, the target datatype must be eligible for row compression. If the target datatype is not eligible for compression, Adaptive Server ignores the request to compress it during the modify operation.
  - Adaptive Server issues an error if you attempt to modify the compression level of a column that you cannot create as a compressed column. For example, Adaptive Server issues an error message if you attempt to compress a virtual computed column or an in-row Java column.

- Combining add, drop, and modify:
  - You can issue multiple add, drop, or modify parameters that include one or more compressed columns in a single alter table statement. The data movement for this alter table command is dictated by the data movement restrictions for the parameters.
  - If alter table requires data movement, the column's compression level remains unchanged for the columns not affected by the add, drop, or modify parameters.
- Repartitioning a table – if you do not specify the compression clause for new partitions, Adaptive Server sets the compression level for the new partitions as:
  - Uncompressed if the source table and all of its partitions are uncompressed.
  - The same compression level as the source table, if all of its partitions are compressed with the same compression level.
  - Uncompressed if:
    - The table or the individual partitions are compressed differently, or,
    - The source table is not compressed, but some of its partitions are

    Adaptive Server does not compress the new partitions because it may be difficult to uniquely map and migrate the compression attribute from the original compressed partitions to the new partitions. You must explicitly state the compression level as part of the alter table command to specify which target partitions must be compressed during the data copy.
- add partition – newly added partitions inherit the table's compression level if you do not specify a partition level in the compression clause.
- drop partition – dropping a table's only compressed partition does not change the table's compression level if the table includes multiple partitions.

  If a table has been defined for compression, it remains compressed after the partition is dropped, and Adaptive Server automatically configures future partitions for compression.

- Changing the locking scheme – Adaptive Server requires data movement if you change the locking scheme of a table from allpages-locked to data-only-locked, or vice-versa. You cannot simultaneously change the compression level of the table or individual partitions when you change the locking scheme. Instead, you must run the set compression command to specify the compression level before you change the locking scheme.
- Unpartitioning a table – if at least one source partition is compressed when you unpartition a table, the entire table is marked as compressed when you run alter table. Adaptive Server issues a warning message if the table was initially uncompressed.
- Other commands – you cannot combine parameters that specify the default value of a column, enable or disable triggers, add or drop column-level or table-level constraints, and so on, with commands that specify column-level or partition-level compression or copy data.
- If alter table does not include data movement, existing data is not affected, and Adaptive Server applies the table's compression level to data once it is inserted. If alter table includes data movement, existing data is compressed or decompressed according to the table's compression level.
- These alter table events include data movement:
    - Adding non-null columns
    - Dropping columns
    - Modifying a column to increase its length (for example, from a smallint to an int, or from char(3) to varchar(45))
- These alter table events do not include data movement:
    - Adding null column
    - Adding null text column (adding a non-null text column has restrictions)
    - Modifying a variable-length column to increase its length (for example, from varchar(5) to varchar(20) or from varchar(20) to varchar(40))
- You cannot compress proxy tables or partitions or columns on proxy tables.

Altering the compression level for a table using large objects

- Changing the table's large object (LOB) compression level affects only the LOB columns that do not have an explicitly defined compression level. Columns without an explicitly defined compression level implicitly inherit the table's compression level.
- The default behavior for newly added LOB columns for which you have not specified a LOB compression clause depends on the table's LOB compression level. For LOB compressed tables, Adaptive Server uses the table's LOB compression level for the columns. For LOB uncompressed tables, newly added LOB columns remain uncompressed.

Interactions between compression and other alter table parameters for tables with LOB data:

- drop column – if the table includes no compressed LOB columns after dropping columns, the table uses the table-level LOB column compression level.
- add column
    - You can add a nullable compressed LOB column, but you cannot add a non-nullable compressed LOB column.
    - For a table not set to LOB compression, by default, newly added LOB columns are not compressed. Newly added LOB columns with LOB compression subclauses can be compressed or not compressed as specified.
- modify column
    - You can uncompress an existing compressed LOB column. Although newly inserted data is uncompressed, existing data remains compressed.
    - You can change the compression level of an existing LOB column. Although newly inserted data assumes the new compression level, existing data retains the original compression level.
    - You can change an uncompressed LOB column to compressed.
    - You cannot modify a regular column to a LOB column (compressed or uncompressed).
    - You can modify a compressed LOB column to:
        - Compressed text columns using *n*char, *n*varchar, unichar, and univarchar

- Compressed image columns using varbinary and binary
- Compressed unitext columns using *n*char, *n*varchar, unichar, univarchar, varbinary, and binary

Compressed off-row java columns cannot be modified to regular columns.

Adaptive Server decompresses the LOB data, truncating the data if necessary to fit the regular column length, and converting it to the regular datatype. The maximum length of the regular column is governed by the Adaptive Server page size.

- Combinations of add, drop, modify, and set lob_compression:
  - You can issue multiple add, drop, or modify subcommands in a single alter table command—or set lob_compression and set compression subclauses—that involves one or more compressed columns.
  - If you add a column to a LOB-compressed table and include set lob_compression = 0 in the command, the newly added column is not compressed.
  - If you add a column to a regular, uncompressed table, and include set lob_compression = *compression_level* in the command, the newly added column is compressed.

  Existing LOB data is not affected by alter table commands; only future DMLs are affected by the changed LOB compression attributes. Use update and select into to compress or uncompress existing LOB data.

Getting information about tables

- For information about a table and its columns, use sp_help.
- To rename a table, execute sp_rename (do not rename the system tables).
- For information about integrity constraints (unique, primary key, references, and check) or the default clause, see create table in this chapter.

Specifying ascending or descending ordering in indexes

- Use the asc and desc keywords after index column names to specify the sort order for the index. Creating indexes so that columns are in the same order specified in the order by clause of queries eliminates the sorting step during query processing. See Chapter 13, “Indexing for Performance” in the *Performance and Tuning Guide: Basics*.

Using cross-database referential integrity constraints

- When you create a cross-database constraint, Adaptive Server stores the following information in the sysreferences table of each database:

Table 1-2: Information stored about referential integrity constraints

Information stored in sysreferences	Columns with information about the referenced table	Columns with information about the referencing table
Key column IDs	refkey1 through refkey16	fokey1 through fokey16
Table ID	reftabid	tableid
Database ID	pmrydbid	frgndbid
Database name	pmrydbname	frgndbname

- When you drop a referencing table or its database, Adaptive Server removes the foreign-key information from the referenced database.
- Because the referencing table depends on information from the referenced table, Adaptive Server does not allow you to:
  - Drop the referenced table,
  - Drop the external database that contains the referenced table, or
  - Rename either database with sp_renamedb.

  You must first use alter table to remove the cross-database constraint
- Each time you add or remove a cross-database constraint, or drop a table that contains a cross-database constraint, dump *both* the affected databases.

  Warning! Loading earlier dumps of these databases may cause database corruption.

- The sysreferences system table stores the name and the ID number of the external database. Adaptive Server cannot guarantee referential integrity if you use load database to change the database name or to load it onto a different server.

  Warning! Before dumping a database to load it with a different name or move it to another Adaptive Server, use alter table to drop all external referential integrity constraints.

Changing defaults

- You can create column defaults either by declaring the default as a column constraint in the create table or alter table statement, or by creating the default using the create default statement and binding it to a column using sp_bindefault.
- You cannot replace a user-defined default bound to the column with sp_bindefault. First use sp_unbindefault to unbind the default.
- If you declare a default column value with create table or alter table, you cannot bind a default to that column with sp_bindefault. Drop the default by altering it to NULL, then bind the user-defined default. Changing the default to NULL unbinds the default and deletes it from the sysobjects table.

Setting space management properties for indexes

- The space management properties fillfactor, max_rows_per_page, and reservepagegap in the alter table statement apply to indexes that are created for primary key or unique constraints. The space management properties affect the data pages of the table if the constraint creates a clustered index on an allpages-locked table.
- Use sp_chgattribute to change max_rows_per_page or reservepagegap for a table or an index, to change the exp_row_size value for a table, or to store fillfactor values.
- Space management properties for indexes are applied when indexes are:
  - Re-created as a result of an alter table command that changes the locking scheme for a table from allpages locking to data-only locking or vice versa. See “Changing locking schemes” on page 81.
  - Automatically rebuilt as part of a reorg rebuild command.
- To see the space management properties currently in effect for a table, use sp_help. To see the space management properties currently in effect for an index, use sp_helpindex.
- The space management properties fillfactor, max_rows_per_page, and reservepagegap help manage space usage for tables and indexes in the following ways:
  - fillfactor leaves extra space on pages when indexes are created, but the fillfactor is not maintained over time. It applies to all locking schemes.

- max_rows_per_page limits the number of rows on a data or index page. Its main use is to improve concurrency in allpages-locked tables.
- reservepagegap specifies the ratio of empty pages to full pages to apply for commands that perform extent allocation. It applies to all locking schemes.

You can store space management properties for tables and indexes so that they are applied during alter table and reorg rebuild commands.

- The following table shows the valid combinations of space management properties and locking schemes. If an alter table command changes the table so that the combination is not compatible, the values stored in the stored in system tables remain there, but are not applied during operations on the table. If the locking scheme for a table changes so that the properties become valid, then they are used.

Parameter	Allpages	Datapages	Datarows
max_rows_per_page	Yes	No	No
reservepagegap	Yes	Yes	Yes
fillfactor	Yes	Yes	Yes
exp_row_size	No	Yes	Yes

- The following table shows the default values and the effects of using the default values for the space management properties.

Parameter	Default	Effect of using the default
max_rows_per_page	0	Fits as many rows as possible on the page, up to a maximum of 256
reservepagegap	0	Leaves no gaps
fillfactor	0	Fully packs leaf pages

Conversion of *max_rows_per_page* to *exp_row_size*

- If a table has max_rows_per_page set, and the table is converted from allpages locking to data-only locking, the value is converted to an exp_row_size value before the alter table...lock command copies the table to its new location. The exp_row_size is enforced during the copy. The following table shows how the values are converted.

If max_rows_per_page is set to	Set exp_row_size to
0	Percentage value set by default exp_row_size percent
255	1, that is, fully packed pages

If max_rows_per_page is set to	Set exp_row_size to
1 – 254	The smaller of: • Maximum row size • 2002/max_rows_per_page value

Using *reservepagegap*

- Commands that use large amounts of space allocate new space by allocating an extent rather than allocating single pages. The reservepagegap keyword causes these commands to leave empty pages so that future page allocations take place close to the page that is being split, or to the page from which a row is being forwarded.
- The reservepagegap value for a table is stored in sysindexes, and is applied when the locking scheme for a table is changed from allpages locking to data-only locking, or vice versa. To change the stored value, use sp_chgattribute before running alter table.
- reservepagegap specified with the clustered keyword on an allpages-locked table overwrites any value previously specified with create table or alter table.

Partitioning tables for improved performance

- Use he partition by clause to partition an unpartitioned table or repartition an already partitioned table. The task requires a data copy; all data rows are redistributed according to the specified partition criteria. You may run this task in parallel if the Adaptive Server is configured for parallel processing. You must set the select into/bulkcopy/pllsort option to true. If the table has indexes, you must drop the indexes before you can change:
  - An unpartitioned table into a semantic-partitioned table.
  - The partitioning type.
  - The partitioning key – you need not drop indexes to change other attributes of the partitions, such as number of partitions, partition bounds, or partition location; the indexes are built automatically. See create table on page 205 for more information on partition key and bound restrictions.
- You can use the add partition clause to add empty partitions to list- or range-partitioned tables, but not to hash or round-robin-partitioned tables.

  For range-partitioned tables, you can add new partitions only to the high end of the partition conditions. If the last existing partition has the maximum boundary (values <= (MAX)), you cannot add new partitions.

- The partition *number_of_partition* and unpartition clauses are provided for compatibility with versions of Adaptive Server earlier than 15.0. You can use partition *number_of_partition* only on unpartitioned tables to add (*number_of_partition*-1) empty round-robin partitions; existing data is placed on the first partition, with subsequent data distributed among all partitions. If the table has a global clustered index, Adaptive Server places subsequent data rows in the first partition. To redistribute the data, drop and re-create the index.

  Note These commands do not require data movement. However, because Adaptive Server performs a number of internal steps, the commands, especially when executed on large tables, do not occur instantly. To avoid data corruption, do not interrupt the operation while you partition or unpartition a table.

  You can use the unpartition clause only on round-robin-partitioned tables without indexes.

- You cannot partition system tables.
- You cannot partition remote proxy tables.
- You cannot issue the partition-related alter table commands within a user-defined transaction.
- You cannot change a table's partitioning properties using the partition by clause if there are active open cursors on the table.
- After using the partition by clause, you must perform a full database dump before you can use dump transaction.
- You cannot drop a column that is part of a partitioning key.
- Alter key columns with care. In some cases, modifying the datatype of a key column might redistribute data among partitions. See the *Transact-SQL Users Guide*.
- Changing a table's partitioning properties increments the schema count, which causes existing stored procedures that access this table to recompile the next time they are executed.

Using computed columns

- When you add a new computed column without specifying nullability and the materialization property, the default option is nullable and not materialized.

- When you add a new materialized computed column, the *computed_column_expression* is evaluated for each existing row in the table, and the result is stored in the table.
- You cannot add new computed columns and add or modify their base columns at the same time.
- You can modify the entire definition of an existing computed column. This is a quick way to drop the computed column and add a new one with the same name. Such a column behaves like a new computed column: its defaults are not materialized and nullable, if you do not specify these options.
- You can modify the materialization property of an existing computed column without changing its other properties, such as the expression that defines it or its nullability.
- When you modify a not-null, materialized computed column into a virtual column, you must specify "null" in the modify clause.
- When you modify a computed column that is not materialized, to materialize it, the *computed_column_expression* is evaluated for each existing row in the table, and the result is stored in the table.
- If you modify existing columns that are index keys, the index is rebuilt.
- You cannot modify a materialized computed column into a virtual column if it has been used as an index key; you must first drop the index.
- You cannot modify a regular column to become a computed column, or a computed column to become a regular column.
- You cannot modify or drop the base column referenced by a computed column.
- You cannot drop a computed column if it is used as an index key.

Adding IDENTITY columns

- When adding a numeric or integer IDENTITY column to a table, make sure the column precision is large enough to accommodate the number of existing rows. If the number of rows exceeds $10^{precision} - 1$, Adaptive Server prints an error message and does not add the column.
- When adding an IDENTITY column to a table, Adaptive Server:
    - Locks the table until all the IDENTITY column values have been generated. If a table contains a large number of rows, this process may be time-consuming.

- Assigns each existing row a unique, sequential IDENTITY column value, beginning with 1.
- Logs each insert operation into the table. Use dump transaction to clear the database's transaction log before adding an IDENTITY column to a table with a large number of rows.

- Each time you insert a row into the table, Adaptive Server generates an IDENTITY column value that is one higher than the value. This value takes precedence over any defaults declared for the column in the alter table statement or bound to it with sp_bindefault.

Altering table schema

- add, drop, modify, and lock subclauses are useful in changing an existing table's schema. A single statement can contain any number of these sub-clauses, in any order, as long as the same column name is not referenced more than once in the statement.
- If stored procedures using select * reference a table that has been altered, no new columns appear in the result set, even if you use the with recompile option. You must drop the procedure and re-create it to include these new columns.
- To ensure that triggers fire properly, drop and re-create all triggers on an altered table after you perform an add, drop, modify, or lock operation.
- Adaptive Server issues an error message if you add a not null column with alter table.
- You cannot drop all the columns in a table. Also, you cannot drop the last remaining column from a table (for example, if you drop four columns from a five-column table, you cannot then drop the remaining column). To remove a table from the database, use drop table.
- A data copy is required:
  - To drop a column
  - To add a NOT NULL column
  - For most alter table ... modify commands

  Use set noexec on and showplan on options to determine if a data copy is required for a particular alter table command.
- You can specify a change in the locking scheme for the modified table with other alter table commands (add, drop, or modify) when the other alter table command requires a data copy.

- If alter table performs a data copy, select into /bulkcopy/pllsort must be turned on in the database that includes the table whose schema you are changing.
- The modified table retains the existing space management properties (max_rows_per_page, fillfactor, and so on) and indexes of the table.
- alter table that requires a data copy does not fire any triggers.
- You can use alter table to change the schema of remote proxy tables created and maintained by CIS. See the *Component Integration Services Users Guide*.
- You cannot perform a data copy and add a table level or referential integrity constraint in the same statement.
- You cannot perform a data copy and create a clustered index in the same statement.
- If you add a not null column, you must also specify a default clause. This rule has one exception: if you add a user-defined type column, and the type has a default bound to it, you need not specify a default clause.
- You can always add, drop, or modify a column in allpages-locked tables. However, there are restrictions for adding, dropping, or modifying a column in a data-only-locked table, which are described in the following table:

Type of index	All pages locked, partitioned table	All pages locked, unpartitioned table	Data-only-locked, partitioned table	Data-only-locked, unpartitioned table
Clustered	Yes	Yes	No	Yes
Nonclustered	Yes	Yes	Yes	Yes

If you need to add, drop, or modify a column in a data-only-locked table partitioned with a clustered index, you can:

a Drop the clustered index.

b Alter the data-only-locked table.

c Re-create the clustered index.

- You cannot add a NOT NULL Java object as a column. By default, all Java columns always have a default value of NULL, and are stored as either varbinary strings or as image datatypes.
- You cannot modify a partitioned table that contains a Java column if the modification requires a data copy. Instead, first unpartition the table, execute alter table, then repartition the table.

- You cannot drop the key column from an index or a referential integrity constraint. To drop a key column, first drop the index or referential integrity constraint, then drop the key column. See the *Transact-SQL Users Guide*.
- You can drop columns that have defaults or rules bound to them. Any column-specific defaults are also dropped when you drop the column. You cannot drop columns that have check constraints or referential constraints bound to them. Instead, first drop the check constraint or referential constraint, then drop the column. Use sp_helpconstraint to identify any constraints on a table, and use sp_depends to identify any column-level dependencies.
- You cannot drop a column from a system table. Also, you cannot drop columns from user tables that are created and used by Sybase-provided tools and stored procedures.
- You can generally modify the datatype of an existing column to any other datatype if the table is empty. If the table is not empty, you can modify the datatype to any datatype that is explicitly convertible to the original datatype.
- You can:
  - Add a new IDENTITY column.
  - Drop an existing IDENTITY column.
  - Modify the size of an existing IDENTITY.

  See the *Transact-SQL Users Guide* for more information.
- Altering the schema of a table increments the schema count, causing existing stored procedures that access this table to be renormalized the next time they are executed. Changes in datatype-dependent stored procedures or views may fail with datatype normalization errors. Update these dependent objects so they refer to the modified schema of the table.

Restrictions for modifying a table schema

- You cannot run alter table from inside a transaction.
- Altering a table's schema can invalidate backups that you made using bcp. These backups may use a table schema that is no longer compatible with the table's current schema.
- You can add NOT NULL columns with check constraints, however, Adaptive Server does not validate the constraint against existing data.

- You cannot change the locking scheme of a table using the alter table . . . add, drop, or modify commands if the table has a clustered index and the operation requires a data copy. Instead you can

  a. Drop the clustered index.

  b. Alter the table's schema.

  c. Re-create the clustered index.

- You cannot alter a table's schema if there are any active open cursors on the table.

Restrictions for modifying *text* and *image* columns

- You can only add text or image columns that accept null values.

  To add a text or image column so it contains only non-null values, first add a column that only accepts null values and then update it to the non-null values.

- You can modify a column from text datatype only to the following datatypes:

  - [n]char
  - [n]varchar
  - unichar
  - univarchar
  - nchar
  - nvarchar

- You can modify a column from image datatype only to binary or varbinary.
- You cannot add a new text or image column and then drop an existing text or image column in the same statement.
- You cannot modify a column to either text or image datatype.

Modifying tables with unitext columns

The following restrictions apply when you use alter table to modify unitext columns:

- You can add a new unitext column that accepts NULL values.
- You can modify a column from unitext only to the following datatypes:

  - [n]char

    - [n]varchar
    - unichar
    - univarchar
    - binary
    - varbinary

- You cannot modify a column to the unitext datatype.
- You cannot add a unitext column and drop an existing unitext column in the same statement.

Changing locking schemes

- alter table supports changing from any locking scheme to any other locking scheme. You can change:
    - From allpages to datapages or vice versa
    - From allpages to datarows or vice versa
    - From datapages to datarows or vice versa
- Before you change from allpages locking to a data-only locking scheme, or vice versa, use sp_dboption to set the database option select into/bulkcopy/pllsort to true, then run checkpoint in the database if any of the tables are partitioned and the sorts for the indexes require a parallel sort.
- After changing the locking scheme from allpages-locking to data-only locking or vice versa, you cannot use the dump transaction command to back up the transaction log; you must first perform a full database dump.
- When you use alter table...lock to change the locking scheme for a table from allpages locking to data-only locking or vice versa, Adaptive Server makes a copy of the table's data pages. There must be enough room on the segment where the table resides for a complete copy of the data pages. There must be space on the segment where the indexes reside to rebuild the indexes.

  Clustered indexes for data-only-locked tables have a leaf level above the data pages. If you are altering a table with a clustered index from allpages-locking to data-only-locking, the resulting clustered index requires more space. The additional space required depends on the size of the index keys.

Use sp_spaceused to determine how much space is currently occupied by the table, and use sp_helpsegment to see the space available to store the table.

- When you change the locking scheme for a table from allpages locking to datapages locking or vice versa, the space management properties are applied to the tables, as the data rows are copied, and to the indexes, as they are re-created. When you change from one data-only locking scheme to another, the data pages are not copied, and the space management properties are not applied.
- If a table is partitioned, changing the locking scheme performs a partition-to-partition copy of the rows. It does not balance the data on the partitions during the copy.
- When you change the locking scheme for a table, the alter table...lock command acquires an exclusive lock on the table until the command completes.
- When you use alter table...lock to change from datapages locking to datarows locking, the command does not copy data pages or rebuild indexes. It updates only system tables.
- Changing the locking scheme while other users are active on the system may have the following effects on user activity:
    - Query plans in the procedure cache that access the table are recompiled the next time they are run.
    - Active multistatement procedures that use the table are recompiled before continuing with the next step.
    - Ad hoc batch transactions that use the table are terminated.

Warning! Changing the locking scheme for a table while a bulk-copy operation is active can cause table corruption. Bulk copy operates by first obtaining information about the table and does not hold a lock between the time it reads the table information and the time it starts sending rows, leaving a small window of time for an alter table...lock command to start.

Adding Java-SQL columns

- If Java is enabled in the database, you can add Java-SQL columns to a table. See *Java in Adaptive Server Enterprise*.
- The declared class (*datatype*) of the new Java-SQL column must implement either the Serializable or Externalizable interface.

- When you add a Java-SQL column to a table, the Java-SQL column cannot be specified:
  - As a foreign key
  - In a references clause
  - As having the UNIQUE property
  - As the primary key
- If in row is specified, the value stored cannot exceed 16KB, depending on the page size of the data server.
- If off row is specified, then the column cannot be:
  - Referenced in a check constraint
  - Referenced in a select that specifies distinct
  - Specified in a comparison operator, in a predicate, or in a group by clause

Restrictions for shared-disk clusters

- A referential integrity constraint cannot reference a column on a local temporary database except from a table on the same local temporary database. alter table fails when it attempts to create a reference to a column on a local temporary database from a table in another database.
- You cannot encrypt a column with an encryption key stored in a local temporary database unless the column's table resides on the same local temporary database. alter table fails if it attempts to encrypt a column with an encryption key on the local temporary database and the table is in another database.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

See Chapter 1, "System and User-Defined Datatypes" in *Reference Manual: Building Blocks* for datatype compliance information.

Permissions

alter table permission defaults to the table owner; it cannot be transferred except to the database owner, who can impersonate the table owner by running the setuser command. A system administrator can also alter user tables.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo

3	alter	alter table	• *Roles* – current active roles
			• *Keywords or options* – add column, drop column, modify column, replace column, add constraint, or drop constraint
			• *Previous value* – NULL
			• *Current value* – NULL
			• *Other information* – NULL
			• *Proxy information* – original login name, if a set proxy is in effect
			• If the set option for set transfer table [on | off] is:
			  • on – Adaptive Server prints `SET TRANSFER TABLE ON` in the extra info in the audit record.
			  • off – Adaptive Server prints `SET TRANSFER TABLE OFF`.

See also

Commands create index, create table, dbcc, drop database, dump transaction, insert, setuser

System procedures sp_chgattribute, sp_help, sp_helppartition, sp_rename

alter thread pool

Description

Alters a thread pool.

Considerations for process mode

alter thread pool is not supported in process mode.

Syntax

```
alter thread pool pool_name with { pool name = "new_name"
        thread count = thread_count,
        [pool description = "description"]}
        [idle timeout = time_period]
```

Parameters

pool_name
name of the thread pool you are altering.

pool name = "*new_name*"
new name for the pool you are altering.

thread count = *thread_count*
new number of threads in the thread pool. Must be greater than or equal to 1.

pool description = "*description*"
describes the pool's purpose. Must be fewer than 256 characters.

idle timeout = *time_period*
time, in microseconds, that threads look for work before going to sleep. A value of -1 means the threads never go to sleep, and continue to consume CPU if no work is available. A value of 0 indicates that threads immediately go to sleep if they find no work.

Examples

Example 1 Renames the order_pool thread pool to sales_pool:

```
alter thread pool order_pool with pool name = 'sales_pool'
```

Example 2 Modifies the sales_pool thread pool to contain 7 threads:

```
alter thread pool sales_pool with thread count = 7
```

Example 3 Modifies the name and description for sales_pool:

```
alter thread pool sales_pool with pool name = "larger_sales_pool", pool
    description = 'thread pool exclusive to sales group'
```

Example 4 Modify sales_pool so threads sleep if they find no work after 500 microseconds:

```
alter thread pool order_pool with idle timeout = 500
```

Example 5 Modify sales_pool so threads never go to sleep if they find no work:

```
alter thread pool order_pool with idle timeout = -1
```

Usage

- *thread_count* must be greater than or equal to 1.
- When you reduce a thread count, the thread pool you specify must wait for currently running tasks to yield before it reduces the number of threads, which may cause a slight delay in Adaptive Server shrinking the pool.
- You cannot rename system-created thread pools (which begin with syb_). However, you can use alter thread pool to change the number of threads or idle timeout in system-created thread pools.
- You cannot use Transact-SQL variables as parameters with alter thread pool.
- You can set idle timeout only for engine thread pools.
- You may issue alter thread pool with execute immediate.

Standards

ANSI SQL – Compliance level: Transact-SQL extension

Permissions

alter thread pool permission defaults to the system administrator. alter thread pool permission is not included in the grant all command.

Auditing

Event	Audit option	Command or access audited	Information in extrainfo
143			The old name, new name, and thread count

begin...end

Description

Encloses a series of SQL statements so that control-of-flow language, such as if...else, can affect the performance of the whole group.

Syntax

```
begin
        statement block
end
```

Parameters

statement block
is a series of statements enclosed by begin and end.

Examples

Example 1 Without begin and end, the if condition would cause execution of only one SQL statement:

```
if (select avg (price) from titles) < $15
begin
    update titles
    set price = price * $2
    select title, price
    from titles
    where price > $28
end
```

Example 2 Without begin and end, the print statement would not execute:

```
create trigger deltitle
on titles
for delete
as
if (select count (*) from deleted, salesdetail
 where salesdetail.title_id = deleted.title_id) > 0
    begin
        rollback transaction
        print "You can’t delete a title with sales."
    end
else
    print "Deletion successful--no sales for this
        title."
```

Usage

- begin...end blocks can nest within other begin...end blocks.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

begin...end permission defaults to all users. No permission is required to use it.

See also

Commands if...else

begin transaction

Description

Marks the starting point of a user-defined transaction.

Syntax

begin tran[saction] [*transaction_name*]

Parameters

transaction_name

is the name assigned to this transaction. Transaction names must conform to the rules for identifiers. Use transaction names only on the outermost pair of nested begin transaction/commit or begin transaction/rollback statements.

Examples

Explicitly begins a transaction for the insert statement:

```
begin transaction
    insert into publishers (pub_id) values ("9999")
commit transaction
```

Usage

- Define a transaction by enclosing SQL statements and system procedures within the phrases begin transaction and commit. If you set chained transaction mode, Adaptive Server implicitly invokes a begin transaction before the following statements: delete, insert, open, fetch, select, and update. You must still explicitly close the transaction with a commit.
- To cancel all or part of a transaction, use the rollback command. The rollback command must appear within a transaction; you cannot roll back a transaction after it is committed.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

begin transaction permission defaults to all users. No permission is required to use it.

See also

Commands commit, rollback, save transaction

break

Description

Causes an exit from a while loop. break is often activated by an if test.

Syntax

while *logical_expression*
    statement
break
    statement
continue

Parameters

logical_expression
is an expression (a column name, constant, any combination of column names and constants connected by arithmetic or bitwise operators, or a subquery) that returns TRUE, FALSE, or NULL. If the logical expression contains a select statement, enclose the select statement in parentheses.

Examples

If the average price is less than $30, double the prices. Then, select the maximum price; if it is less than or equal to $50, restart the while loop and double the prices again. If the maximum price is more than $50, exit the while loop and print a message:

```
while (select avg (price) from titles) < $30
 begin
    update titles
    set price = price * 2
    select max (price) from titles
  if (select max (price) from titles) > $50
       break
    else
       continue
 end
 begin
  print "Too much for the market to bear"
 end
```

Usage

- break causes an exit from a while loop. Statements that appear after the keyword end, which marks the end of the loop, are then executed.
- If two or more while loops are nested, the inner break exits to the next outermost loop. First, all the statements after the end of the inner loop run; then, the next outermost loop restarts.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

break permission defaults to all users. No permission is required to use it.

See also

Commands continue, while

checkpoint

Description

Writes all **dirty** pages (pages that have been updated since they were last written) to the database device.

Syntax

checkpoint [all | [*dbname*[, *dbname*, *dbname*, ...]]

Examples

Writes all dirty pages in the current database to the database device, regardless of the system checkpoint schedule:

```
checkpoint
```

Usage

- You can use checkpoint with an archive database, however, the checkpoint process does not automatically checkpoint an archive database.
- Use checkpoint only as a precautionary measure in special circumstances.
- sp_dboption automatically defaults to using checkpoint when you change a database option.
- You can specify one or more databases to run checkpoint.
- To run checkpoint all against all databases, including system and temp databases, you must have the sa_role or oper_role.
- If you do not have the sa_role or oper_role, the checkpoint all runs only against those databases you own.

Automatic checkpoints

- Checkpoints caused by the checkpoint command supplement automatic checkpoints, which occur at intervals calculated by Adaptive Server on the basis of the configurable value for maximum acceptable recovery time.
- checkpoint shortens the automatic recovery process by identifying a point at which all completed transactions are guaranteed to have been written to the database device. A typical checkpoint takes about 1 second, although checkpoint time varies, depending on the amount of activity on Adaptive Server.
- The automatic checkpoint interval is calculated by Adaptive Server on the basis of system activity and the recovery interval value in the system table syscurconfigs. The recovery interval determines checkpoint frequency by specifying the maximum amount of time it should take for the system to recover. Reset this value by executing sp_configure.
- You can configure Adaptive Server with multiple checkpoint processes. This allows Adaptive Server with multiple engines to checkpoint tasks more frequently, thereby shortening the automatic recovery process.

- If the housekeeper task can flush all active buffer pools in all configured caches during the server's idle time, it wakes up the checkpoint task. The checkpoint task determines whether it can checkpoint the database.

  Checkpoints that occur as a result of the housekeeper task are known as **free checkpoints**. They do not involve writing many dirty pages to the database device, since the housekeeper task has already done this work. They may improve recovery speed for the database.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

checkpoint permission defaults to the database owner. It cannot be transferred.

See also

System procedures sp_configure, sp_dboption

close

Description — Deactivates a cursor.

Syntax — close *cursor_name*

Parameters

cursor_name
is the name of the cursor to close.

Examples — Closes the cursor named authors_crsr:

```
close authors_crsr
```

Usage

- The close command essentially removes the cursor's result set. The cursor position within the result set is undefined for a closed cursor.
- Adaptive Server returns an error message if the cursor is already closed or does not exist.

Standards — ANSI SQL – Compliance level: Entry-level compliant.

Permissions — close permission defaults to all users. No permission is required to use it.

See also — **Commands** deallocate cursor, declare cursor, fetch, open

commit

Description

Marks the ending point of a user-defined transaction.

Syntax

commit [tran | transaction | work] [*transaction_name*]

Parameters

tran | transaction | work

specifies that you want to commit the transaction or the work. If you specify tran, transaction, or work, you can also specify a *transaction_name*.

transaction_name

is the name assigned to the transaction. It must conform to the rules for identifiers. Use transaction names only on the outermost pair of nested begin transaction/commit or begin transaction/rollback statements.

Examples

After updating the royaltyper entries for the two authors, insert the savepoint percentchanged, then determine how a 10 percent increase in the book's price would affect the authors' royalty earnings. The transaction is rolled back to the savepoint with the rollback transaction command:

```
begin transaction royalty_change

update titleauthor
    set royaltyper = 65 from titleauthor, titles
    where royaltyper = 75
    and titleauthor.title_id = titles.title_id
    and title = "The Gourmet Microwave"

update titleauthor
    set royaltyper = 35 from titleauthor, titles
    where royaltyper = 25
    and titleauthor.title_id = titles.title_id
    and title = "The Gourmet Microwave"

save transaction percentchanged

update titles
    set price = price * 1.1
    where title = "The Gourmet Microwave"

select (price * total_sales) * royaltyper
    from titles, titleauthor
    where title = "The Gourmet Microwave"
    and titles.title_id = titleauthor.title_id

rollback transaction percentchanged

commit transaction
```

Usage

- Define a transaction by enclosing SQL statements and system procedures with the phrases begin transaction and commit. If you set the chained transaction mode, Adaptive Server implicitly invokes a begin transaction before the following statements: delete, insert, open, fetch, select, and update. You must still explicitly enclose the transaction with a commit.
- To cancel all or part of an entire transaction, use the rollback command. The rollback command must appear within a transaction. You cannot roll back a transaction after the commit has been entered.
- If no transaction is currently active, the commit or rollback statement has no effect on Adaptive Server.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The commit transaction and commit tran forms of the statement are Transact-SQL extensions.

Permissions

commit permission defaults to all users. No permission is required to use it.

See also

Commands begin transaction, rollback, save transaction

compute clause

Description

Generates summary values that appear as additional rows in the query results.

Syntax

```
start_of_select_statement
        compute row_aggregate (column_name)
            [, row_aggregate (column_name)]...
        [by column_name [, column_name]...]
```

Parameters

row_aggregate
is one of the following:

- sum – is the total of values in the (numeric) column.
- avg – is the average of values in the (numeric) column.
- min – is the lowest value in the column.
- max – is the highest value in the column.
- count – is the number of values in the column as an integer.
- count – is the number of values in the column as a bigint.

column_name
is the name of a column, which must be enclosed in parentheses. You can use numeric columns only with sum and avg. You can only use integer, numeric, and decimal columns with sum and avg.

by
calculates the row aggregate values for subgroups. Whenever the value of the by item changes, row aggregate values are generated. If you use by, you must use order by.

Listing more than one item after by breaks a group into subgroups and applies a function at each level of grouping.

Examples

Example 1 Calculates the sum of the prices of each type of cookbook that costs more than $12:

```
select type, price
from titles
where price > $12
    and type like "%cook"
    order by type, price
compute sum (price) by type
```

```
type       price
---------  ------------
mod_cook          19.99
           sum
```

```
                  ------------
                         19.99
type       price
---------  ------------
trad_cook         14.99
trad_cook         20.95
           sum
           ------------
                  35.94
 (5 rows affected)
```

Example 2 Calculates the sum of the prices and advances for each type of cookbook that costs more than $12, with one compute clause applying several aggregate functions to the same set of grouping columns:

```
select type, price, advance
from titles
where price > $12
    and type like "%cook"
    order by type, price
compute sum (price), sum (advance) by type
```

```
type       price      advance
---------  ---------  ------------
mod_cook       19.99          0.00
          sum         sum
           ---------  ------------
               19.99          0.00

type       price      advance
---------  ---------  ------------
trad_cook      14.99      8,000.00
trad_cook      20.95      7,000.00
           sum        sum
           ---------  ------------
               35.94     15,000.00
 (5 rows affected)
```

Example 3 Calculates the sum of the prices and maximum advances of each type of cook book that costs more than $12, with one compute clause applying several aggregate functions to the same set of grouping columns:

```
select type, price, advance
from titles
where price > $12
    and type like "%cook"
    order by type, price
compute sum (price), max (advance) by type
```

```
type      price     advance
--------- --------- -------------
mod_cook      19.99          0.00
          sum
          ---------
              19.99
                    max
                    -------------
                             0.00
type      price     advance
--------- --------- -------------
trad_cook     14.99      8,000.00
trad_cook     20.95      7,000.00
          sum
          ---------
              35.94
                     max
                     -------------
                          8,000.00
 (5 rows affected)
```

Example 4 Breaks on type and pub_id and calculates the sum of the prices of psychology books by a combination of type and publisher ID:

```
select type, pub_id, price
from titles
where price > $10
    and type = "psychology"
    order by type, pub_id, price
compute  sum (price) by type, pub_id
type         pub_id    price
------------ --------- -----------
psychology   0736          10.95
psychology   0736          19.99
                        sum
                        ---------
                           30.94
type         pub_id    price
------------ --------- ---------
psychology   0877          21.59
                       sum
                       ---------
                           21.59
 (5 rows affected)
```

Example 5 Calculates the grand total of the prices of psychology books that cost more than $10 in addition to calculating sums by type and pub_id, using more than one compute clause to create more than one group:

```
select type, pub_id, price
from titles
where price > $10
    and type = "psychology"
order by type, pub_id, price
compute  sum (price) by type, pub_id
compute  sum (price) by type
```

```
type         pub_id    price
------------ --------- ---------
psychology   0736          10.95
psychology   0736          19.99
                       sum
                       ---------
                           30.94

type         pub_id    price
------------ --------- ---------
psychology   0877          21.59
                       sum
                       ---------
                           21.59
                       sum
                       ---------
                           52.53
 (6 rows affected)
```

Example 6 Calculates the grand totals of the prices and advances of cook books that cost more than $10:

```
select type, price, advance
from titles
where price > $10
    and type like "%cook"
compute sum (price), sum (advance)
```

```
type       price        advance
---------  -----------  --------------
mod_cook         19.99            0.00
trad_cook        20.95        8,000.00
trad_cook        11.95        4,000.00
trad_cook        14.99        7,000.00
            sum         sum
           -----------  --------------
                 67.88       19,000.00
```

```
(5 rows affected)
```

Example 7 Calculates the sum of the price of cook books and the sum of the price used in an expression:

```
select type, price, price*2
from titles
    where type like "%cook"
compute sum (price), sum (price*2)

type         price
------------ --------------  ------------
mod_cook              19.99         39.98
mod_cook               2.99          5.98
trad_cook             20.95         41.90
trad_cook             11.95         23.90
trad_cook             14.99         29.98
              sum             sum
              =============  ============
                      70.87        141.74
```

Usage

- The compute clause allows you to see the detail and summary rows in one set of results. You can calculate summary values for subgroups, and you can calculate more than one aggregate for the same group.
- You can use compute without by to generate grand totals, grand counts, and so on. order by is optional if you use the compute keyword without by. See Example 6.
- If you use compute by, you must also use an order by clause. The columns listed after compute by must be identical to or a subset of those listed after order by and must be in the same left-to-right order, start with the same expression, and cannot skip any expressions. For example, if the order by clause is order by a, b, c, the compute by clause can be any (or all) of these:

```
compute by a, b, c
compute by a, b
compute by a
```

Restrictions

- You cannot use more than 127 aggregate columns in a compute clause.
- You cannot use a compute clause in a cursor declaration.
- You can compute summary values for both expressions and columns. Any expression or column that appears in the compute clause must appear in the select list.

- Aliases for column names are not allowed as arguments to the row aggregate in a compute clause, although you can use them in the select list, the order by clause, and the by clause of compute.
- In a select statement with a compute clause, the order of columns in the select list overrides the order of the aggregates in the compute clause. Open Client™, JDBC, and DB-Library™ programmers must be aware of this in order to put the aggregate results in the right place.
- You cannot use select into in the same statement as a compute clause, because statements that include compute do not generate normal tables.
- If a compute clause includes a group by clause:
  - The compute clause cannot contain more than 255 aggregates.
  - The group by clause cannot contain more than 255 columns.
- Columns included in a compute clause cannot be longer than 255 bytes.

compute results appear as a new row or rows

- The aggregate functions ordinarily produce a single value for all the selected rows in the table or for each group, and these summary values are shown as new columns. For example:

```
select type, sum (price), sum (advance)
from titles
where type like "%cook"
group by type
type
-------------  ---------  ----------
mod_cook           22.98  15,000.00
trad_cook          47.89  19,000.00

 (2 rows affected)
```

- The compute clause allows you to retrieve detail and summary rows with one command. For example:

```
select type, price, advance
from titles
where type like "%cook"
order by type
compute sum (price), sum (advance) by type
type        price       advance
----------  ----------  ----------------
mod_cook          2.99         15,000.00
mod_cook         19.99              0.00
```

```
Compute Result:
--------------------- ----------------
                22.98        15,000.00
type         price         advance
----------  ----------  ----------------
trad_cook        11.95          4,000.00
trad_cook        14.99          8,000.00
trad_cook        20.95          7,000.00

Compute Result:
--------------------- ----------------
                47.89        19,000.00
 (7 rows affected)
```

- The output and grouping of different types of compute clauses are:.

Clauses and grouping	Output	Examples
One compute clause, same function	One detail row	1, 2, 4, 6, 7
One compute clause, different functions	One detail row per type of function	3
More than one compute clause, same grouping columns	One detail row per compute clause; detail rows together in the output	Same results as having one compute clause with different functions
More than one compute clause, different grouping columns	One detail row per compute clause; detail rows in different places, depending on the grouping	5

Case-sensitivity

If your server has a case-insensitive sort order installed, compute ignores the case of the data in the columns you specify. For example, given this data:

```
select * from groupdemo
lname      amount
---------- ------------------
Smith                 10.00
smith                  5.00
SMITH                  7.00
Levi                   9.00
Lévi                  20.00
```

compute by on lname produces these results:

```
select lname, amount from groupdemo
order by lname
compute sum (amount) by lname
lname      amount
---------- ------------------------
Levi                           9.00
```

```
Compute Result:
------------------------
                    9.00

lname      amount
---------- ------------------------
Lévi                          20.00

Compute Result:
------------------------
                   20.00

lname      amount
---------- ------------------------
smith                          5.00
SMITH                          7.00
Smith                         10.00

Compute Result:
------------------------
                   22.00
```

The same query on a case- and accent-insensitive server produces these results:

```
lname      amount
---------- ------------------------
Levi                           9.00
Lévi                          20.00

Compute Result:
------------------------
                   29.00

lname      amount
---------- ------------------------
smith                          5.00
SMITH                          7.00
Smith                         10.00

Compute Result:
------------------------
                   22.00
```

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

See also

Commands group by and having clauses, select

Functions avg, count, max, min, sum

connect to...disconnect

Description

(Component Integration Services only) Connects to the specified server and disconnects the connected server.

Syntax

This syntax is sent to Adaptive Server verbatim. Use this syntax with CIS to create a passthru to a different server:

```
connect to server_name
disconnect
    [from ASE]
    [all]
    [connection_name]
```

This syntax opens a new JDBC-level connection to Adaptive Server, and does not use CIS. You can specify the arguments in any order. If you do not include arguments, Adaptive Server prompts you for connection parameters:

```
connect
    [to ASE engine_name]
    [database database_name]
    [as connection_name]
    [user user_id]
    [identified by password]]]
```

This syntax opens a new JDBC-level connection to Adaptive Server. This syntax does not use CIS:

```
connect using connect_string
```

Parameters

server_name
is the server to which a passthrough connection is required.

from ASE
disconnects from the current Adaptive Server.

all
disconnects from all Adaptive Servers.

connection_name
disconnects from the specified connection.

engine_name
connects to the specified engine.

database_name
connects to the specified database.

connection_name
connects to the configured connection.

user_id
connects to the user with this ID.

connection_string
connects using a predetermined connection string.

Examples

Example 1 Establishes a passthrough connection to the server named SYBASE:

```
connect to SYBASE
```

Example 2 Disconnects the connected server:

```
disconnect
```

Example 3 Disconnects from all servers:

```
disconnect all
```

Usage

- connect to specifies the server to which a passthrough connection is required. Passthrough mode enables you to perform native operations on a remote server.
- *server_name* must be the name of a server in the sysservers table, with its server class and network name defined.
- When establishing a connection to *server_name* on behalf of the user, CIS uses one of the following identifiers:
  - A remote login alias described in sysattributes, if present
  - The user's name and password

  In either case, if the connection cannot be made to the specified server, Adaptive Server returns an error message.
- After making a passthrough connection, CIS bypasses the Transact-SQL parser and compiler when subsequent language text is received. It passes statements directly to the specified server, and converts the results into a form that can be recognized by the Open Client interface and returned to the client program.
- To close the connection created by the connect to command, use the disconnect command. You can use this command only after the connection has been made using connect to.
- You can abbreviate the disconnect command to disc.
- The disconnect command returns an error unless connect to has been previously issued and the server is connected to a remote server.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Permission to use the connect to command must be explicitly granted by the system administrator. The syntax is:

grant connect to *user_name*

The system administrator can grant or revoke connect permission to public globally while in the master database. If the system administrator wants to grant or revoke connect to permission for a particular user, the user must be a valid user of the master database, and the system administrator must first revoke permission from public as follows:

```
use master
go
revoke connect from public
go
sp_adduser fred
go
grant connect to fred
go
```

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
90	security	connect to	• *Roles* – current active roles • *Keywords or options* – connect to • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands create existing table, grant

System procedures sp_addserver, sp_autoconnect, sp_helpserver, sp_passthru, sp_remotesql, sp_serveroption

continue

Description

Restarts the while loop. continue is often activated by an if test.

Syntax

while *boolean_expression*
statement
break
statement
continue

Examples

If the average price is less than $30, double the prices. Then, select the maximum price. If the maximum price is less than or equal to $50, restart the while loop and double the prices again. If the maximum price is more than $50, exit the while loop and print a message:

```
while (select avg (price) from titles) < $30
begin
  update titles
  set price = price * 2
  select max (price) from titles

  if (select max (price) from titles) > $50
     break
  else
     continue
end

begin
print "Too much for the market to bear"
end
```

Usage

continue restarts the while loop, skipping any statements after continue.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

continue permission defaults to all users. No permission is required to use it.

See also

Commands break, while

create archive database

Description

Creates an archive database.

Syntax

create archive database *db_name*
  [on *db_device* [= *size*]
    [, *db_device* [= *size*]] ...]
  with scratch_database = *db_name*

Parameters

on
specifies the modified pages section. Adaptive Server requires traditional database storage to store modified pages. Use the on clause to specify the location and size of the modified pages section.

db device
specifies the database device on which you want to create your modified pages section.

size
specifies the size of the modified pages section you want to create. If you omit *size*, 5120 pages are allocated.

with scratch_database
(required if a scratch database does not already exist) specifies the name of an existing database in which information about the archive database is maintained. The sysaltusages system table, which maps logical pages in the archive database onto physical pages, is stored in the scratch database.

Examples

This could be a typical archive database command sequence.

1. Create the scratch database, if necessary:

```
create database scratchdb
    on datadev1 = 100
    log on logdev1 = 50
```

This creates a 150MB traditional database called scratchdb.

2. Designate the database you just created as a scratch database:

```
sp_dboption "scratchdb", "scratch database", "true"
```

3. Create the archive database:

```
create archive database archivedb
    on datadev2 = 20
    with scratch_database = scratchdb
```

This creates an archive database called archivedb, with a 20MB modified pages section.

4 Materialize your archive database:

```
load database archivedb
    from "/dev/dumps/050615/proddb_01.dmp"
    stripe on "/dev/dumps/050615/proddb_02.dmp"
```

5 Bring the database online:

```
online database archivedb
```

6 Check the consistency of the archive database using dbcc commands. For example:

```
dbcc checkdb(archivedb)
```

7 Load a transaction log dump, and restore objects from the archive database:

```
load tran archivedb
    from "/dev/dumps/050615/proddb1_log_01.dmp"
load tran archivedb
    from "/dev/dumps/050615/proddb1_log_02.dmp"
online database archivedb
select * into proddb.dbo.orders from
    archivedb.dbo.orders
load tran archivedb
    from "/dev/dumps/050615/proddb1_log_03.dmp"
online database archivedb
```

Usage

You cannot use an in-menory database as an archive database.Sybase reommends that you do not use an in-memory database as a scratch database.

Standards

Permissions

create archive database permission defaults to system administrators, who can transfer it to users listed in the sysusers table of the master database. However, create archive database permission is often centralized to maintain control over database storage allocation.

create archive database permission is not included in the grant all command.

See also

create database

Description

Creates a new database.

Syntax

Syntax for nonclustered environments:

```
create [inmemory] [temporary] database database_name
	[use database_name as template]
	[on {default | database_device} [= size]
		[, database_device [= size]]...]
	[log on database_device [= size]
		[, database_device [= size]]...]
	[with {dbid = number, default_location = "pathname", override}]
		| [[,]durability = { no_recovery
			| at_shutdown
			| full} ]
		[ [,] compression = {none | row | page}]
		[ [,] lob_compression = {compression_level | off}]
		[ [,] inrow_lob_length = value ] }...
	[for {load | proxy_update}]
```

Syntax for cluster environments:

```
create [ [ global | system ] temporary ] database database_name
	[ for instance instance_name ]
	[on {default | database_device} [= size]
		[, database_device [= size]]...]
	[log on database_device [= size]
		[, database_device [= size]]...]
	[with {override | default_location = "pathname"}]
	[for {load | proxy_update}]
```

Parameters

temporary
: indicates that you are creating a temporary database.

inmemory
: required for in-memory databases.

database_name
: is the name of the new database, which must conform to the rules for identifiers, and cannot be a variable.

on
: indicates a location and size for the database.

default
: indicates that create database can put the new database on any default database devices, as shown in sysdevices.status. To specify a size for the database without specifying a location, use:

```
on default = size
```

To change a database device's status to "default," use sp_diskdefault.

database_device

is the logical name of the device on which to locate the database. A database can occupy different amounts of space on each of several database devices. To add database devices to Adaptive Server, use disk init.

size

is the amount of space to allocate to the database extension. You can use the following unit specifiers, using uppercase, lowercase, single and double quotes interchangeably: 'k' or "K" (kilobytes), "m" or 'M' (megabytes), "g" or "G" (gigabytes), and 't' or 'T' (terabytes). Sybase recommends that you always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier. If you do not provide a unit specifier, the value provided is presumed to be in megabytes.

log on

specifies the logical name of the device for the database logs. You can specify more than one device in the log on clause.

with

can be specified in any order. You must specify at least one of the following options when you use the with clause:

- with dbid = *number* – specifies the dbid for the new database. If you do not explicitly specify the dbid, the server assigns an unused dbid.
- with default_location – specifies the storage location of new tables. If you also specify the for proxy_update clause, one proxy table for each remote table or view is automatically created from the specified location.
- with override – forces Adaptive Server to accept your device specifications, even if they mix data and transaction logs on the same device, thereby endangering up-to-the-minute recoverability for your database. If you attempt to mix log and data on the same device without using this clause, the create database command fails. If you mix log and data, and use with override, you are warned, but the command succeeds.

durability =
: determines the durability level of the database:

- full – all transactions are written to disk. This is the default if you do not specify a durability level when you create the database, and ensures full recovery from a server failure. All system databases use this durability level (the traditional durability level for disk-resident databases).
- no_recovery – transactions are not durable to disk and all changes are lost if the server fails or is shut down. For disk-based databases, Adaptive Server periodically writes data at runtime to the disk devices, but in an uncontrolled manner. After any shutdown (polite, impolite, or server failure and restart) a database created with no_recovery is not recovered, but is re-created from the model or template (if defined) database.
- at_shutdown – transactions are durable while the server is running and after a polite shutdown. All durability is lost if the server fails.

compression
: indicates the level of compression to be applied to newly created tables or partitions:

- none – data is not compressed.
- row – compresses one or more data items in an individual row. Adaptive Server stores data in a row-compressed form only if the compressed form saves space compared to an uncompressed form.
- page – when the page fills, existing data rows that are row-compressed are then compressed using page-level compression to create page-level dictionary, index, and character-encoding entries.

  Adaptive Server compresses data at the page level only after it has compressed data at the row level, so setting the compression to page implies both page and row compression.

lob_compression = off | *compression_level*
Determines the compression level for the newly created table. Selecting off means the table does not use LOB compression.

The compression algorithm ignores rows that do not use LOB data.

Table compression level. The compression levels are:

- 0 – the row is not compressed.
- 1 through 9 – Adaptive Server uses ZLib compression. Generally, the higher the compression number, the more Adaptive Server compresses the LOB data, and the greater the ratio between compressed and uncompressed data (that is the greater the amount of space savings, in bytes, for the compressed data versus the size of the uncompressed data).

  However, the amount of compression depends on the LOB content, and the higher the compression level , the more CPU-intensive the process. That is, level 9 provides the highest compression ratio but also the heaviest CPU usage.
- 100 – Adaptive Server uses FastLZ compression. The compression ratio that uses the least CPU usage; generally used for shorter data.
- 101 – Adaptive Server uses FastLZ compression. A value of 101 uses slightly more CPU than a value of 100, but uses a better compression ratio than a value of 100.

inrow_lob_length = *value*
specifies the number of bytes. The range of valid values for inrow_lob_length is 0 through the logical page size of the database. A value of 0 turns off LOB specification database-wide, and all LOB columns without a specific in row clause are created as off-row LOB columns.

dml_logging
specifies the logging level for DML operations.

full | minimal
specifies either full logging or minimal logging of the DML operations.

for load
invokes a streamlined version of create database that you can use only for loading a database dump. See “Using the for load option” on page 122.

for proxy_update
: automatically gets metadata from the remote location and creates proxy tables. You cannot use for proxy_update unless you also specify with default_location.

global temporary
: indicates that you are creating a global temporary database.

system temporary
: indicates that you are creating a local system temporary database.

temporary
: indicates that you are creating a temporary database.

for instance *instance_name*
: specifies the instance that is to own the local system temporary database or local temporary database you are creating. This parameter is not used when creating global temporary databases.

Note You must create a local user temporary database from the instance that is to own it. You can create a local system temporary database from any instance.

Examples

Example 1 Creates a database named pubs:

```
create database pubs
```

Example 2 Creates a 4MB database named pubs:

```
create database pubs
on default = 4
```

If you do not provide a unit specifier for *size*, the value provided for pubs is presumed to be in megabytes.

Example 3 Creates a database named pubs with 3MB on the datadev device and 2MB on the moredatadev device:

```
create database pubs
    on datadev = "3M", moredatadev = '2.0m'
```

Example 4 Creates a database named pubs with 3MB of data on the datadev device and a 0.5GB log on the logdev device:

```
create database pubs
    on datadev='3m'
    log on logdev='0.5g'
```

Example 5 Creates a proxy database named proxydb but does not automatically create proxy tables:

```
create database proxydb
with default_location
"UNITEST.pubs.dbo."
```

Example 6 Creates a proxy database named proxydb and automatically creates proxy tables:

```
create database proxydb
on default = "4M"
with default_location
"UNITEST.pubs2.dbo."
for proxy_update
```

Example 7 Creates a proxy database named proxydb, and retrieves the metadata for all of the remote tables from a remote database:

```
create database proxydb
on default = 4
with default_location
"UNITEST.pubs2.."
for proxy_update
```

Example 8 Creates a database called pubs with dbid 15:

```
create database pubs with dbid = 15
```

Example 9 Creates a temporary database called mytempdb1, with 3MB of data on the datadev device and 1MB of log on the logdev device:

```
create temporary database mytempdb1
    on datadev = '3m' log on logdev = '1M'
```

Example 10 Creates a table with one materialized computed column:

```
create table mytitles
   (title_id tid not null,
  title varchar (80) not null,
  type char (12) not null,
  pub_id char (4) null,
  price money null,
  advance money null,
  total_sales int null,
  notes varchar (200) null,
  pubdate datetime not null,
    sum_sales compute price * total_sales materialized)
```

Example 11 In a cluster environment, creates a local user temporary database on “ase1.” Execute the following command from the owner instance (“ase1”):

```
create temporary database local_tempdb1 for instance
ase1
```

or:

```
create temporary database local_tempdb1
```

Example 12 In a cluster environment, creates a local system temporary database on "ase1." Execute this command from any instance in the cluster:

```
create system temporary database local_systempdb1 for
instance ase1
```

Example 13 In a cluster environment, creates a global temporary database:

```
create global temporary database global_tempdb1
```

Example 14 Creates an in-memory database on two different in-memory storage devices, imdb_data_dev1 for the data and imdb_logdev for the log:

```
create inmemory database imdb2
on imdb_data_dev1 = '1.0g'
log on imdb_logdev = '0.5g'
with durability = no_recovery
```

Example 15 Creates an in-memory database on multiple in-memory storage devices. imdb_data_dev1 and imdb_data_dev2 contain all data, and inmem_logdev contains the log:

```
create inmemory database imdb3
on imdb_data_dev1 = '100m',
   imdb_data_dev2 = '200m'
log on inmem_logdev = '50m'
with durability=no_recovery
```

Example 16 Creates the pubs5 database using the pubs2 database as the template:

```
create inmemory database pubs5
use pubs2 as template
on imdb_duck1_cach = '5m'
log on imdb_duck_log = '5m'
with durability = no_recovery
```

Example 17 Creates a relaxed-durability database named pubs5_rddb:

```
create database pubs5_rddb on pubs5_dev = '6M'
log on pubs5_log = '2M'
with durability = at_shutdown
```

Example 18 Creates an in-memory storage cache dedicated to an in-memory temporary database:

1 Create the in-memory storage cache:

```
sp_cacheconfig inmem_tempdb_cache, "40m", inmemory_storage,
"none", "cache_partition=2"
```

2 Create an in-memory device to create temporary database:

```
DISK INIT name = "inmem_dev"
, physname = "inmem_tempdb_cache"
, size = "40m"
, type='inmemory'
```

3 Create the in-memory database:

```
create inmemory temporary database temp_imdb
on inmem_dev = "20m"
with durability = no_recovery
```

Example 19 Creates a temporary database on an existing disk-device with durability set to no_recovery:

```
create temporary database tempdb_rddb_norec
on datadev = "5m" log on logdev = "5m"
with durability = no_recovery
```

Example 20 Creates the emaildb database, and configures it for page-level compression:

```
create database emaildb
on email_dev = '50M'
with compression = page
```

Example 21 Creates the email_lob_db database and configures it for a LOB compression level of 101:

```
Create database email_lob_db
on email_lob_dev = '50M'
with lob_compression = 101
```

Example 22 Creates a database called pubs that allows in-row LOB data with a length of 300 bytes:

```
create database pubs
    with inrow_lob_length = 300
```

Usage

- Use create database from the master database.
- You can specify the *size* as a float datatype, however, the size is rounded down to the nearest multiple of the allocation unit.

- If you do not explicitly state the size of the database, the size is determined by the size of the model database. The minimum size that you can create a database is four allocation units.
- Because Adaptive Server allocates space for databases for create database and alter database in chunks of 256 logical pages, these commands round the specified size down to the nearest multiple of allocation units.
- If you do not include a unit specifier, Adaptive Server interprets the size in terms of megabytes of disk space, and this number is converted to the logical page size the server uses.
- If you do not specify a location and size for a database, the default location is any default database devices indicated in master..sysdevices. The default size is the larger of the size of the model database or the default database size parameter in sysconfigures.

  system administrators can increase the default size by using sp_configure to change the value of default database size and restarting Adaptive Server. The default database size parameter must be at least as large as the model database. If you increase the size of the model database, you must also increase the default size.

  If Adaptive Server cannot give you as much space as you want where you have requested it, it comes as close as possible, on a per-device basis, and prints a message telling how much space was allocated and where it was allocated. The maximum size of a database is system-dependent.
- If you create a proxy database using:

  ```
  create database mydb on my_device
  with default_location = "pathname" for proxy_update
  ```

  The presence of the device name is enough to bypass size calculation, and this command may fail if the default database size (the size of the model database) is not large enough to contain all of the proxy tables.

  To allow CIS to estimate database size, do not include any device name or other option with this command:

  ```
  create database mydb
  with default_location = "pathname" for proxy_update
  ```

Restrictions

- Adaptive Server can manage as many as 32,767 databases.
- The dbid should always be greater than zero and less than the maximum dbid of 32,767.

- Adaptive Server can create only one database at a time. If two database creation requests collide, one user sees this message:

  ```
  model database in use: cannot create new database
  ```

- Each time you allocate space on a database device with create database or alter database, that allocation represents a device fragment, and the allocation is entered as a row in sysusages.
- The maximum number of named segments for a database is 32. Segments are named subsets of database devices available to a particular Adaptive Server. For more information about segments, see the *System Administration Guide*.

Temporary databases

- You cannot use either with default_location or for proxy_update parameters with the create temporary database command. Doing so generates an error, such as the following two examples:

```
1> create temporary database tb1 with default_location
     "remSERVER.mydb.."

Msg 102, Level 15, State 7:
Server 'ebi_SUS_AS125x_SUN32', Line 1:
Incorrect syntax near 'create temporary database'.

1> create temporary database tb1 with default_location
     "remSERVER.mydb.." for proxy_update

Msg 102, Level 15, State 7:
Server 'ebi_SUS_AS125x_SUN32', Line 1:
Incorrect syntax near 'create temporary database'.
```

- The temporary status of a database, which is set during the creation of the temporary database, is indicated by value 0x00000100 (256 decimal) of the status3 field of a sysdatabases entry.
- In addition to all options inherited from model, a temporary database, like the system tempdb, has the following database options set:
  - select into/bulkcopy
  - trunc log on chkpt
- As with system tempdb, the guest user is added to the temporary database, and create table permission is granted to PUBLIC.
- Unused pages are not cleared during creation of the temporary database, since a temporary database is re-created every time the server is restarted.

Creating compressed databases

- The compression setting for create table . . .with compression overrides the create database compression setting.
- Temporary tables created with select into do not inherit the compression level from the database.
- The default setting for compression in the model database is none (data compression is off for all databases based on model).
- When you enable data compression in tempdb or other temporary databases, temporary tables created in a session or inside stored procedures do not inherit tempdb's compression level.
- The database to which a task is bound determines the compression level of the temporary tables it creates.

Creating databases with in-row LOBs

- The in-row size can be as large as the maximum row size allowed in the database. Adaptive Server lowers the limit on the size of individual column's in-row LOB storage during inserts and updates, based on the space available for storage in a single page, minus any page or row overheads.
- When you create a table in a database where you have specified a valid in-row LOB length database-wide, all LOB columns in the table are created as in-row unless you specify off row in the syntax for the column's definition. The column's in-row length, in bytes, is specified by this database-wide setting.
- The default value for inrow_lob_length setting is 0 bytes, which causes no changes in behavior to existing databases when you upgrade to Adaptive Server version 15.7. Changing this default allows applications with different requirements on in-row storage to control how much LOB data is stored in-row.
- The database-wide setting applies only to newly created tables or LOB columns added to existing tables after the database-wide setting is applied or changed. The in-row LOB length inherited by each LOB column when the table was initially created remains unchanged, even when the database-wide setting is altered. To change an individual LOB column's in-row length or in-row property, use alter table modify column.
- To change the default length, use the inrow_lob_length parameter of alter database.

Creating in-memory and relaxed durability databases

- The *database_device* you list for the in-memory database must be an in-memory storage device.
- The for load parameter indicates that the database is created initially in a state waiting to be loaded using a load database command.
- You cannot:
  - Create an in-memory database on a default device.
  - Use in-memory databases for system databases (other than tempdb).
  - Use an in-menory database as an archive database.Sybase reommends that you do not use an in-memory database as a scratch database.
  - Use the same name for the database you are creating and its template database.
  - Specify system databases, including model, as the template database.
  - Mix disk-based and cache-based storage devices. Adaptive Server treats databases created entirely on in-memory storage cache as in-memory databases. You cannot use:
    - In-memory storage devices created on different in-memory storage caches for one in-memory database
    - In-memory storage devices created on one in-memory storage cache, either in full or in part, for different in-memory databases
  - Use he use as template parameter with the with default_location = parameter.
  - Use he for load and for proxy update parameters with the use as template parameter.
- You can:
  - Create in-memory databases on in-memory storage devices residing on named caches as long as all the in-memory storage devices are hosted by in-memory storage cache.
  - Create mixed log-and-data in-memory databases on the same in-memory storage devices. However, mixed log-and-data in-memory databases must be on a single cache.
- The durability = no_recovery parameter is required when you create an an in-memory database. This parameter reinforces the behaviour that in-memory databases are always recreated when you restart the server.

New databases created from *model*

- Adaptive Server creates a new database by copying the model database.
- You can customize model by adding tables, stored procedures, user-defined datatypes, and other objects, and by changing database option settings. New databases inherit these objects and settings from model.
- To guarantee recoverability, create database must clear every page that was not initialized when the model database was copied. This may take several minutes, depending on the size of the database and the speed of your system.

  If you are creating a database to load a database dump into it, you can use the for load option to skip the page-clearing step. This makes database creation considerably faster.

Ensuring database recoverability

- Back up the master database each time you create a new database. This makes recovery easier and safer if master is damaged.

  Note If you create a database and fail to back up master, you may be able to recover the changes with disk reinit.

- The with override clause allows you to mix log and data segments on a single device. However, for full recoverability, the device or devices specified in log on should be different from the physical device that stores the data. In the event of a hard-disk failure, you can recover the database from database dumps and transaction logs.

  You can create a small database on a single device that is used to store both the transaction log and the data, but you *must* rely on the dump database command for backups.
- The size of the device required for the transaction log varies according to the amount of update activity and the frequency of transaction log dumps. As a rule of thumb, allocate to the log device 10 – 25 percent of the space you allocate to the database itself. It is best to start small, since space allocated to a transaction log device cannot be reclaimed and cannot be used for storing data.

Using the *for load* option

You can use the for load option for recovering from media failure or for moving a database from one machine to another, if you have not added to the database with sp_addsegment. Use alter database for load to create a new database in the image of the database from which the database dump to be loaded was made. For a discussion of duplicating space allocation when loading a dump into a new database, see the *System Administration Guide*.

- When you create a database using the for load option, you can run only the following commands in the new database before loading a database dump:
    - alter database for load
    - drop database
    - load database

  After you load the database dump into the new database, you can also use some dbcc diagnostic commands in the databases. After you issue the online database command, there are no restrictions on the commands you can use.

- A database created with the for load option has a status of "don't recover" in sp_helpdb output.

Getting information about databases

- To get a report on a database, execute sp_helpdb.
- For a report on the space used in a database, use sp_spaceused.

Using *with default_location* and *for proxy_update*

Without the for proxy_update clause, the behavior of the with default_location clause is the same as that provided by sp_defaultloc—a default storage location is established for new and existing table creation, but proxy table definitions are not automatically imported during the processing of create database.

- If for proxy_update is specified with no default_location, an error is reported.
- When a proxy database is created (using the for proxy_update option), CIS is called upon to:
    - Provide an estimate of the database size required to contain all proxy tables representing the actual tables and views found in the primary server's database. This estimate is the number of database pages needed to contain all proxy tables and indexes. The estimate is used if no size is specified, and no database devices are specified.

- Create all proxy tables representing the actual tables and views found in the companion server's database.
- Grant all permissions on proxy tables to public.
- Add the guest user to the proxy database.
- The database status is set to indicate that this database "Is_A_Proxy". This status is contained in master.dbo.sysdatabases.status3.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create database permission defaults to system administrators, who can transfer it to users listed in the sysusers table of the master database. However, to maintain control over database storage allocation, create database permission is often centralized.

Any user with create database privilege can also create a new database with logging disabled. Only the database owner or a login with sa_role privilege can run alter database to change the database-wide logging setting. The user creating a database from a template must be the owner of the template database, or a user with the sa_role.

If you are creating the sybsecurity database, you must be a system security officer.

create database permission is not included in the grant all command.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
9	create	create database	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter database, disk init, drop database, dump database, load database, online database

System procedures sp_changedbowner, sp_diskdefault, sp_helpdb, sp_logdevice, sp_renamedb, sp_spaceused

create default

Description

Specifies a value to insert in a column (or in all columns of a user-defined datatype) if no value is explicitly supplied at insert time.

Syntax

```
create default [owner.]default_name
    as constant_expression
```

Parameters

default_name

is the name of the default, which must conform to the rules for identifiers and cannot be a variable. Specify the owner's name to create another default of the same name owned by a different user in the current database. The default value for *owner* is the current user.

constant_expression

is an expression that does not include the names of any columns or other database objects. It can include global variables and built-in functions that do not reference database objects. Enclose character and date constants in quotes and use a "0x" prefix for binary constants.

Examples

Example 1 Creates a default called D1 that uses the *@@spid* global variable:

```
create default D1 as @@spid
```

Example 2 Defines a default value, then binds it to the appropriate column or user-defined datatype:

```
create default phonedflt as "UNKNOWN"
```

```
sp_bindefault phonedflt, "authors.phone"
```

The default takes effect only if there is no entry in the phone column of the authors table. No entry is different from a null value entry. To get the default, issue an insert command with a column list that does not include the column that has the default.

Example 3 Creates a default value, todays_date, that inserts the current date into the columns to which it is bound:

```
create default todays_date as getdate ()
```

Usage

- Bind a default to a column or user-defined datatype—but not an Adaptive Server-supplied datatype—with sp_bindefault.
- You can bind a new default to a datatype without unbinding the old one. The new default overrides and unbinds the old one.
- create default performs error checking for check constraints before it creates the default.
- To hide the source test of a default, use sp_hidetext.

Restrictions

- You can create a default only in the current database.
- You cannot combine create default statements with other statements in a single batch.
- You must drop a default using drop default before you create a new one of the same name; you must unbind a default using sp_unbindefault, before you drop it.

Datatype compatibility

- Adaptive Server generates an error message when it attempts to insert a default value that is not compatible with the column's datatype. For example, if you bind a character expression such as "N/A" to an integer column, any insert that does not specify the column value fails.
- If a default value is too long for a character column, Adaptive Server either truncates the string or generates an exception, depending on the setting of the string_rtruncation option. See the set command.

Getting information about defaults

- Default definitions are stored in syscomments.
- After a default is bound to a column, its object ID is stored in syscolumns. After a default is bound to a user-defined datatype, its object ID is stored in systypes.
- To rename a default, use sp_rename.
- For a report on the text of a default, use sp_helptext.

Defaults and rules

If a column has both a default and a rule associated with it, the default value must not violate the rule. A default that conflicts with a rule cannot be inserted. Adaptive Server generates an error message each time it attempts to insert such a default.

Defaults and nulls

If a column does not allow nulls, and you do not create a default for the column, when a user attempts to insert a row but does not include a value for that column, the insert fails and Adaptive Server generates an error message.

Table 1-3 illustrates the relationship between the existence of a default and the definition of a column as NULL or NOT NULL.

Table 1-3: Relationship between nulls and column defaults

Column null type	No entry, no default	No entry, default exists	Entry is null, no default	Entry is null, default exists
NULL	Null inserted	Default value inserted	Null inserted	Null inserted
NOT NULL	Error, command fails	Default value inserted	Error, command fails	Error, command fails

Specifying a default value in *create table*

You can define column defaults using the default clause of the create table statement as an alternative to using create default. However, these column defaults are specific to that table; you cannot bind them to other tables. See create table and alter table for information about integrity constraints.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Use the default clause of the create table statement to create ANSI SQL-compliant defaults.

Permissions

create default permission defaults to the database owner, who can transfer it to other users.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
14	create	create default	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Other information* – NULL • *Current value* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter table, create rule, create table, drop default, drop rule

System procedures sp_bindefault, sp_help, sp_helptext, sp_rename, sp_unbindefault

create encryption key

Description

Creates encryption keys. All the information related to keys and encryption is encapsulated by create encryption key, which allows you to specify the encryption algorithm and key size, the key's default property, an optional user-specified password to encrypt the key, as well as the use of an initialization vector or padding during the encryption process.

Adaptive Server uses Security Builder Crypto for key generation and encryption.

Syntax

Create the master key:

```
create encryption key [dual] master
     [for AES] with passwd char_literal
```

Create the service key:

```
create encryption key syb_extpasswdkey
     [ with { static key | master key }]
create encryption key syb_syscommkey
          [ with { static key | master key }]
```

Create the column encryption key:

```
create encryption key [[database.][owner].]keyname
     [as default]
     [for algorithm_name]
     [with [{{passwd {char_literal | system_encr_passwd} | master key}]
     [key_length num_bits]
     [init_vector {null | random}]
     [pad {null | random}]
     [[no] dual_control]}]
```

Parameters

keyname

must be unique in the user's table, view, and procedure name space in the current database. Specify the *database* name if the key is in another database; specify the *owner* name if you are creating a key for another user. The default value for *owner* is the current user, and the default value for *database* is the current database. Only the system security officer can create keys for other users.

as default

allows the system security officer or the key custodian to create a database default key for encryption. The existence of a database default encryption key enables the table creatorto specify encryption without using a keyname on create table, alter table, and select into. Adaptive Server uses the default key from the same database. The default key may be changed. See alter encryption key on page 15.

for *algorithm_name*

specifies the algorithm you are using. Advanced Encryption Standard (AES) is the only algorithm supported. AES supports key sizes of 128 bits, 192 bits, and 256 bits, and a block size of 16 bytes.

for AES

uses the Advanced Encryption Standard (AES) encryption algorithm to encrypt data.

syb_extpasswdkey | syb_syscommkey

- syb_extpasswdkey – all external passwords in sysattributes are reencrypted with the new key using strong encryption
- syb_syscommkey – any subsequent execution of sp_hidetext uses the new key with strong encryption. sp_hidetext must be executed on an existing database object for the object to be encrypted with the new key

static key | master key

indicates that you are creating an encryption key using a static or master key.

keylength *num_bits*

the size, in bits, of the key to be created. For AES, valid key lengths are 128, 192, and 256 bits. The default key length is 128 bits.

password_phrase

is a quoted alphanumeric string of up to 255 bytes in length that Adaptive Server uses to generate the key used to encrypt the column encryption key (the key encryption key).

init_vector random

specifies use of an initialization vector during encryption. When an initialization vector is used by the encryption algorithm, the cipher text of two identical pieces of plain text are different, which prevents a cryptanalyst from detecting patterns of data. Use an initialization vector to increase the security of your data.

An initialization vector has some performance implications. Index creation, and optimized joins and searches, can be performed only on a column for which the encryption key does not specify an initialization vector.

The default is to use an initialization vector, that is, init_vector random. Use of an initialization vector implies using a cipher-block chaining (CBC) mode of encryption; setting init_vector null implies the electronic codebook (ECB) mode.

init_vector null
omits the use of an initialization vector when encrypting. This makes the column suitable for supporting an index.

pad null
is the default, which omits random padding of data. You cannot use padding if the column must support an index.

pad random
data is automatically padded with random bytes before encryption. You can use padding instead of an initialization vector to randomize the cipher text. Padding is suitable only for columns whose plaintext length is less than half the block length. For the AES algorithm, the block length is 16 bytes.

[no] dual_control
indicates whether dual control is used to create the master key.

Examples

Example 1 Specifies a 256-bit key called “safe_key” as the database default key. The system security officer enters:

```
create encryption key safe_key as default for AES with keylength 256
```

Example 2 Creates a 128-bit key called “salary_key” for encrypting columns using random padding:

```
create encryption key salary_key for AES with init_vector null pad random
```

Example 3 Creates a 192-bit key named “mykey” for encrypting columns using an initialization vector:

```
create encryption key mykey for AES with keylength 192 init_vector random
```

Example 4 Ceates a key that is protected by a user-specified password:

```
create encryption key key1 with passwd 'Worlds1Biggest6Secret'
```

You must enter user-specified passwords that protect keys before accessing a column encrypted by the key. See set on page 624.

Example 5 Specifies a 256-bit key called “safe_key” as the database default key. Because the key does not specify a password, Adaptive Server uses the database-level master key as the key encryption key for safe_key. If there is no master key, Adaptive Server uses the system encryption password:

```
create encryption key safe_key as default for AES with keylength 256
```

Example 6 Encrypts CEK k3 with a combination of the master key and “Whybother”:

```
create encryption key k3 with passwd 'Whybother' dual_control
create encryption key k1 with keylength 192
```

Usage

Adaptive Server does not save the user-specified password. It saves a string of validating bytes known as the "salt" in sysencryptkeys.eksalt, which allows Adaptive Server to recognize whether a password used on a subsequent encryption or decryption operation is legitimate for a key. You must supply the password to Adaptive Server before you can access any column encrypted by keyname.

Permissions

The system security officer and the key custodian have implicit permission to create encryption keys. The system security officer may grant that permission to other users.

Default keys can be created only by the system security officer and the key custodian.

See also

Commands alter encryption key, drop encryption key, grant, revoke

Documentation For information about auditing, see Chapter 6, "Auditing Encrypted Columns," in the *User Guide for Encrypted Columns*.

create existing table

Description

(Component Integration Services only) Creates a proxy table, then retrieves and stores metadata from a remote table and places the data into the proxy table. Allows you to map the proxy table to a table, view, or procedure at a remote location.

The preferred method of creating proxy tables is the create proxy_table command, which eliminates the need to define the column definitions.

Syntax

```
create existing table table_name (column_list)
    [on segment_name]
    [[external {table | procedure | file | connection_type}] at pathname
    [column delimiter "string"]]
```

Parameters

table_name
specifies the name of the table for which you want to create a proxy table.

column_list
specifies the name of the column list that stores information about the remote table.

on *segment_name*
specifies the segment that contains the remote table.

external
specifies that the object is a remote object.

table
specifies that the remote object is a table or a view. The default is external table.

procedure
specifies that the remote object is a stored procedure.

file
specifies that the remote object is a file.

connection_type
determines whether a remote procedure call uses the current or a separate connection. The valid values are:

- non_transactional – is a separate connection is used to execute the RPC.
- transactional – is the existing connection is used to execute the RPC.

The default behavior is transactional.

at *pathname*

specifies the location of the remote object. *pathname* takes the form: *server_name*.*dbname*.*owner*.*object*, where:

- *server_name* (required) – is the name of the server that contains the remote object.
- *dbname* (optional) – is the name of the database managed by the remote server that contains this object.
- *owner* (optional) – is the name of the remote server user that owns the remote object.
- *object* (required) – is the name of the remote table, view, or procedure.

column delimiter

used to separate fields within each record when accesssing flat files. The column delimiter can be up to 16 bytes long.

string

the column delimiter string can be any character sequencer, but if the string is longer than 16 bytes, only the first 16 bytes are used. The use of column delimiter for proxy tables mapped to anything but files results in a syntax error.

Examples

Example 1 Creates the proxy table authors:

```
create existing table authors
(
au_id       id,
au_lname    varchar (40)    NOT NULL,
au_fname    varchar (20)    NOT NULL,
phone       char (12),
address     varchar (40)    NULL,
city        varchar (20)    NULL,
state       char (2)        NULL,
zip         char (5)        NULL,
contract    bit
)
at "nhserver.pubs2.dbo.authors"
```

Example 2 Creates the proxy table syb_columns:

```
create existing table syb_columns
(
id        int,
number    smallint,
colid     tinyint,
status    tinyint,
```

```
type      tinyint,
length    tinyint,
offset    smallint,
usertype  smallint,
cdefault  int,
domain    int,
name      varchar (30),
printfmt  varchar (255)    NULL,
prec      tinyint         NULL,
scale     tinyint         NULL
)
at "remote1.master.dbo.columns"
```

Example 3 Creates a proxy table named blurbs for the blurbs table at the remote server SERVER_A:

```
create existing table blurbs
(
author_id      id      not null,
copy           text    not null
)
at "SERVER_A.db1.joe.blurbs"
```

Example 4 Creates a proxy table named rpc1 for the remote procedure named p1:

```
create existing table rpc1
(
column_1       int,
column_2       int
)
external procedure
at "SERVER_A.db1.joe.p1"
```

Usage

- create existing table does not create a new table unless the remote object is a file. Instead, CIS checks the table mapping to confirm that the information in *column_list* matches the remote table, verifies the existence of the underlying object, and retrieves and stores metadata about the remote table.
- If the host data file or remote server object does not exist, the command is rejected with an error message.
- If the object exists, the system tables sysobjects, syscolumns, and sysindexes are updated. The verification operation requires these steps:

a. The nature of the existing object is determined. For host data files, this requires determining file organization and record format. For remote server objects, this requires determining whether the object is a table, a view, or an RPC.

b. For remote server objects (other than RPCs), column attributes obtained for the table or view are compared with those defined in the column_list.

c. Index information from the host data file or remote server table is extracted and used to create rows for the sysindexes system table. This defines indexes and keys in Adaptive Server terms and enables the query optimizer to consider any indexes that might exist on this table.

- The on *segment_name* clause is processed locally and is not passed to a remote server.
- After successfully defining an existing table, issue update statistics for the table. This allows the query optimizer to make intelligent choices regarding index selection and join order.
- CIS allows you to create a proxy table with a column defined as NOT NULL even though the remote column is defined as NULL. It displays a warning to notify you of the mismatch.
- The location information provided by the at keyword is the same information that is provided by sp_addobjectdef. The information is stored in the sysattributes table.
- CIS inserts or updates a record in the systabstats catalog for each index of the remote table. Since detailed structural statistics are irrelevant for remote indexes, only a minimum number of columns are set in the systabstats record—id, indid, and rowcnt.
- External files cannot be of datatypes text, image, or Java ADTs.

Datatype conversions

- When using create existing table, you must specify all datatypes with recognized Adaptive Server datatypes. If the remote server tables reside on a class of server that is heterogeneous, the datatypes of the remote table are automatically converted into the specified Adaptive Server types when the data is retrieved. If the conversion cannot be made, CIS does not allow the table to be defined.
- The *Component Integration Services Users Guide* contains a section for each supported server class and identifies all possible datatype conversions that are implicitly performed by CIS.

Changes by server class

- All server classes allow you to specify fewer columns than there are in the table on the remote server.
- All server classes match the columns by name.
- All server classes allow the column type to be any datatype that can be converted to and from the datatype of the column in the remote table.

Remote procedures

- When the proxy table is a procedure-type table, you must provide a column list that matches the description of the remote procedure's result set. create existing table does *not* verify the accuracy of this column list.
- No indexes are created for procedures.
- CIS treats the result set of a remote procedure as a virtual table that can be sorted, joined with other tables, or inserted into another table using insert or select. However, a procedure type table is considered read-only, which means you cannot issue the following commands against the table:
  - alter table
  - create index
  - delete
  - insert
  - truncate table
  - update
- Begin the column name with an underscore (_) to specify that the column is not part of the remote procedure's result set. These columns are referred to as parameter columns. For example:

```
create existing table rpc1
 (
    a        int,
    b        int,
    c        int,
    _p1      int null,
    _p2      int null
)
external procedure
at "SYBASE.sybsystemprocs.dbo.myproc"
```

  In this example, the parameter columns _p1 and _p2 are input parameters. They are not expected in the result set, but can be referenced in the query:

```
select a, b, c from t1
where _p1 = 10 and _p2 = 20
```

CIS passes the search arguments to the remote procedure as parameters, using the names *@p1* and *@p2*.

- Parameter-column definitions in a create existing table statement:
  - Must allow a null value.
  - Cannot precede regular result columns—they must appear at the end of the column list.
- If a parameter column is included in a select list and is passed to the remote procedure as a parameter, the return value is assigned by the where clause.
- If a parameter column is included in a select list, but does not appear in the where clause or cannot be passed to the remote procedure as a parameter, its value is NULL.
- A parameter column can be passed to a remote procedure as a parameter if the Adaptive Server query processor considers it a searchable argument. A parameter column is considered a searchable argument if it is not included in any or predicates. For example, the or predicate in the second line of the following query prevents the parameter columns from being used as parameters:

```
select a, b, c from t1
where _p1 = 10 or _p2 = 20
```

Encrypted columns

create existing table automatically updates syscolumns with any encrypted column metadata from the remote table. You cannot include the encrypt keyword in the column list for a create existing table command.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create existing table permission defaults to the table owner and is not transferable.

See also

Commands alter table, create table, create proxy_table, drop index, insert, order by clause, set, update

create function

Description

Creates a user-defined function, which is a saved Transact-SQL routine that returns a specified value.

Syntax

```
create function [ owner_name. ] function_name
          [ ( @parameter_name [as] parameter_datatype [ = default ]
               [ ,...n ] ) ]
          returns return_datatype
          [ with recompile]
          as
          [begin]
          function_body
          return scalar_expression
          [end]
```

Parameters

owner_name

is the name of the user ID that owns the user-defined function. Must be an existing user ID.

function_name

is the name of the user-defined function. Function names must conform to the rules for identifiers and must be unique within the database and to its owner. Function names cannot be the same as other Adaptive Server functions.

Note To reference or invoke a user-defined function, specify the *owner_name.function_name*, followed by parentheses (see the BONUS function in the "Examples" section below). Specify expressions as arguments for all the parameters within the parentheses. You cannot specify the parameter names in the argument list when you invoke a function.You must supply argument values for all of the parameters, and the argument values must be in the same sequence in which the parameters are defined in the create function statement. When a function's parameter has a default value, you must specify the keyword "default" when calling the function to get the default value.

@parameter_name
is the parameter in the user-defined function. You can declare one or more parameters in a create function statement. A function can have a maximum of 2,047 parameters. The value of each declared parameter must be supplied by the user when the function is executed, unless you define a default for the parameter.

Specify a parameter name using an “at” sign (@) as the first character. The parameter name must conform to the rules for identifiers. Parameters are local to the function. You can use the same parameter names in other functions.

If a parameter has a default value, the user must specify the keyword “default” when they call the function to get the default value.

parameter_datatype
is the datatype of the parameter. All scalar datatypes and Java abstract datatypes (ADTs) can be used as a parameter for user-defined functions. However, user-defined functions do not support the timestamp, text, image and unitext.

with recompile
indicates that Adaptive Server never saves a plan for this function; instead, a new plan is created each time the function is referenced in a SQL statement. Use *with recompile* when you expect the execution of this function to be atypical, and require a new plan.

return_datatype
is the return value of a scalar, user-defined function. *return_datatype* can be any of the scalar datatypes and Java ADTs except text, image, unitext, and timestamp.

scalar_expression
specifies the scalar value the scalar function returns.

You can invoke scalar-valued functions where scalar expressions are used, including computed columns and check constraint definitions.

function_body
specifies a series of Transact-SQL statements, which together do not produce a side effect but define the value of the function. *function_body* is used only in scalar functions and multistatement table-valued functions. In scalar functions, *function_body* is a series of Transact-SQL statements that evaluate to a scalar value.

Examples

Creates a user-defined function named bonus:

```
create function BONUS(@salary int, @grade int, @dept_id
```

```
int)
returns int
as
    begin
    declare @bonus int
    declare @cat int
    set @bonus = 0
    select @cat = dept_cat from department
        where dept_id = @dept_id

    if (@cat < 10)
        begin
            set @bonus = @salary *15/100

        end
        else
            begin
            set @bonus = @salary * 10/100
        end
return @bonus
end
```

Usage

- If the owner of the user-defined function also owns all the database objects referenced inside, then all the other users who have execute permission on the function are automatically granted access permissions to all the referenced objects when they execute the function.
- When a function is created, Adaptive Server checks to see if it is a SQL user-defined function or a SQLJ user-defined function. If it is the latter, Adaptive Server checks for "sa" permissions. If it is a SQL function, Adaptive Server checks for create function privileges.

Permissions

create function permission defaults to the database owner, who can transfer it to other users.

Owners of functions have execute permission on their functions. Other users do not have execute permissions unless execute permissions on the specific function are granted to them.

create function (SQLJ)

Description

Creates a user-defined function by adding a SQL wrapper to a Java static method. Can return a value defined by the method.

Syntax

```
create function [owner.]sql_function_name
                ([ sql_parameter_name sql_datatype
                     [(length)| (precision[, scale ])]
               [[, sql_parameter_name sql_datatype
                     [(length)| (precision[, scale])]]
               ...]])
          returns sql_datatype
               [(length)| (precision[, scale])]
          [modifies sql data]
          [returns null on null input |
               called on null input]
          [deterministic | not deterministic]
          [exportable]
          language java
          parameter style java
          external name 'java_method_name
               [([java_datatype[, java_datatype
               ...]])] '
```

Parameters

sql_function_name
is the Transact-SQL name of the function, must conform to the rules for identifiers, and cannot be a variable.

sql_parameter_name
is the name of an argument to the function. The value of each input parameter is supplied when the function is executed. Parameters are optional; a SQLJ function need not take arguments.

Parameter names must conform to the rules for identifiers. If the value of a parameter contains nonalphanumeric characters, it must be enclosed in quotes. This includes object names qualified by a database name or owner name, since they include a period. If the value of the parameter begins with a numeric character, it also must be enclosed in quotes.

sql_datatype [(*length*) | (*precision* [, *scale*])]
is the Transact-SQL datatype of the parameter. See create procedure on page 172 for more information about these parameters.

sql_datatype is the SQL procedure signature.

returns *sql_datatype*
specifies the result datatype of the function.

modifies sql data
: indicates that the Java method invokes SQL operations, reads, and modifies SQL data in the database. This is the default and only implementation. It is included for syntactic compatibility with the ANSI standard.

deterministic | not deterministic
: included for syntactic compatibility with the ANSI standard. Not currently implemented.

exportable
: specifies that the procedure is to be run on a remote server using the Adaptive Server OmniConnect™ feature. Both the procedure and the method it is built on must reside on the remote server.

language java
: specifies that the external routine is written in Java. This is a required clause for SQLJ functions.

parameter style java
: specifies that the parameters passed to the external routine at runtime are Java parameters. This is a required clause for SQLJ functions.

external
: indicates that create function defines a SQL name for an external routine written in a programming language other than SQL.

name
: specifies the name of the external routine (Java method). The specified name—'*java_method_name* [*java_datatype*[{, *java_datatype*} ...]]'—is a character-string literal and must be enclosed in single quotes.

java_method_name
: specifies the name of the external Java method.

java_datatype
: specifies a Java datatype that is mappable or result-set mappable. This is the Java method signature.

Examples

Creates a function square_root that invokes the java.lang.Math.sqrt() method:

```
create function square_root
    (input_number double precision) returns
        double precision
    language java parameter style java
    external name 'java.lang.Math.sqrt'
```

Usage

- You cannot create a SQLJ function with the same name as an Adaptive Server built-in function.

- You can create user-defined functions (based on Java static methods) and SQLJ functions with the same class and method names.

Note Adaptive Server searching order ensures that the SQLJ function is always found first.

- You can include a maximum of 31 parameters in a create function statement.
- When a function is created, Adaptive Server checks to see if it is a SQL user-defined function or a SQLJ user-defined function. If it is the latter, Adaptive Server checks for "sa" permissions. If it is a SQL function Adaptive Server checks for create function privileges.

Permissions

Only the database owner or user with sa role can execute create function. The database owner or sa cannot transfer permission for create function.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
97	install	create function	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a set proxy is in effect

See also

See *Java in Adaptive Server Enterprise* for more information about create function.

Commands create function (SQLJ), drop function (SQLJ)

System procedures sp_depends, sp_help, sp_helpjava, sp_helpprotect

create index

Description

Creates an index on one or more computed or noncomputed columns in a table. Creates partitioned indexes.

Allows computed columns, like ordinary columns, to be index keys, and creates function-based indexes. A function-based index has one or more expressions as its index key.

The existing create index syntax can create indexes on computed columns, but function-based indexes require additional syntax.

Syntax

```
create [unique] [clustered | nonclustered] index index_name
    on [[database.]owner.]table_name
        (column_expression [asc | desc]
            [, column_expression [asc | desc]]...)
    [with {fillfactor = pct,
            max_rows_per_page = num_rows,
            reservepagegap = num_pages,
            consumers = x, ignore_dup_key, sorted_data,
            [ignore_dup_row | allow_dup_row],
             statistics using num_steps values}]
    [on segment_name]
    [index_partition_clause]
```

To create index partitions:

```
index_partition_clause::=
    [local index [partition_name [on segment_name]
    [, partition_name [on segment_name]...]]]
```

For function-based indexes:

```
create [unique | nonclustered] index index_name
    on [[database.] owner.] table_name
     (column_expression [asc | desc]
    [, column_expression [asc | desc]]...
```

Parameters

unique

prohibits duplicate index values (also called "key values"). The system checks for duplicate key values when the index is created (if data already exists), and each time data is added with an insert or update. If there is a duplicate key value or if more than one row contains a null value, the command fails, and Adaptive Server prints an error message giving the duplicate entry.

Warning! Adaptive Server does not detect duplicate rows if a table contains any non-null text, unitext, or image columns.

---

update and insert commands, which generate duplicate key values, can succeed if you create your index using the allow_dup_row option.

Composite indexes (indexes in which the key value is composed of more than one column) can also be unique.

The default is nonunique. To create a nonunique clustered index on a table that contains duplicate rows, specify allow_dup_row or ignore_dup_row. See "Duplicate rows" on page 156.

When you create a unique local index on range-, list-, and hash-partitioned tables, the index key list is a superset of the partition-key list.

clustered

means that the physical order of rows on the current database device is the same as the indexed order of the rows. The bottom, or **leaf level**, of the clustered index contains the actual data pages. A clustered index almost always retrieves data faster than a nonclustered index. Only one clustered index per table is permitted. See "Creating clustered indexes" on page 154.

If clustered is not specified, nonclustered is assumed.

nonclustered

means that the physical order of the rows is not the same as their indexed order. The leaf level of a nonclustered index contains pointers to rows on data pages. You can have as many as 249 nonclustered indexes per table.

index_name

is the name of the index. Index names must be unique within a table, but need not be unique within a database.

table_name

is the name of the table in which the indexed column or columns are located. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

column_expression

is a valid Transact-SQL expression that references at least one base column, and does not contain columns from other tables, local and global variables, aggregate functions, or subqueries.

Note *column_expressions* replaces the *column_name* variable used in Adaptive Server versions earlier than 15.0.

---

asc | desc

specifies whether the index is to be created in ascending or descending order for the column specified. The default is ascending order.

fillfactor

specifies how full Adaptive Server makes each page when it creates a new index on existing data. The fillfactor percentage is relevant only when the index is created. As data changes, the pages are not maintained at any particular level of fullness.

The value you specify is not saved in sysindexes. Use sp_chgattribute to create stored fillfactor values.

The default for fillfactor is 0; this is used when you do not include with fillfactor in the create index statement (unless the value has been changed with sp_configure). When specifying a fillfactor, use a value between 1 and 100.

A fillfactor of 0 creates clustered indexes with completely full pages and nonclustered indexes with completely full leaf pages. It leaves a comfortable amount of space within the index B-tree in both the clustered and nonclustered indexes. There is seldom a reason to change the fillfactor.

If the fillfactor is set to 100, Adaptive Server creates both clustered and nonclustered indexes with each page 100 percent full. A fillfactor of 100 makes sense only for read-only, to which no data is ever added.

fillfactor values smaller than 100 (except 0, which is a special case) cause Adaptive Server to create new indexes with pages that are not completely full. A fillfactor of 10 might be a reasonable choice if you are creating an index on a table that will eventually hold a great deal more data, but small fillfactor values cause each index (or index and data) to occupy more storage space.

Warning! Creating a clustered index with a fillfactor affects the amount of storage space your data occupies, since Adaptive Server redistributes the data as it creates the clustered index.

---

max_rows_per_page

limits the number of rows on data pages and the leaf-level pages of indexes. Unlike fillfactor, the max_rows_per_page value is maintained until it is changed with sp_chgattribute.

If you do not specify a value for max_rows_per_page, Adaptive Server uses a value of 0 when creating the table. Values for tables and clustered indexes range from 0 to 183K on a 2K page, to 0 to 1486 on a 16K page.

The maximum number of rows per page for nonclustered indexes depends on the size of the index key. Adaptive Server returns an error message if the specified value is too high.

A max_rows_per_page value of 0 creates clustered indexes with full pages and nonclustered indexes with full leaf pages. It leaves a comfortable amount of space within the index B-tree in both clustered and nonclustered indexes.

If max_rows_per_page is set to 1, Adaptive Server creates both clustered and nonclustered indexes with one row per page at the leaf level. Use low values to reduce lock contention on frequently accessed data. However, low max_rows_per_page values cause Adaptive Server to create new indexes with pages that are not completely full, uses storage space, and may cause more page splits.

If CIS is enabled, you cannot use max_rows_per_page for remote servers.

Warning! Creating a clustered index with max_rows_per_page can affect the amount of storage space your data occupies, since Adaptive Server redistributes the data as it creates the clustered index.

---

with reservepagegap = *num_pages*

specifies a ratio of filled pages to empty pages to be left during extent I/O allocation operations. For each specified *num_pages*, an empty page is left for future expansion of the index. Valid values are 0 – 255. The default is 0.

with consumers

specifies the number of consumer processes that should perform the sort operation for creating the index. The actual number of consumer processes used to sort the index may be different from the specified number, depending on the number of worker processes available and the number of data partitions.

ignore_dup_key

cancels attempts of duplicate key entry into a table that has a unique index (clustered or nonclustered). Adaptive Server cancels the attempted insert or update of a duplicate key with an informational message. After the cancellation, the transaction containing the duplicate key proceeds to completion.

You cannot create a unique index on a column that includes duplicate values or more than one null value, whether or not ignore_dup_key is set. If you attempt to do so, Adaptive Server prints an error message that displays the first of the duplicate values. You must eliminate duplicates before Adaptive Server can create a unique index on the column.

ignore_dup_row

allows you to create a new, nonunique clustered index on a table that includes duplicate rows. ignore_dup_row deletes the duplicate rows from the table, and cancels any insert or update that would create a duplicate row, but does not roll back the entire transaction. See “Duplicate rows” on page 156.

allow_dup_row

allows you to create a nonunique clustered index on a table that includes duplicate rows, and allows you to duplicate rows with update and insert statements. See “Duplicate rows” on page 156.

sorted_data

speeds creation of clustered indexes or unique nonclustered indexes when the data in the table is already in sorted order (for example, when you have used bcp to copy data that has already been sorted into an empty table). See “Using the sorted_data option to speed sorts” on page 157.

with statistics using *num_steps* values

specifies the number of steps to generate for the histogram used to optimize queries. If you omit this clause:

- The default value is 20, if no histogram is currently stored for the leading index column.
- The current number of steps is used, if a histogram for the leading column of the index column already exists.

If you specify 0 for *num_steps*, the index is re-created, but the statistics for the index are not overwritten in the system tables.

The actual number of steps may differ from the one you specify; if the histogram steps specified with *num_steps* is *M*, and the histogram tuning factor parameter is *N*, then the actual steps are between *M* and *M*N*, depending on the number of frequency cells that exist in the distribution.

on *segment_name*

creates the index on the named segment. Before using the on *segment_name* option, initialize the device with disk init, and add the segment to the database using sp_addsegment. See your system administrator, or use sp_helpsegment to generate a list of the segment names available in your database. There are two locations where you can use on *segment_name*:

- Immediately before the *index_partition_clause* – defines a global default which is used for all partitions where the segment is not explicitly defined in the *index_partition_clause*.
- Within that clause itself – allows you to specify a segment for each individual partition

See the examples section for an example that uses on *segment_name* in both locations.

local index

specifies, for semantically partitioned tables, an index that is always equipartitioned with its base table; that is, the table and index share the same partitioning key and partitioning criteria. For round-robin-partitioned tables, a local index means that index keys in each of the tables' index partitions refer to data rows in one and only one table partition.

For both semantically partitioned tables and round-robin-partitioned tables, each table partition has only one corresponding index partition.

partition_name

specifies the name of a new partition on which indexes are to be stored. Partition names must be unique within the set of partitions on a table or index. Partition names can be delimited identifiers if set quoted_identifier is on. Otherwise, they must be valid identifiers.

If *partition_name* is omitted, Adaptive Server creates a name in the form *table_name_partition_id*. Adaptive Server truncates partition names that exceed the allowed maximum length.

Examples

Example 1 Creates an index named au_id_ind on the au_id column of the authors table:

```
create index au_id_ind on authors (au_id)
```

Example 2 Creates a unique clustered index named au_id_ind on the au_id column of the authors table:

```
create unique clustered index au_id_ind
on authors (au_id)
```

Example 3 Creates an index named ind1 on the au_id and title_id columns of the titleauthor table:

```
create index ind1 on titleauthor (au_id, title_id)
```

Example 4 Creates a nonclustered index named zip_ind on the zip column of the authors table, filling each index page one-quarter full and limiting the sort to 4 consumer processes:

```
create nonclustered index zip_ind
on authors (postalcode)
with fillfactor = 25, consumers = 4
```

Example 5 Creates an index with ascending ordering on pub_id and descending order on pubdate:

```
create index pub_dates_ix
on titles (pub_id asc, pubdate desc)
```

Example 6 Creates an index on title_id, using 50 histogram steps for optimizer statistics and leaving 1 empty page out of every 40 pages in the index:

```
create index title_id_ix
on titles (title_id)
with reservepagegap = 40,
statistics using 50 values
```

Example 7 Creates a local, clustered index on a partitioned salesdetail table. The clust_idx index inherits the partition strategy, partition key, and partition bounds of salesdetail.

```
create clustered index clust_idx
on salesdetail (ord_num) local index
```

Example 8 Creates a nonpartitioned, nonclustered global index on a partitioned sales table, which is partitioned by range on the date column.

```
create nonclustered index global_idx
on sales (order_num)
```

Example 9 First, creates a table, pback_sales, with three data partitions:

```
create table pback_sales (c1 int, c2 int,
    c3 varchar (20)) partition range (c1)
        (p1 c1 values <= (10),
        p2 c1 values <= (20),
        p3 c1 values <= (MAX))
```

Then, creates a local, function-based index on partition p1:

```
create index fc_idx on pback_sales (c1*c2) local index
    p1
```

Example 10 Creates a function-based index:

```
create index sum_sales on mytitles (price * total_sales)
```

Example 11 Specifies the on *segment_name* clause both before and after the partition name:

```
use tempdb
go
if not exists(select 1 from tempdb..syssegments where name = 'seg1')
    exec sp_addsegment seg1,tempdb,master
go
if not exists(select 1 from tempdb..syssegments where name = 'seg2')
    exec sp_addsegment seg2,tempdb,master
go
if not exists(select 1 from tempdb..syssegments where name = 'seg3')
    exec sp_addsegment seg3,tempdb,master
go
if not exists(select 1 from tempdb..syssegments where name = 'seg4')
    exec sp_addsegment seg4,tempdb,master
go
if exists(select 1 from sysobjects where name = 't1')
    drop table t1
go
create table t1 (a int, b varchar(30)) partition by roundrobin (p1 on seg1, p2 on seg2)
go
create index t1_i1 on t1 (a) local index
go
create index t1_i2 on t1 (a) on seg3 local index ip1 on seg4
go
sp_help t1
go
```

Provides the following output:

```
 Name Owner Object_type Create_date
---- ----- ----------- ------------------
t1   dbo   user table  Aug 7 2008 11:14AM

(1 row affected)
Column_name Type    Length Prec Scale Nulls Default_name Rule_name
    Access_Rule_name Computed_Column_object Identity
----------- ------- ------ ---- ----- ----- ------------ ---------
    ---------------- ---------------------- ----------
a           int          4 NULL  NULL    0 NULL         NULL
     NULL            NULL                        0
b           varchar     30 NULL  NULL    0 NULL         NULL
     NULL            NULL                        0
Object has the following indexes

index_name index_keys index_description index_max_rows_per_page
    index_fillfactor index_reservepagegap index_created       index_local
```

```
---------- ---------- ---------------- ----------------------
    --------------- -------------------- ------------------- -----------
t1_i1       a       nonclustered                          0
                  0                  0 Aug  7 2008 11:14AM Local Index
t1_i2       a       nonclustered                         0
                  0                  0 Aug  7 2008 11:14AM Local Index

(2 rows affected)
index_ptn_name   index_ptn_seg
---------------- -------------
t1_i1_952063116  default
t1_i1_968063173  default
ip1             seg4
t1_i2_1000063287 seg3

(4 rows affected)
No defined keys for this object.
name type      partition_type partitions partition_keys
---- ---------- -------------- ---------- -------------
t1   base table roundrobin            2 NULL

(1 row affected)

partition_name partition_id pages row_count segment create_date
-------------- ------------ ----- --------- ------- ------------------
p1             920063002    1        0 seg1    Aug 7 2008 11:14AM
p2             936063059    1        0 seg2    Aug 7 2008 11:14AM

Partition_Conditions
--------------------
NULL

Avg_pages   Max_pages   Min_pages   Ratio(Max/Avg)   Ratio(Min/Avg)
----------- ----------- ----------- -------------    ----------------
1          1          1                1.000000   1.000000
Lock scheme Allpages
The attribute 'exp_row_size' is not applicable to tables with allpages lock scheme.
The attribute 'concurrency_opt_threshold' is not applicable to tables with
allpages lock scheme.

exp_row_size reservepagegap fillfactor max_rows_per_page identity_gap ascinserts
------------ -------------- ---------- ----------------- ------------ -----------
0           0             0        0                0           0

(1 row affected)
concurrency_opt_threshold optimistic_index_lock dealloc_first_txtpg
------------------------- --------------------- -------------------
0                       0                   0

(1 row affected)
(return status = 0)
```

Usage

- Periodically run update statistics if you add data to the table that changes the distribution of keys in the index. The query optimizer uses the information created by update statistics to select the best plan for running queries on the table.
- If the table contains data when you create a nonclustered index, Adaptive Server runs update statistics on the new index. If the table contains data when you create a clustered index, Adaptive Server runs update statistics on all the table's indexes.
- Index all columns that are regularly used in joins.
- When CIS is enabled, the create index command is reconstructed and passed directly to the Adaptive Server associated with the table.
- You cannot use create index (clustered or unclustered) on the segment that includes the virtually hashed table, since a virtually hashed table must take only one exclusive segment, which cannot be shared by other tables or databases

create index and stored procedures

Adaptive Server automatically recompiles stored procedures after executing create index statements. Although adh oc queries that you start before executing create index continue to work, they do not take advantage of the new index.

In Adaptive Server versions 12.5 and earlier, create index was ignored by cached stored procedures.

Creating indexes efficiently

- Indexes speed data retrieval, but can slow data updates. For better performance, create a table on one segment and create its nonclustered indexes on another segment, when the segments are on separate physical devices.
- Adaptive Server can create indexes in parallel if a table is partitioned and the server is configured for parallelism. It can also use sort buffers to reduce the amount of I/O required during sorting. See Chapter 9, "Parallel Sorting," in the *Performance and Tuning Guide: Optimizer and Abstract Plans*.
- Create a clustered index before creating any nonclustered indexes, since nonclustered indexes are automatically rebuilt when a clustered index is created.

- When using parallel sort for data-only-locked tables, the number of worker processes must be equal or exceed the number of partitions, even for empty tables. The database option select into/bulkcopy/pllsort must also be enabled.

Creating clustered indexes

- A table "follows" its clustered index. When you create a table, use the on *segment_name* extension to create clustered index, the table migrates to the segment where the index is created.

  If you create a table on a specific segment, then create a clustered index without specifying a segment, Adaptive Server moves the table to the default segment when it creates the clustered index there.

  Because text, unitext, and image data is stored in a separate page chain, creating a clustered index with on *segment_name* does not move text and image columns.

- To create a clustered index, Adaptive Server duplicates the existing data; the server deletes the original data when the index is complete. Before creating a clustered index, use sp_spaceused to make sure that the database has at least 120 percent of the size of the table available as free space.
- The clustered index is often created on the table's primary key (the column or columns that uniquely identify the row). You can record the primary key in the database (for use by front-end programs and sp_depends) using sp_primarykey.
- To allow duplicate rows in a clustered index, specify allow_dup_row.

Creating indexes on compressed table

- Adaptive Server compresses all rows available for compression during the data copy operation if the table requires sorting.
- Adaptive Server does not perform a data copy if you create a clustered index using sorted_data, and does not compress any data rows while it builds the clustered index.
- Adaptive Server does not compress index key values: It compresses only the values in the data rows.
- You may select index key columns and create unique indexes even if the key columns are compressed. To perform nonclustered uniqueness checks, examine the uncompressed index keys in an index page.

- Adaptive Server uses the uncompressed index key and row formats to verify support for ignore_dup_key, ignore_dup_row, and allow_dup_row.
- Adaptive Server applies the fillfactor parameter only for row-level compression.
- When it applies the fillfactor parameter to the data pages of an allpages-locked clustered index, Adaptive Server considers the:
  - Final compressed row format
  - Space required for compression

  Adaptive Server may additionally compress the page space used with subsequent page compression operations, resulting in lower fillfactor values.
- Adaptive Server applies the respagegap parameter at the page level so it is not affected by compression.
- max_rows_per_page includes a page's data rows only, and not the hidden page-dictionary, index, and character-encoding entries.

Creating indexes on encrypted columns

You can create an index on an encrypted column if you specify the encryption key without any initialization vector or random padding. Indexes on encrypted columns are useful for equality and nonequality matches, but are not useful for matching case-insensitive data, or for range searches of any data.

To improve performance on both equality and nonequality searches, and on joins, create indexes on encrypted columns.

create index reports an error if you create:

- A functional index using an expression that references an encrypted column
- An index on a column encrypted with initialization vector or random padding

---

Note You cannot use an encrypted column in an expression for a functional index.

Specifying ascending or descending ordering in indexes

Use the asc and desc keywords after index column names to specify the sorting order for the index keys. Creating indexes so that columns are in the same order specified in the order by clause of queries eliminates the sorting step during query processing. See Chapter 6, “Indexing for Performance,” in the *Performance and Tuning Guide: Locking*.

Space requirements for indexes

- Space is allocated to tables and indexes in increments of one extent, or eight pages, at a time. Each time an extent is filled, another extent is allocated. Use sp_spaceused to display the amount of space allocated and used by an index.
- In some cases, using the sorted_data option allows Adaptive Server to skip copying the data rows as described in Table 1-6 on page 158. In these cases, you need only enough additional space for the index structure itself. Depending on key size, this is usually about 20 percent of the size of the table.

Duplicate rows

- The ignore_dup_row and allow_dup_row options are irrelevant when you create a nonunique, nonclustered index. Adaptive Server attaches a unique row identification number internally in each nonclustered index; duplicate rows are not a problem, even for identical data values.
- ignore_dup_row and allow_dup_row are mutually exclusive.
- In all-pages-locked tables, nonunique clustered indexes allows duplicate keys, but does not allow duplicate rows unless you specify allow_dup_row. This behavior differs for data-only-locked tables, and is described in detail in Table 1-4.
- allow_dup_row allows you to create a nonunique, clustered index on a table that includes duplicate rows. If a table has a nonunique, clustered index that was created without the allow_dup_row option, you cannot create new duplicate rows using the insert or update command.

  If any index in the table is unique, the requirement for uniqueness takes precedence over the allow_dup_row option. You cannot create an index with allow_dup_row if a unique index exists on any column in the table.
- The ignore_dup_row option is also used with a nonunique, clustered index. The ignore_dup_row option eliminates duplicates from a batch of data. ignore_dup_row cancels any insert or update that would create a duplicate row, but does not roll back the entire transaction.

- Table 1-4 illustrates how allow_dup_row and ignore_dup_row affect attempts to create a nonunique, clustered index on a table that includes duplicate rows and attempts to enter duplicate rows into a table.

Table 1-4: Duplicate row options for nonunique clustered indexes

Option setting	Create an index on a table that has duplicate rows	Insert duplicate rows into a table with an index
Neither option set	create index fails.	insert fails.
allow_dup_row set	create index completes.	insert completes.
ignore_dup_row set	Index is created, but duplicate rows are deleted; error message.	All rows are inserted, except duplicates; error message.

Table 1-5 shows which index options you can use with the different types of indexes:

Table 1-5: Index options

Index type	Options
Clustered	ignore_dup_row | allow_dup_row
Unique, clustered	ignore_dup_key
Nonclustered	None
Unique, nonclustered	ignore_dup_key

Using unique constraints in place of indexes

- As an alternative to create index, you can implicitly create unique indexes by specifying a unique constraint with the create table or alter table statement. The unique constraint creates a clustered or nonclustered unique index on the columns of a table. These *implicit* indexes are named after the constraint, and they follow the same rules for indexes created with create index.
- You cannot drop indexes supporting unique constraints using the drop index statement. They are dropped when the constraints are dropped through an alter table statement or when the table is dropped. See create table for more information about unique constraints.

Using the *sorted_data* option to speed sorts

- The sorted_data option can reduce the time needed to create an index by skipping the sort step and by eliminating the need to copy the data rows to new pages in certain cases. The speed increase becomes significant on large tables and increases to several times faster in tables larger than 1GB.

  If sorted_data is specified, but data is not in sorted order, Adaptive Server displays an error message, and the command fails.

Creating a nonunique, nonclustered index succeeds, unless there are rows with duplicate keys. If there are rows with duplicate keys, Adaptive Server displays an error message, and the command fails.

- The effects of sorted_data for creating a clustered index depend on whether the table is partitioned and whether certain other options are used in the create index command. Some options require data copying, if used at all, for nonpartitioned tables and sorts plus data copying for partitioned tables, while others require data copying only if you use:
  - The ignore_dup_row option
  - The fillfactor option
  - The on *segmentname* clause to specify a segment that is different from the segment where the table data is located
  - The max_rows_per_page clause to specify a value that is different from the value associated with the table
- Table 1-6 shows when the sort is required and when the table is copied for partitioned and nonpartitioned tables.

Table 1-6: Using the sorted_data option for creating a clustered index

Options	Partitioned table	Unpartitioned table
No options specified	Parallel sort necessary only for creating a clustered index on a round-robin-partitioned table; copies data, distributing evenly on partitions; creates index tree.	Either parallel or nonparallel sort; copies data, creates index tree.
with sorted_data only or with sorted_data on *same_segment*	Creates index tree only. Does not perform the sort or copy data. Does not run in parallel.	Creates index tree only. Does not perform the sort or copy data. Does not run in parallel.
with sorted_data andignore_dup_row or fillfactor or on *other_segment* or max_rows_per_page	Parallel sort; copies data, distributing evenly on partitions; creates index tree.	Copies data and creates the index tree. Does not perform the sort. Does not run in parallel.

Specifying the number of histogram steps

- Use he with statistics clause to specify the number of steps for a histogram for the leading column of an index. Histograms are used during query optimization to determine the number of rows that match search arguments for a column.
- To re-create an index without updating the values in sysstatistics for a column, use 0 for the number of steps. This avoids overwriting statistics that have been changed with optdiag.

- If you specify the histogram tuning factor parameter with a value, then create index uses anywhere between 20 and M*20 steps, depending on the number of frequency cells that have been isolated. The default is 20, but you can specify a different number with the using step values option.

Space management properties

- fillfactor, max_rows_per_page, and reservepagegap help manage space on index pages in different ways:
  - fillfactor applies to indexes for all locking schemes. For clustered indexes on allpages-locked tables, it affects the data pages of the table. On all other indexes, it affects the leaf level of the index.
  - max_rows_per_page applies only to index pages of allpages-locked tables.
  - reservepagegap applies to tables and indexes for all locking schemes.
- reservepagegap affects space usage in indexes when:
  - The index is created.
  - reorg commands on indexes are executed.
  - Nonclustered indexes are rebuilt after creating a clustered index.
- When reservepagegap value is specified in a create clustered index command, it applies to:
  - The data and index pages of allpages-locked tables
  - Only the index pages of data-only-locked tables
- The *num_pages* value specifies a ratio of filled pages to empty pages on the leaf level of the index so that indexes can allocate space close to existing pages, as new space is required. For example, a reservepagegap of 10 leaves 1 empty page for each 9 used pages.
- reservepagegap specified along with create clustered index on an allpages-locked table overwrites any value previously specified with create table or alter table.
- You can change the space management properties for an index with sp_chgattribute. Changing properties with sp_chgattribute does not immediately affect storage for indexes on the table. Future large scale allocations, such as reorg rebuild, use the sp_chgattribute value.
- The fillfactor value set by sp_chgattribute is stored in the fill_factor column in sysindexes. The fillfactor is applied when an index is re-created as a result of an alter table...lock command or a reorg rebuild command.

Index options and locking modes

Table 1-7 shows the index options supported for allpages-locked and data-only-locked tables. On data-only-locked tables, the ignore_dup_row and allow_dup_row options are enforced during create index, but are not enforced during insert and update operations. Data-only-locked tables always allow the insertion of duplicate rows.

Table 1-7: create index options supported for locking schemes

Index type	**Allpages-locked table**	**Data-only-locked table**	
		During index creation	**During inserts**
Clustered	allow_dup_row, ignore_dup_row	allow_dup_row, ignore_dup_row	allow_dup_row
Unique clustered	ignore_dup_key	ignore_dup_key	ignore_dup_key
Nonclustered	None	None	None
Unique nonclustered	ignore_dup_key	ignore_dup_key	ignore_dup_key

Table 1-8 shows the behavior of commands that attempt to insert duplicate rows into tables with clustered indexes, and when the clustered indexes are dropped and re-created.

Table 1-8: Enforcement and errors for duplicate row options

Options	**Allpages-locked table**	**Data-only-locked table**
No options specified	Insert fails with error message 2615. Re-creating the index succeeds.	Insert succeeds. Re-creating the index fails with error message 1508.
allow_dup_row	Insert and re-creating the index succeed.	Insert and re-creating the index succeed.
ignore_dup_row	Insert fails with "Duplicate row was ignored" message. Re-creating the index succeeds.	Insert succeeds. Re-creating the index deletes duplicate rows.

Using the *sorted_data* option on data-only-locked tables

- You can use the sorted_data option to create index only immediately following a bulk-copy operation into an empty table. Once data modifications to that table cause additional page allocations, you cannot use the sorted_data option.
- Specifying different values for space management properties may override the sort suppression functionality of the sorted_data.

Getting information about tables and indexes

- Each index—including composite indexes—is represented by one row in sysindexes.
- For information about the order of the data retrieved through indexes and the effects of an Adaptive Server-installed sort order, see the order by clause.

- For information about a table's indexes, execute sp_helpindex. For information about index partitions, you can also execute sp_helpartitions.
- Each index partition and data partition is represented by one row in syspartitions.

Creating indexes on computed columns

- You can use materialized computed columns as index keys, as though they were regular columns.
- To convert a virtual column to a materialized column and index it, use alter table modify with the materialized option before executing create index.
- A computed column need not be deterministic to be used as an index key; however, you must be careful about the possible impact of a nondeterministic column on the queries that reference it.

Creating partitioned indexes

- A local index inherits the partition strategies, partition columns, and partition bounds (for range and list partitions) of the base table.
- Adaptive Server maintains local indexes, rebuilding the local index if the base table is repartitioned with a different partition key.
- Adaptive Server supports:

Index type	Table type
Local clustered and nonclustered partitioned indexes	Partitioned tables
Global, clustered, unpartitioned indexes	Round-robin-partitioned tables
Global, nonclustered, unpartitioned indexes	All partitioned tables

- For range-, hash-, and list-partitioned tables, clustered indexes are always local. Adaptive Server creates a local clustered index whether or not "local index" is included in the syntax.

Creating function-based indexes

- You can create indexes directly on expressions.
- The expression must be deterministic.
- Since Adaptive Server does not verify the deterministic property of the expression index key, the user must manually maintain the property. A change in this property can cause unexpected results.

- As a function-based index key must be deterministic, its result is preevaluated, and reused without reevaluation. Adaptive Server assumes all function-based index keys to be deterministic and uses their preevaluated values when they are referenced in a query; they are reevaluated only when the values of their base columns are changed.
- An index can have multiple function-based index keys or a combination of function-based index keys and regular columns.
- Expressions used as index keys must be deterministic. An expression key is different from a computed column index key, which needs to be evaluated only once, and does not require the deterministic property. An expression, however, must be reevaluated upon each occurrence of the expression in a specified query, and must always return the same result.
- If a user-defined function that is referenced by a function-based index is dropped or becomes invalid, any operations that call that function fail.
- Adaptive Server does not support clustered function-based indexes.
- You cannot create a function-based index with the sorted_data option.
- Once you create an index key on an expression, subsequent queries recognize the expression as an index key only if the expression is exactly the same as the expression used to create the index key.
- All insert, delete, and update operations on base columns cause Adaptive Server to automatically update the value of function-based index keys.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create index permission defaults to the table owner and is not transferable.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
104	create	create index	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – Name of the index • *Proxy information* – original login name, if a set proxy is in effect

See also

Commands alter table, create table, drop index, insert, order by clause, set, update

System procedures sp_addsegment, sp_chgattribute, sp_helpcomputedcolumn, sp_helpindex, sp_helpsegment, sp_spaceused

Utilities optdiag

create login

Description

Creates a login account; specifies a password, a login profile for the account, and user-supplied parameters to be assigned to the account.

Syntax

```
create login login_name with [encrypted]
        password password
        [attribute_value_pair_list]
```

Parameters

login_name
specifies the name of the login account to be created.

with encrypted
specifies an encrypted password for the new login account.

password *passwordValue*
specifies a password for the new login account.

attribute_value_pair_list
list of attributes and corresponding values to be added to the login account. The *attribute_value_ pair_list* is an attribute name and value. Specify one or more of the following:

Parameter	Parameter Value	Description
login profile	Valid values: • *login_profile_name* • ignore	• *login_profile_name* binds the specified login profile to the specified login account. • ignore eliminates any login profile binding. A default login profile will not be applicable and attributes will be applied as they were prior to release 15.7. If a login profile is not specified, a default login profile is applied. See "Applying login profile and password policy attributes" in the *Security Administration Guide*.
suid	Valid values: Unique value between [-32768, 2147483647] excluding [-2, -1, 0, 1, 2].	By default an suid is generated and automatically assigned to the login account upon creation.
fullname	*name_value*	Full name of user who owns the login account. Default is NULL.
login script	*login_script_name*	Specifies a valid stored procedure. Limited to 120 characters for a login script.
password expiration	Valid range: 0 to 32767 days.	Password expiration interval. Default is 0, meaning the password never expires.
min password length	Valid range: 0 to 30.	Minimum password length required. Default is 6.

Parameter	Parameter Value	Description
max failed attempts	Valid range: -1 to 32767.	Number of login attempts allowed after which the login account is locked. -1 indicates the failed count is tracked but not locked. Default is 0, meaning the failed count is not tracked and the account is not locked due to failed login attempts.
default database	*default_database_name*	Specifies a database to be the default. Default is Master.
default language	*default_language*	Specifies a language to be the default. Default is us_english
authenticate with V	alid values: ASE, LDAP, PAM, KERBEROS, ANY	Specifies the mechanism used for authenticating the login account. When ANY is used, Adaptive Server checks for a defined external authentication mechanism. If one is defined, Adaptive Server uses the defined mechanism., otherwise the ASE mechanism is used. If authenticate with *authentication mechanism* is not specified, ANY will be used for the login account.
exempt inactive lock	Valid values: TRUE or FALSE	Specifies whether or not to exempt login accounts from being locked due to inactivity. Default is FALSE which indicates accounts are not exempt.

Examples

Example 1 Creates a login account with password itsA8ecret, applies the login profile emp_lp, applies server user ID 7, and specifies that the account will not be locked due to inactivity

```
create login ravi with password itsA8ecret login profile
emp_lp suid 7 exempt inactive lock true
```

Usage

- Precedence rules determine how login account attributes will be applied when attributes are taken from different login profiles or when values have been specified using sp_passwordpolicy.
- For ease of management, it is strongly recommended that all users' Adaptive Server login names be the same as their operating system login names. This makes it easier to correlate audit data between the operating system and Adaptive Server. Otherwise, keep a record of the correspondence between operating system and server login names.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must have sso_role privileges to create login accounts.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
103	login_admin	create login	Keywords contain: WITH *attribute_value_pair_list*

See also

Commands create login profile, alter login, alter login profile, drop login, drop login profile

Documents For more information about creating login accounts, see the *Security Administration Guide*. For precedence rules, see "Applying login profile and password policy attributes," in the *Security Administration Guide.*

Functions lprofile_id, lprofile_name

System procedures sp_passwordpolicy, sp_displaylogin, sp_displayroles, sp_locklogin

create login profile

Description

Creates a login profile with specified attributes.

Syntax

create login profile *login_profile_name* [as default]
[with { attributes from *login_name* | *attribute_value_pair_list* }]

Parameters

login_profile_name

specifies the name of the login profile to be created.

as default

sets the created login profile as the default for all login accounts except sa and probe.

with attributes from *login_name* | *attribute_value_pair_list*

when *login_name* is specified, creates a login profile with attributes values taken from the specified login account. The *attribute_value_ pair_list* specifies, an attribute name and corresponding value. Specify one or more of the following attributes and value:

- default database *default_database_name* – specifies a default database. The default is Master.
- default language *default_language* – specifies a default language. The default is us_english
- login script *login_script_name* – specifies a valid stored procedure. Limited to 120 characters for a login script.
- authenticate with – specifies the mechanism used for authenticating the login account. Valid values: ASE, LDAP, PAM, KERBEROS, ANY

  When ANY is used, Adaptive Server checks for a defined external authentication mechanism. If one is defined, Adaptive Server uses the defined mechanism., otherwise the ASE mechanism is used.

  If authenticate with *authentication mechanism* is not specified, ANY will be used for the login account.
- track lastlogin – enables last login updates. Valid values: TRUE, FALSE. The default is TRUE, which is to update.
- stale period – indicates the duration a login account is allowed to remain inactive before it is locked due to inactivity. Valid values are 1 .. 32767 days. Duration: D (days), W (weeks), M (months), Y (years). The default is D (days).
- profile id – shares the ID space with the server user ID (suid) of login accounts. By default, the login profile ID is generated and automatically assigned to the login profile upon creation

  Valid value is unique between login accounts and login profiles. Range: [-32768, 2147483647] Excluding: -2, -1, 0, 1, 2

Examples

Example 1 Creates a login profile. Attribute values that are not set will follow the precedence rules:

```
create login profile eng_lp
```

For information, see “Applying login pfoile and password policy attributes,” in the *Security Administration Guide*.

Example 2 Creates a login profile and transfers the login attribute values from the login account ravi to the new login profile ravi_lp. Attribute values that are not set will follow the precedence rules.

```
Create login profile ravi_lp with attributes from ravi
```

Example 3 Creates login profile sa_login_profile with the authentication method ASE.

```
create login profile sa_login_profile with authenticate
with ASE
```

Usage

Precedence rules determine how login account attributes will be applied when attributes are taken from different login profiles or when values have been specified using sp_passwordpolicy.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only a system security officer can execute create login profile.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
137	security_profile	create login profile	Keywords contain DEFAULT If the login profile is made the default: {attributes from *login_name* | *attribute_value_pair_list*}

See also

Commands create login, alter login, alter login profile, drop login, drop login profile

Documents For information about creating login profiles, invoking a login script at login, and precedence rules, see the *Security Administration Guide*.

Functions lprofile_id, lprofile_name

System procedures sp_passwordpolicy, sp_displaylogin, sp_displayroles, sp_locklogin

create plan

Description

Creates an abstract plan.

Syntax

create plan *query plan*
[into *group_name*]
[and set @*new_id*]

Parameters

query
is a string literal, parameter, or local variable containing the SQL text of a query.

plan
is a string literal, parameter, or local variable containing an abstract plan expression.

into *group_name*
specifies the name of an abstract plan group.

and set @*new_id*
returns the ID number of the abstract plan in the variable.

Examples

Example 1 Creates an abstract plan for the specified query:

```
create plan "select * from titles where price > $20" " (t_scan titles)"
```

Example 2 Creates an abstract plan for the query in the dev_plans group, and returns the plan ID in the variable @*id*:

```
declare @id int
create plan "select au_fname, au_lname from authors
where au_id = '724-08-9931' "
" (i_scan au_id_ix authors)"
into dev_plans
and set @id
select @id
```

Usage

- create plan saves the abstract plan in the group specified with into. If no group name is specified, the plan is saved in the currently active plan group.
- Queries and abstract plans specified with create plan are not checked for valid SQL syntax, and plans are not checked for valid abstract plan syntax. Also, the plan is not checked for compatibility with the SQL text. You should immediately check all plans created with create plan for correctness by running the query specified in the create plan statement.
- If another query plan in the group has the same SQL text, replace mode must be enabled with set plan replace on. Otherwise, the create plan command fails.

- You must declare *@new_id* before using it in the and set clause.
- The abstract plan group you specify with into must already exist.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create plan permission defaults to all users. No permission is required to use it.

See also

Commands set plan

Documentation *Performance and Tuning Guide: Optimizer and Abstract Plans*.

System procedures sp_add_qpgroup, sp_find_qplan, sp_help_qplan, sp_set_qplan

create procedure

Description

Creates a stored procedure or an extended stored procedure (ESP) that can take one or more user-supplied parameters.

Note For syntax and usage information about the SQLJ command for creating procedures, see create function (SQLJ) on page 140.

Syntax

```
create procedure [owner.]procedure_name[;number]
        [[(@parameter_name datatype [(length) | (precision [, scale])]
            [= default][output]
        [, @parameter_name datatype [(length) | (precision [, scale])]
            [= default][output]]...)]]
        [with recompile]
        as {SQL_statements | external name dll_name}
```

Parameters

procedure_name
is the name of the procedure. It must conform to the rules for identifiers and cannot be a variable. Specify the owner's name to create another procedure of the same name owned by a different user in the current database. The default value for *owner* is the current user.

;number
is an optional integer used to group procedures that share the same name so they can be dropped together with a single drop procedure statement. Procedures used in the same application are often grouped this way. For example, if the procedures used with the application named orders are named orderproc;1, orderproc;2, and so on, the following statement drops the entire group:

```
drop proc orderproc
```

Once procedures have been grouped, individual procedures within the group cannot be dropped. For example, the following statement is not allowed:

```
drop procedure orderproc;2
```

You cannot group procedures if you are running Adaptive Server in the **evaluated configuration**. The evaluated configuration requires that you disallow procedure grouping so that every stored procedure has a unique object identifier and can be dropped individually. To disallow procedure grouping, a system security officer must use sp_configure to reset allow procedure grouping. For more information about the evaluated configuration, see the *System Administration Guide*.

parameter_name

is the name of an argument to the procedure. The value of each parameter is supplied when the procedure is executed. Parameter names are optional in create procedure statements—a procedure is not required to take any arguments.

Parameter names must be preceded by the @ sign and conform to the rules for identifiers. A parameter name, including the @ sign, can be a maximum of 30 characters, and larger for identifiers. Parameters are local to the procedure: the same parameter names can be used in other procedures.

If the value of a parameter contains nonalphanumeric characters, it must be enclosed in quotes. This includes object names qualified by a database name or owner name, since they include a period. If the value of a character parameter begins with a numeric character, it also must be enclosed in quotes.

datatype[(*length*) | (*precision* [, *scale*])]

is the datatype of the parameter. See "User-defined datatypes" on page 47 in Chapter 1, "System and User-Defined Datatypes"of *Reference Manual: Building Blocks*. Stored procedure parameters cannot have a datatype of text, unitext, or image or a user-defined datatype whose underlying type is text, unitext, or image.

The char, varchar, unichar, univarchar, nchar, nvarchar, binary, and varbinary datatypes should include a *length* in parentheses. If you omit the length, Adaptive Server truncates the parameter value to 1 character.

The float datatype expects a binary *precision* in parentheses. If you omit the precision, Adaptive Server uses the default precision for your platform.

The numeric and decimal datatypes expect a *precision* and *scale*, enclosed in parentheses and separated by a comma. If you omit the precision and scale, Adaptive Server uses a default precision of 18 and a scale of 0.

default

defines a default value for the procedure's parameter. If a default is defined, a user can execute the procedure without giving a parameter value. The default must be a constant. It can include the wildcard characters (%, _, [ ], and [^]) if the procedure uses the parameter name with the keyword like (see Example 2).

The default can be NULL. The procedure definition can specify that some action be taken if the parameter value is NULL (see Example 3).

output
: indicates that the parameter is a return parameter. Its value can be returned to the execute command that called this procedure. Use return parameters to return information to the calling procedure.

  To return a parameter value through several levels of nested procedures, each procedure must include the output option with the parameter name, including the execute command that calls the highest level procedure.

  The output keyword can be abbreviated to out.

with recompile
: means that Adaptive Server creates a new plan each time the procedure is executed. Use this optional clause when you expect that the execution of a procedure is atypical—that is, when you need a new plan. The with recompile clause has no impact on the execution of an extended stored procedure.

SQL_statements
: specifies the actions the procedure is to take. You can include any number and kind of SQL statements, with the exception of create view, create default, create rule, create procedure, create trigger, and use.

  create procedure SQL statements often include control-of-flow language, including one or more of the following: declare; if...else; while; break; continue; begin...end; goto label; return; waitfor; /* *comment* */. They can also refer to parameters defined for the procedure.

  The SQL statements can reference objects in another database, as long as they are properly qualified.

external name
: creates an extended stored procedure. You cannot use the *number* parameter with as external name.

dll_name
: specifies the name of the dynamic link library (DLL) or shared library containing the functions that implement the extended stored procedure. The *dll_name* can be specified with no extension or with a platform-specific extension, such as *.dll* on Windows NT or *.so* on Sun Solaris. If you specify the extension, enclose the entire *dll_name* in quotation marks.

Examples

Example 1 Given a table name, the procedure showind displays its name and the names and identification numbers of any indexes on any of its columns:

```
create procedure showind @tabname varchar (30)
as
  select sysobjects.name, sysindexes.name, indid
  from sysindexes, sysobjects
```

```
  where sysobjects.name = @tabname
  and sysobjects.id = sysindexes.id
```

Here are the acceptable syntax forms for executing showind:

```
execute showind titles
execute showind @tabname = "titles"
```

Or, if this is the first statement in a file or batch:

```
showind titles
```

Example 2 This procedure displays information about the system tables if the user does not supply a parameter:

```
create procedure
showsysind @table varchar (30) = "sys%"
as
  select sysobjects.name, sysindexes.name, indid
  from sysindexes, sysobjects
  where sysobjects.name like @table
  and sysobjects.id = sysindexes.id
```

Example 3 This procedure specifies an action to be taken if the parameter is NULL (that is, if the user does not give a parameter):

```
create procedure
showindnew @table varchar (30) = null
as
  if @table is null
   print "Please give a table name"
  else
   select sysobjects.name, sysindexes.name, indid
   from sysindexes, sysobjects
   where sysobjects.name = @table
   and sysobjects.id = sysindexes.id
```

Example 4 This procedure multiplies two integer parameters and returns the product in the output parameter, *@result*:

```
create procedure mathtutor @mult1 int, @mult2 int,
  @result int output
as
select @result = @mult1 * @mult2
```

If the procedure is executed by passing it three integers, the select statement performs the multiplication and assigns the values, but does not print the return parameter:

```
mathtutor 5, 6, 32
 (return status 0)
```

Example 5 Both the procedure and the execute statement include `output` with a parameter name so that the procedure can return a value to the caller:

```
declare @guess int
select @guess = 32
exec mathtutor 5, 6, @result = @guess output

 (1 row affected)
 (return status = 0)

Return parameters:

@result
-----------
        30
```

The output parameter and any subsequent parameters in the execute statement, *@result*, must be passed as:

```
@parameter = value
```

- The value of the return parameter is always reported, whether or not its value has changed.
- *@result* does not need to be declared in the calling batch because it is the name of a parameter to be passed to `mathtutor`.
- Although the changed value of *@result* is returned to the caller in the variable assigned in the execute statement (in this case, *@guess*), it appears under its own heading (*@result*).

Example 6 You can use return parameters in additional SQL statements in the batch or calling procedure. This example shows how to use the value of *@guess* in conditional clauses after the execute statement by storing it in another variable name, *@store*, during the procedure call. When return parameters are used in an execute statement that is part of a SQL batch, the return values are printed with a heading before subsequent statements in the batch are executed.

```
declare @guess int
declare @store int
select @guess = 32
select @store = @guess
execute mathtutor 5, 6, @result = @guess output
select Your_answer = @store, Right_answer = @guess
if @guess = @store
    print "Right-o"
else
    print "Wrong, wrong, wrong!"
```

```
 (1 row affected)
 (1 row affected)
 (return status = 0)

Return parameters:

@result
-----------
        30
Your_answer Right_answer
----------- ------------
         32           30

 (1 row affected)
Wrong, wrong, wrong!
```

Example 7 Creates an extended stored procedure named xp_echo, which takes an input parameter, *@in*, and echoes it to an output parameter, *@out*. The code for the procedure is in a function named xp_echo, which is compiled and linked into a DLL named *sqlsrvdll.dll*:

```
create procedure xp_echo @in varchar (255),
        @out varchar (255) output
as external name "sqlsrvdll.dll"
```

Usage

- To avoid seeing unexpected results due to changes in settings, run set rowcount 0 as your initial statement before executing create procedure. The scope of set is limited to the create procedure command, and resets to your previous setting once the procedure exits.
- After a procedure is created, you can run it by issuing the execute command along with the procedure's name and any parameters. If a procedure is the first statement in a batch, you can give its name without the keyword execute.
- You can use sp_hidetext to hide the source text for a procedure, which is stored in syscomments.
- When a stored procedure batch executes successfully, Adaptive Server sets the *@@error* global variable to 0.

Restrictions

- The maximum number of parameters that a stored procedure can have is 2048.
- The maximum number of local and global variables in a procedure is limited only by available memory.

- The maximum amount of text in a stored procedure is 16MB.
- You cannot combine a create procedure statement with other statements in a single batch.
- You can create a stored procedure only in the current database, although the procedure can reference objects from other databases. Most objects referenced in a procedure must exist at the time you create the procedure. However, you can include statements like drop table, create index, or truncate table. These are allowed in a create procedure statement even if the underlying object does not exist when you create the procedure.

  You can create an object within a procedure, then reference it, provided the object is created before it is referenced.

  You cannot use alter table in a procedure to add a column and then refer to that column within the procedure.
- If you use select * in your create procedure statement, the procedure (even if you use the with recompile option to execute) does not pick up any new columns you may have added to the table. You must drop the procedure and re-create it. Otherwise, the wrong results can be caused by the insert...select statement of insert into table1 select * from table2 in the procedure when new columns have been added to both tables.
- Within a stored procedure, you cannot create an object (including a temporary table), drop it, then create a new object with the same name. Adaptive Server creates the objects defined in a stored procedure when the procedure is executed, not when it is compiled.

> **Warning!** Certain changes to databases, such as dropping and re-creating indexes, can cause object IDs to change. When object IDs change, stored procedures recompile automatically, and can increase slightly in size. Leave some space for this increase.

Extended stored procedures

- If you use the as *external name* syntax, create procedure registers an extended stored procedure (ESP). Extended stored procedures execute procedural language functions rather than Transact-SQL commands.
- (Windows) An ESP function should not call a C runtime signal routine. This can cause XP Server to fail, because Open Server™ does not support signal handling on Windows NT.

- To support multithreading, ESP functions should use the Open Server srv_yield function, which suspends and reschedules the XP Server thread to allow another thread of the same or higher priority to execute.
- The DLL search mechanism is platform-dependent. On Windows NT, the sequence of a DLL file name search:

  a The directory from which the application is loaded

  b The current directory

  c The system directory (SYSTEM32)

  d Directories listed in the PATH environment variable

  If the DLL is not in the first three directories, set the PATH to include the directory in which it is located.

  On UNIX platforms, the search method varies with the particular platform. If it fails to find the DLL or shared library, it searches *$SYBASE/lib*.

  Absolute path names are not supported.

System procedures

- System administrators can create new system procedures in the sybsystemprocs database. System procedure names must begin with the characters "sp_". You can execute these procedures from any database by specifying the procedure name; you need not qualify it with the sybsystemprocs database name. For more information about creating system procedures, see the *System Administration Guide*.
- System procedure results may vary, depending on the context in which they are executed. For example, sp_foo, which executes the db_name () system function, returns the name of the database from which it is executed. When executed from the pubs2 database, it returns the value "pubs2":

```
use pubs2
sp_foo
------------------------------
pubs2
```

  When executed from sybsystemprocs, it returns the value "sybsystemprocs":

```
use sybsystemprocs
sp_foo
------------------------------
sybsystemprocs
```

Nested procedures

- Procedure nesting occurs when one stored procedure calls another.
- If you execute a procedure that calls another procedure, the called procedure can access objects created by the calling procedure.
- The nesting level increments when the called procedure begins execution, and decrements when the called procedure completes execution. Exceeding the maximum of 16 levels of nesting causes the transaction to fail.
- You can call another procedure by name or by a variable name in place of the actual procedure name.
- The current nesting level is stored in the *@@nestlevel* global variable.

Procedure return status

- Stored procedures can return an integer value called a **return status**. The return status either indicates that the procedure executed successfully or specifies the type of error that occurred.
- When you execute a stored procedure, it automatically returns the appropriate status code. Adaptive Server currently returns these status codes:

Code	Meaning
0	Procedure executed without error
-1	Missing object
-2	Datatype error
-3	Process was chosen as deadlock victim
-4	Permission error
-5	Syntax error
-6	Miscellaneous user error
-7	Resource error, such as out of space
-8	Nonfatal internal problem
-9	System limit was reached
-10	Fatal internal inconsistency
-11	Fatal internal inconsistency
-12	Table or index is corrupt
-13	Database is corrupt
-14	Hardware error

Codes -15 through -99 are reserved for future use.

- Users can generate a user-defined return status with the return statement. The status can be any integer other than 0 through -99. The following example returns 1 when a book has a valid contract and 2 in all other cases:

```
create proc checkcontract @titleid tid
as
if (select contract from titles where
        title_id = @titleid) = 1
   return 1
else
   return 2
checkcontract @titleid = "BU1111"
 (return status = 1)
checkcontract @titleid = "MC3026"
 (return status = 2)
```

- If more than one error occurs during execution, the code with the highest absolute value is returned. User-defined return values take precedence over system-defined values.

Object identifiers

- To change the name of a stored procedure, use sp_rename.
- To change the name of an extended stored procedure, drop the procedure, rename and recompile the supporting function, then re-create the procedure.
- If a procedure references table names, column names, or view names that are not valid identifiers, you must set quoted_identifier on before the create procedure command and enclose each such name in double quotes. The quoted_identifier option does not need to be on when you execute the procedure.
- You must drop and re-create the procedure if any of the objects it references have been renamed.
- Inside a stored procedure, object names used with the create table and dbcc commands must be qualified with the object owner's name if other users are to make use of the stored procedure. For example, user "mary," who owns the table marytab, should qualify the name of her table inside a stored procedure (when it is used with these commands) if she wants other users to be able to execute it. This is because the object names are resolved when the procedure is run. When another user tries to execute the procedure, Adaptive Server looks for a table called marytab owned by the user "mary" and not a table called marytab owned by the user executing the stored procedure.

Thus, if marytab is not qualified, and user "john" tries to execute the procedure, Adaptive Server looks for a table called marytab owned by the owner of the procedure ("mary," in this case) or by the database owner if the user table does not exist. For example, if the table mary.marytab is dropped, the procedure references dbo.marytab.

Object names used with other statements (for example, select or insert) inside a stored procedure need not be qualified because the names are resolved when the procedure is compiled.

Temporary tables and procedures

- You can create a procedure to reference a temporary table if the temporary table is created in the current session. A temporary table created within a procedure disappears when the procedure exits. See the *Transact-SQL Users Guide*.
- System procedures such as sp_help work on temporary tables, but only if you use them from tempdb.

Setting options in procedures

You can use the set command inside a stored procedure. Most set options remain in effect during the execution of the procedure, then revert to their former settings.

However, if you use a set option (such as identity_insert) which requires the user to be the object owner, a user who is not the object owner cannot execute the stored procedure.

Getting information about procedures

- For a report on the objects referenced by a procedure, use sp_depends.
- To display the text of a create procedure statement, which is stored in syscomments, use sp_helptext with the procedure name as the parameter. You must be using the database where the procedure resides when you use sp_helptext. To display the text of a system procedure, execute sp_helptext from the sybsystemprocs database.
- To see a list of system extended stored procedures and their supporting DLLs, use sp_helpextendedproc from the sybsystemprocs database.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create procedure permission defaults to the database owner, who can transfer it to other users.

Permission to use a procedure must be granted explicitly with the grant command and may be revoked with the revoke command.

Permissions on objects at procedure creation When you create a procedure, Adaptive Server makes no permission checks on objects, such as tables and views, that are referenced by the procedure. Therefore, you can create a procedure successfully even though you do not have access to its objects. All permission checks occur when a user executes the procedure.

Permissions on objects at procedure execution When the procedure is executed, permission checks on objects depend upon whether the procedure and all referenced objects are owned by the same user.

- If the procedure's objects are owned by different users, the invoker must have been granted direct access to the objects. For example, if the procedure performs a select from a table that the user cannot access, the procedure execution fails.
- If a procedure and its objects are owned by the same user, however, special rules apply. The invoker automatically has "implicit permission" to access the procedure's objects even though the invoker could not access them directly. Without having to grant users direct access to your tables and views, you can give them restricted access with a stored procedure. In this way, a stored procedure can be a security mechanism. For example, invokers of the procedure might be able to access only certain rows and columns of your table.

  A detailed description of the rules for implicit permissions is discussed in the *System Administration Guide*.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
11	create	create procedure	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands begin...end, break, continue, declare, drop procedure, execute, goto label, grant, if...else, return, select, waitfor, while

System procedures sp_addextendedproc, sp_helpextendedproc, sp_helptext, sp_hidetext, sp_rename

create procedure (SQLJ)

Description

Creates a SQLJ stored procedure by adding a SQL wrapper to a Java static method. Can accept user-supplied parameters and return result sets and output parameters.

Note For syntax and usage information about the Transact-SQL command for creating procedures, see create procedure on page 172.

Syntax

```
create procedure [owner.]sql_procedure_name
        ([[in | out | inout] sql_parameter_name
            sql_datatype [(length) |
             (precision[, scale])]
            [=default]
        ...])
        [, [in | out | inout] sql_parameter_name
            sql_datatype [(length) |
             (precision[, scale])]]
            [=default]
        ...])
        [modifies sql data]
        [dynamic result sets integer]
        [deterministic | not deterministic]
        language java
        parameter style java
        external name 'java_method_name
            [([java_datatype[, java_datatype
            ...]])]'
```

Parameters

sql_procedure_name

is the Transact-SQL name of the procedure, which must conform to the rules for identifiers and cannot be a variable. Specify the owner's name to create another procedure of the same name owned by a different user in the current database. The default value for *owner* is the current user.

in | out | inout

specifies the mode of the listed parameter. in indicates an input parameter; out indicates an output parameter; and inout indicates a parameter that is both an input and an output parameter. The default mode is in.

sql_parameter_name

is the name of an argument to the procedure. The value of each input parameter is supplied when the procedure is executed. Parameters are optional; a SQLJ stored procedure need not take arguments.

Parameter names must conform to the rules for identifiers. If the value of a parameter contains nonalphanumeric characters, it must be enclosed in quotes. This includes object names qualified by a database name or owner name, since they include a period. If the value of the parameter begins with a numeric character, it also must be enclosed in quotes.

sql_datatype [(*length*) | (*precision* [, *scale*])]

is the Transact-SQL datatype of the parameter.

sql_datatype is the SQL procedure signature.

default

defines a default value for the procedure's parameter. If a default is defined, you can execute the procedure without a parameter value. The default must be a constant. It can include wildcard characters (%, _, [ ], and ^) if the procedure uses the parameter name with the keyword like.

The default can be NULL. The procedure definition can specify some action to be taken if the parameter value is NULL.

modifies sql data

indicates that the Java method invokes SQL operations, reads, and modifies SQL data in the database. This is the default and only implementation. It is included for syntactic compatibility with the ANSI standard.

dynamic result sets *integer*

specifies that the Java method can return SQL result sets. *integer* specifies the maximum number of result sets the method can return. This value is implementation-defined.

deterministic | not deterministic

this syntax is supported for compatibility with other SQLJ-compliant vendors.

language java

specifies that the external routine is written in Java. This is a required clause for SQLJ stored procedures.

parameter style java

specifies that the parameters passed to the external routine at runtime are Java parameters. This is a required clause for SQLJ stored procedures.

external

indicates that create procedure defines a SQL name for an external routine written in a programming language other than SQL.

name

specifies the name of the external routine (Java method). The specified name is a character-string literal and must be enclosed in single quotes:

```
'java_method_name [ java_datatype
                  [{, java_datatype} ...]]'
```

java_method_name

specifies the name of the external Java method.

java_datatype

specifies a Java datatype that is mappable or result-set mappable. This is the Java method signature.

Examples

Example 1 Creates the SQLJ procedure java_multiply, which multiplies two integers and returns an integer.

```
create procedure java_multiply (param1 integer,
      param2 integer, out result integer)
    language java parameter style java
    external name 'MathProc.multiply'
```

Example 2 Returns values that are always larger than 10:

```
create procedure my_max (a int = 10, b int = 10)
language java parameter style java
external name 'java.lang.Math.max'

exec my_max
 (return status = 10)

exec my_max 8
 (return status = 10)
```

See also the examples for Transact-SQL create procedure.

Usage

- The SQLJ create procedure syntax differs from the Transact-SQL create procedure syntax for compatibility with the SQLJ ANSI standard. Adaptive Server executes each type of stored procedure in the same way.
- To avoid seeing unexpected results due to changes in settings, run set rowcount 0 as your initial statement before executing create procedure. The scope of set is limited to just your create procedure command, and resets to your previous setting once the procedure exits.

- You can include a maximum of 31 in, inout, and out parameters in a create procedure statement.
- To comply with the ANSI standard, do not precede parameter names with the @ sign. When executing a SQLJ stored procedure from isql or other non-Java client, however, you must precede parameter names with the @ sign, which preserves the naming order.

Permissions

create procedure permission defaults to the database owner, who can transfer it to other users. Permission to use a procedure must be granted explicitly with the grant command and may be revoked with the revoke command.

See also

Commands create function (SQLJ), drop procedure

System procedures sp_depends, sp_help, sp_helpjava, sp_helprotect

create proxy_table

Description

(Component Integration Services only) Creates a proxy table without specifying a column list. CIS derives the column list from the metadata it obtains from the remote table.

Syntax

```
create proxy_table table_name
        [external [table | directory | file]]
        at pathname
        [column delimiter "&lt;string&gt;"]
```

Parameters

table_name

specifies the local proxy table name to be used by subsequent statements. *table_name* takes the form *dbname*.*owner*.*object*, where *dbname* and *owner* are optional and represent the local database and owner name. If *dbname* is not specified, the table is created in the current database; if *owner* is not specified, the table is owned by the current user. If either *dbname* or *owner* is specified, the entire *table_name* must be enclosed in quotes. If only *dbname* is present, a placeholder is required for *owner*.

external table

specifies that the object is a remote table or view. external table is the default, so this clause is optional.

external directory

specifies that the object is a directory with a path in the following format: "*/tmp/directory_name* [;R]". "R" indicates "recursive."

external file

specifies that the object is a file with a path in the following format: "*/tmp/filename*".

at *pathname*

specifies the location of the remote object. *pathname* takes the form *server_name.dbname.owner.object*, where:

- *server_name* – is the name of the server that contains the remote object.
- (Optional) *dbname* – is the name of the database managed by the remote server that contains this object.
- (Optional) *owner* – is the name of the remote server user that owns the remote object.
- *object* – is the name of the remote table or view.

column delimiter

used to separate fields within each record when accessing flat files. The column delimiter can be up to 16 bytes long.

string
The column delimiter string can be any character sequencer, but if the string is longer than 16 bytes, only the first 16 bytes are used. The use of a column delimiter for proxy tables mapped to anything but files results in a syntax error.

Examples

This example creates a proxy table named t1 that is mapped to the remote table t1. CIS derives the column list from the remote table:

```
create proxy_table t1
at "SERVER_A.db1.joe.t1"
```

Usage

- create proxy_table is a variant of the create existing table command. You use create proxy_table to create a proxy table, but (unlike create existing table) you do not specify a column list. CIS derives the column list from the metadata it obtains from the remote table.
- The location information provided by the at keyword is the same information that is provided by sp_addobjectdef. The information is stored in the sysattributes table.
- If the remote server object does not exist, the command is rejected with an error message.
- If the object exists, the local system tables are updated. Every column is used. Columns and their attributes are obtained for the table or view.
- CIS automatically converts the datatype of the column into an Adaptive Server datatype. If the conversion cannot be made, the create proxy_table command does not allow the table to be defined.
- Index information from the remote server table is extracted and used to create rows for the system table sysindexes. This defines indexes and keys in Adaptive Server terms and enables the query optimizer to consider any indexes that may exist on the table.
- After defining the proxy table, issue an update statistics command for the table. This allows the query optimizer to make intelligent choices regarding join order.
- When executing create proxy_table *table_name* at *pathname*, the table and column names assumes the same case as *table_name*, if the server identified by *pathname* is case-insensitive (such as DB2 and Oracle).

The columns returned by a case-insensitive server (typically in uppercase), is stored in Adaptive Server as lowercase, if *table_name* is lowercase. If *table_name* is uppercase, then the column names is stored as uppercase values. If *table_name* is in mixed case, all column names are stored as received from the remote site.

- create proxy_table is not supported with temporary tables.
- You cannot combine create proxy_table statement with other statements in a single batch.
- A proxy table stores only metadata. As such, the only space used is the result of making entries in system catalogs. It is estimated that a hundred proxy tables consume about 1MB of space, assuming an average of two indexes per table.
- SQL user-defined functions are not currently supported with create proxy table, create table at remote server, or alter table.

Note The execution of SQL functions requires the syntax username.functionname().

- If the remote Adaptive Server table has one or more encrypted columns, CIS updates the proxy table's metadata in syscolumns to reflect the column's encryption properties and its key ID.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create proxy_table permission defaults to the table owner and is not transferable.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
11	create	create procedure	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands create existing table, create table

create role

Description

Creates a user-defined role; specifies the password expiration interval, the minimum password length, and the maximum number of failed logins allowed for a specified role at creation. You can also associate a password with the role at the time that the role is created.

Syntax

create role *role_name* [with passwd "*password*"
  [, {passwd expiration | min passwd length |
  max failed_logins} *option_value*]]

Parameters

role_name
is the name of the new role, which must be unique to the server and conform to the rules for identifiers. *role_name* cannot be a variable.

with passwd
attaches a password the user must enter to activate the role.

password
is the password to attach to the role. Passwords must be at least 6 characters in length and must conform to the rules for identifiers. You cannot use variables for passwords.

passwd expiration
password expiration interval specifies the password expiration interval in days. It can be any value between 0 and 32767, inclusive. For example, if you create a new login on August 1, 2007 at 10:30 a.m., with a password expiration interval of 30 days, the password expires on August 31, 2007 at 10:30 a.m.

min passwd length
specifies the minimum password length required for the specified role.

max failed_logins
specifies the number of allowable failed login attempts for the specified login.

option_value
specifies the value for passwd expiration, min passwd length, or max failed_logins.

Examples

Example 1 Creates a role named doctor_role:

```
create role doctor_role
```

Example 2 Creates a role named doctor_role with the password “physician”:

```
create role doctor_role with passwd "physician"
```

Example 3 Sets passwd expiration to 7 days. The password for the role expires at the time of day that the password was last changed after the specified period has passed (in this example, 7 days):

```
create role intern_role with passwd "temp244",
passwd expiration 7
```

Example 4 Sets the maximum number of failed logins allowed for intern_role:

```
create role intern_role with passwd "temp244"
max failed_logins 20
```

Example 5 Sets the minimum password length for intern_role:

```
create role intern_role with passwd "temp244",
min passwd length 0
```

Usage

- Use create role from the master database.
- If you attach a password to the role, the user granted this role must specify the password to activate the role.

  For information on adding a password to a role after creation, see the alter role command.

  Note Passwords created in versions before 12.x that are attached to user-defined roles do not expire.

- Role names must be unique to the server.
- Role names cannot be the same as user names. You can create a role with the same name as a user, but when you grant privileges, Adaptive Server resolves naming conflicts by making the grant to the user instead of the role.

  For more information on naming conflicts, see the grant role command.

Restrictions

- The maximum number of roles that can be created per server session is 1024. However, 32 roles are reserved for Sybase system roles, such as sa_role and sso_role. Therefore, the maximum number of user-defined roles that can be created per server session is 992.
- If you create a role with an attached password, a user cannot activate that role by default at login. Do not create a role with an attached password if the user to whom you grant that role needs to activate the role by default at login.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must be a system security officer to use create role.

create role permission is not included in the grant all command.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
85	roles	create role, drop role, alter role, grant role, or revoke role	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter role, drop role, grant, revoke, set

System procedures sp_activeroles, sp_displaylogin, sp_displayroles, sp_helprotect, sp_modifylogin

create rule

Description

Specifies the domain of acceptable values for a particular column or for any column of a user-defined datatype, and creates access rules.

Syntax

```
create [[and | or] access]] rule
        [owner.]rule_name
        as condition_expression
```

Parameters

access

specifies that you are creating an access rule. See Chapter 11, "Managing User Permissions" in the *System Administration Guide*.

rule_name

is the name of the new rule, which must conform to the rules for identifiers and cannot be a variable. Specify the owner's name to create anotherrule of the same name owned by a different user in the current database. The default value for *owner* is the current user.

condition_expression

specifies the conditions that define the rule. It can be any expression that is valid in a where clause, and can include arithmetic operators, relational operators, in, like, between, and so on. However, *condition_expression* cannot reference a column or any other database object. Built-in functions that do not reference database objects can be included.

A *condition_expression* takes one argument, which must be prefixed by the @ sign and refers to the value that is entered via the update or insert command. You can use any name or symbol to represent the value when you write the rule. Enclose character and date constants in quotes, and precede binary constants with "0x".

Examples

Example 1 Creates a rule named limit, which limits the value of advance to less than $1000:

```
create rule limit
as @advance < $1000
```

Example 2 Creates a rule named pubid_rule, which restricts the values of pub_id to 1389, 0736, or 0877:

```
create rule pubid_rule
as @pub_id in ('1389', '0736', '0877')
```

Example 3 Creates a rule named picture, which restricts the value of value to always begin with the indicated characters:

```
create rule picture
as @value like '_-%[0-9]'
```

Usage

- To hide the text of a rule, use sp_hidetext.
- To rename a rule, use sp_rename.

Restrictions

- You can create a rule only in the current database.
- Rules do not apply to the data that already exists in the database at the time the rules are created.
- create rule statements cannot be combined with other statements in a single batch.
- You cannot bind a rule to an Adaptive-Server-supplied datatype or to a column of type text, unitext, image, or timestamp.
- You must drop a rule before you create a new one of the same name, and you must unbind a rule before you drop it. Use:

```
sp_unbindrule objname [, futureonly]
```

Binding rules

- Use sp_bindrule to bind a rule to a column or user-defined datatype:

```
sp_bindrule rulename, objname [, futureonly]
```

- A rule that is bound to a user-defined datatype is activated when you insert a value into, or update, a column of that type. Rules do not test values inserted into variables of that type.
- The rule must be compatible with the datatype of the column. For example, you cannot use the following as a rule for an exact or approximate numeric column:

```
@value like A%
```

  If the rule is not compatible with the column to which it is bound, Adaptive Server generates an error message when it tries to insert a value, not when you bind it.
- You can bind a rule to a column or datatype without unbinding an existing rule.
- Rules bound to columns always take precedence over rules bound to user-defined datatypes, regardless of which rule was most recently bound. Table 1-9 indicates the precedence when binding rules to columns and user-defined datatypes where rules already exist.

Table 1-9: Rule binding precedence

New rule bound to	Old rule bound to user-defined datatype	Old rule bound to column
User-defined datatype	New rule replaces old	No change
Column	New rule replaces old	New rule replaces old

- Rules do not override column definitions. If a rule is bound to a column that allows null values, you can insert NULL into the column, implicitly or explicitly, even though NULL is not included in the text of the rule. For example, if you create a rule specifying "@val in (1,2,3)" or "@amount > 10000", and bind this rule to a table column that allows null values, you can still insert NULL into that column. The column definition overrides the rule.
- If a column has both a default and a rule associated with it, the default must fall within the domain defined by the rule. A default that conflicts with a rule is never inserted. Adaptive Server generates an error message each time it attempts to insert the default.
- You can define rules using check with the create table statement, which creates integrity constraints. However, these constraints are specific for that table; you cannot bind them to other tables. See create table and alter table for information about integrity constraints.
- To get a report on a rule, use sp_help.
- To display the text of a rule, which is stored in the syscomments system table, execute sp_helptext with the rule name as the parameter.
- After a rule is bound to a particular column or user-defined datatype, its ID is stored in the syscolumns or systypes system tables.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

To create rules using ANSI SQL-compliant syntax, use the check clause of the create table statement.

Permissions

create rule permission defaults to the database owner, who can transfer it to other users.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
13	create	create rule	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter table, create default, create table, drop rule, drop table

System procedures sp_bindrule, sp_help, sp_helptext, sp_hidetext, sp_rename, sp_unbindrule

create schema

Description

Creates a new collection of tables, views, and permissions for a database user.

Syntax

create schema authorization *authorization_name*
    create_object_statement
        [*create_object_statement* ...]
    [*permission_statement* ...]

Parameters

authorization_name
is the name of the current user in the database.

create_object_statement
is a create table or create view statement.

permission_statement
is a grant or revoke command.

Examples

Creates the newtitles, newauthors, newtitleauthors tables, the tit_auth_view view, and the corresponding permissions:

```
create schema authorization pogo
    create table newtitles (
        title_id tid not null,
        title varchar (30) not null)

    create table newauthors (
        au_id id not null,
        au_lname varchar (40) not null,
        au_fname varchar (20) not null)

    create table newtitleauthors (
        au_id id not null,
        title_id tid not null)

    create view tit_auth_view
    as
        select au_lname, au_fname
            from newtitles, newauthors,
                newtitleauthors
        where
        newtitleauthors.au_id = newauthors.au_id
        and
        newtitleauthors.title_id =
             newtitles.title_id

    grant select on tit_auth_view to public
    revoke select on tit_auth_view from churchy
```

Usage

- Schemas can be created only in the current database.

- The *authorization_name*, also called the **schema authorization identifier**, must be the name of the current user.
- The user must have the correct command permissions (create table and create view). If the user creates a view on tables owned by another database user, permissions on the view are checked when a user attempts to access data through the view, not when the view is created.
- The create schema command is terminated by:
  - The regular command terminator ("go" is the default in isql).
  - Any statement other than create table, create view, grant, or revoke.
- If any of the statements within a create schema statement fail, the entire command is rolled back as a unit, and none of the commands take effect.
- create schema adds information about tables, views, and permissions to the system tables. Use the appropriate drop command (drop table or drop view) to drop objects created with create schema. You cannot change permissions granted or revoked in a schema with the standard grant and revoke commands outside the schema creation statement.
- Clusters only – you cannot include a referential integrity constraint that references a column on a local temporary database unless it is from a table on the same local temporary database. create schema fails when it attempts to create a reference to a column on a local temporary database from a table in another database.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create schema can be executed by any user of a database. The user must have permission to create the objects specified in the schema; that is, create table and create view permission.

See also

Commands create table, create view, grant, revoke

Utilities isql

create service

Description

Wraps the supplied SQL statement in a stored procedure with the specified name and parameters.

Syntax

```
create service service-name [secure security_options ] [, userpath path]
            [, alias alias-name]
    type { xml | raw | soap }
        [[(@parameter_name datatype [(length ) | (precision [, scale ])]
            [= default][output]
    [, @parameter_name datatype [(length ) | (precision [, scale ])]
            [= default][output]]...[)]]
as SQL_statements
```

security_options ::= (*security_option_item* [*security_option_item*])

Parameters

service-name
is the name for the user-defined Web service. This name can be any name that is valid for a stored procedure. When the drop service command is invoked with this service name, the corresponding stored procedure is dropped. If you specify the name of an existing service, an exception results.

security_option_item

- clear – indicates that HTTP is used to access this Web service.
- ssl – indicates HTTPS is used to access this Web service.

path
is a character-string literal specifying the user-defined path to be appended to the URL accessing the Web service. By default, *path* is null.

alias-name
is a character-string-literal specifying the user-defined Web service alias.

parameter_name
is the name of an argument to the user-defined Web service. The value of this parameter is supplied when the Web service is executed. Parameter names must be preceded by the @ sign and conform to the rules for identifiers. These conditions are the same as for the *parameter_name* parameter of the create procedure command.

SQL_statements
are the actions the user-defined Web service is to take. Any number and type of SQL statements can be included, with the exception of create view, create default, create rule, create procedure, create trigger, and use.

type

- soap – implies an HTTP POST request and must be compliant with all the SOAP rules. The data is returned in SQL/XML format.
- raw – indicates that the output is to be sent without any alteration or reformatting. This implies an HTTP GET request. The invoked stored procedure can specify the exact output.
- xml – indicates that the result set output is returned in SQL/XML format. This implies an HTTP GET request.

Note For datatype mappings between Adaptive Server stored procedures and SOAP user-defined Web services, see the *Web Services Users Guide*.

Examples

Example 1 A user-defined Web service, rawservice, of type raw is created to return the version of the current database. The create service command is entered from the isql command line for the pubs2 database:

```
1> use pubs2
2> go
1> create service rawservice type raw as select
'<html><h1>' + @@version + '</h1></html>'
2> go
```

The newly created user-defined Web service is then deployed:

```
1> sp_webservices 'deploy', 'all'
2> go
```

The Web Service Definition Language for the newly created user-defined Web service is at `http://myhost:8181/services/pubs2?wsdl`.

The newly created user-defined Web service is available at the following URL, where bob and bob123 are the user ID and password of the creator of the user-defined Web service:

```
http://myhost:8181/services/pubs2?method=rawservice&username=bob&password=bob123
```

The output, an Adaptive Server Enterprise version string, appears in an HTML `<h1>` tag in the browser window.

Example 2 A user-defined Web service, xmlservice, of type xml is created to return the version of the current database. The create service command is entered from the isql command line for the pubs2 database:

```
1> use pubs2
2> go
1> create service xmlservice userpath "testing" type xml
```

```
as select @@version
2> go
```

The newly created user-defined Web service is then deployed:

```
1> sp_webservices 'deploy', 'xmlservice'
2> go
```

Note For details on the deploy option, see sp_webservices in *Reference Manual: Procedures*.

The WSDL for user-defined Web service is at:

```
http://myhost:8181/services/pubs2/testing?wsdl
```

You can invoke the user-defined Web service from a browser at the following URL, where bob and bob123 are the user ID and password of the creator of the user-defined Web service:

```
http://myhost:8181/services/pubs2/testing?method=xmlervice&
username=bob&password=bob123
```

The output appears as XML in the browser window.

Example 3 A user-defined Web service is made available to a SOAP client to execute the stored procedure sp_who. One argument is supplied, and the optional userpath token is specified:

```
create service sp_who_service userpath
'myservices/args' type soap @loginname varchar(30) as
exec sp_who @loginname
```

The Web service is created as sp_who_service in the pubs2 database and, after being deployed it is accessible at:

```
http://localhost:8181/pubs2/myservices/args/sp_who_service
```

The WSDL for the service is available at:

```
http://localhost:8181/pubs2/myservices/args?wsdl
```

The signature for the Web method, described in the WSDL file, is:

```
DataReturn[] sp_who_service (xsd:string username,
    xsd:string password, xsd:string loginname)
```

The new service is invoked by a SOAP client with one parameter, loginname, of type varchar(30).

Usage

Except for the following differences, the resulting stored procedure behaves the same as a stored procedure created with the create procedure command, following existing stored procedure rules for execution, replication, sp_helptext, and recompilation, and is executable from isql:

- The resulting stored procedure can be dropped only with the drop service command, not the drop procedure command.
- The syscomments table is populated with DDL necessary to re-create the create service command.
- The specified service name cannot create a stored procedure group.

Note To make a user-defined Web service available through the Adaptive Server Web Services engine, you must use the deploy option of sp_webservices. However, the stored procedure for a user-defined Web service is accessible from isql, even if it has not been deployed.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create service permission defaults to the database owner, who can transfer it to other users.

Permission to use a Web service must be granted explicitly with the grant command and may be revoked with the revoke command.

Permissions on objects at service creation When you create a Web service, Adaptive Server makes no permission checks on objects, such as tables and views, that are referenced by the service. Therefore, you can successfully create a Web service even though you do not have access to its objects. All permission checks occur when a user executes the Web service.

Permissions on objects at Web service execution When the Web service is executed, permission checks on objects depend on whether the Web service and all referenced objects are owned by the same user.

- If the Web service's objects are owned by different users, the invoker must have been granted direct access to the objects. For example, if the Web service performs a select from a table that the user cannot access, the Web service execution fails.

- If a Web service and its objects are owned by the same user, however, special rules apply. The invoker automatically has "implicit permission" to access the Web service's objects even though the invoker could not access them directly. Without having to grant users direct access to your tables and views, you can give them restricted access with a stored procedure. In this way, a stored procedure can be a security mechanism. For example, invokers of the Web service might be able to access only certain rows and columns of your table.

  A detailed description of the rules for implicit permissions is discussed in the *System Administration Guide*.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
11	create	create services	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

create table

Description

- Creates new tables and optional integrity constraints.
- Defines computed columns.
- Defines table, row, and partition compression levels.
- Defines encrypted columns and decrypt defaults on encrypted columns.
- Defines the table's partition property. Syntax for creating table partitions is listed separately. See the syntax for partitions.

Syntax

```
create table [[database.[owner].]table_name (column_name datatype
        [default {constant_expression  | user | null}]
        [{identity | null | not null}]
            [ in row [(length)] | off row ]
            [[constraint constraint_name]
            {{unique | primary key}
            [clustered | nonclustered] [asc | desc]
            [with {fillfactor = pct,
                    max_rows_per_page = num_rows,}
                    reservepagegap = num_pages]
                    dml_logging = {full | minimal})
            [on segment_name]
            | references [[database.]owner.]ref_table
                [(ref_column)]
                [match full]
                | check (search_condition)}]}
        [[encrypt [with [database.[owner].]key_name]
            [decrypt_default constant_expression | null]]
                            [not compressed]
            [compressed = {compression_level | not compressed}
        [[constraint [[database.[owner].]key_name]
            {unique | primary key}
                [clustered | nonclustered]
                 (column_name [asc | desc]
                    [{, column_name [asc | desc]}...])
                [with {fillfactor = pct
                    max_rows_per_page = num_rows,
                    reservepagegap = num_pages}]
                [on segment_name]
            | foreign key (column_name [{,column_name}...])
                references [[database.]owner.]ref_table
                    [(ref_column [{, ref_column}...])]
                    [match full]
            | check (search_condition) ...}
        [{, {next_column | next_constraint}}...])
        [lock {datarows | datapages | allpages}]
        [with {max_rows_per_page = num_rows,
                exp_row_size = num_bytes,
                reservepagegap = num_pages,
```

```
            identity_gap = value
            transfer table [on | off]
            dml_logging = {full | minimal}
            compression = {none | page | row}}]
            lob_compression = off | compression_level
    [on segment_name]
    [partition_clause]
    [[external table] at pathname]
    [for load]
    compression_clause::=
        with compression = {none | page | row}
```

Use this syntax for partitions:

```
partition_clause::=

    partition by range (column_name[, column_name]...)
         ([partition_name] values <= ({constant | MAX}
            [, {constant | MAX}] ...)
                [compression_clause] [on segment_name]
            [, [partition_name] values <= ({constant | MAX}
                [, {constant | MAX}] ...)
                [compression_clause] [on segment_name]]...)

    | partition by hash (column_name[, column_name]...)
        { (partition_name
                [compression_clause] [on segment_name]
            [, partition_name
                [compression_clause] [on segment_name]]...)
        | number_of_partitions
            [on (segment_name[, segment_name] ...)]}

    | partition by list (column_name)
         ([partition_name] values (constant[, constant] ...)
                [compression_clause] [on segment_name]
            [, [partition_name] values (constant[, constant] ...)
                [compression_clause] [on segment_name]] ...)

    | partition by roundrobin
        { (partition_name [on segment_name]
            [, partition_name
                [compression_clause] [on segment_name]]...)
        | number_of_partitions
            [on (segment_name[, segment_name]...)]}
```

Use this syntax for computed columns

```
create table [[database.[owner].] table_name
     (column_name {compute | as}
        computed_column_expression
            [[materialized] [not compressed]] | [not materialized]}
```

Use this syntax to create a virtually hashed table

```
create table [database.[owner].]table_name
. . .
    | {unique | primary key}
    using clustered
    (column_name [asc | desc] [{, column_name [asc | desc]}...])=
    (hash_factor [{, hash_factor}...])
        with max num_hash_values key
```

Parameters

table_name

is the explicit name of the new table. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

You cannot use a variable for the table name. The table name must be unique within the database and to the owner. If you have set quoted_identifier on, you can use a delimited identifier for the table name. Otherwise, it must conform to the rules for identifiers. For more information about valid table names, see "Identifiers" on page 347 in Chapter 4, "Expressions, Identifiers, and Wildcard Characters," of *Reference Manual: Building Blocks*.

You can create a temporary table by preceding the table name with either a pound sign (#) or "tempdb..". See "Tables beginning with # (temporary tables)" on page 350 in Chapter 4, "Expressions, Identifiers, and Wildcard Characters," of *Reference Manual: Building Blocks*.

You can create a table in a different database, as long as you are listed in the sysusers table and have create table permission for that database. For example, you can use either of the following to create a table called newtable in the database otherdb:

```
create table otherdb..newtable
```

```
create table otherdb.yourname.newtable
```

column_name

is the name of the column in the table. It must be unique in the table. If you have set quoted_identifier on, you can use a delimited identifier for the column. Otherwise, it must conform to the rules for identifiers. For more information about valid column names, see Chapter 4, "Expressions, Identifiers, and Wildcard Characters," of *Reference Manual: Building Blocks*.

datatype

is the datatype of the column. System or user-defined datatypes are acceptable. Certain datatypes expect a length, *n*, in parentheses:

```
datatype (n)
```

Others expect a precision, *p*, and scale, *s*:

```
datatype (p,s)
```

See Chapter 1, "System and User-Defined Datatypes" in *Reference Manual: Building Blocks* for more information.

If Java is enabled in the database, *datatype* can be the name of a Java class, either a system class or a user-defined class, that has been installed in the database. See *Java in Adaptive Server Enterprise* for more information.

default

specifies a default value for a column. If you specify a default, and the user does not provide a value for the column when inserting data, Adaptive Server inserts the default value. The default can be a constant expression or a built-in, to insert the name of the user who is performing the insert, or null, to insert the null value. Adaptive Server generates a name for the default in the form of *tabname_colname_objid*, where *tabname* is the first 10 characters of the table name, *colname* is the first 5 characters of the column name, and *objid* is the object ID number for the default. Defaults declared for columns with the IDENTITY property have no effect on column values.

You can reference global variables in the default section of create table statements that do not reference database objects. You cannot, however, use global variables in the check section of create table.

constant_expression

is a constant expression to use as a default value for the column. It cannot include global variables, the name of any columns, or other database objects, but can include built-in functions that do not reference database objects. This default value must be compatible with the datatype of the column, or Adaptive Server generates a datatype conversion error when attempting to insert the default.

user | null

specifies that Adaptive Server should insert the user name or the null value as the default if the user does not supply a value. For user, the datatype of the column must be either char (30) or varchar (30). For null, the column must allow null values.

identity

indicates that the column has the IDENTITY property. Each table in a database can have one IDENTITY column with a datatype of:

- exact numeric and a scale of 0; or
- Any of the integer datatypes, including signed or unsigned bigint, int, smallint, or tinyint.

IDENTITY columns are not updatable and do not allow nulls.

IDENTITY columns are used to store sequential numbers—such as invoice numbers or employee numbers—that are generated automatically by Adaptive Server. The value of the IDENTITY column uniquely identifies each row in a table.

null | not null

specifies Adaptive Server behavior during data insertion if no default exists.

null specifies that Adaptive Server assigns a null value if a user does not provide a value.

not null specifies that a user must provide a non-null value if no default exists.

The properties of a bit-type column must always be not null.

If you do not specify null or not null, Adaptive Server uses not null by default. However, you can switch this default using sp_dboption to make the default compatible with the SQL standards.

in row

instructs Adaptive Server to store data in the LOB column as in-row whenever there is enough space in the data page. The LOB column's data is stored either fully as in-row or fully off-row.

length

(optional) specifies the maximum size at which LOB column data can be stored as in-row. Anything larger than this value is stored off-row, while anything equal to or less than *length* is stored as in-row, as long as there is enough space on the page.

When you do not specify *length*, Adaptive Server uses the database-wide setting for in-row length.

off row
: (optional) provides default behavior for storing LOB columns off-row. Adaptive Server assumes this behavior for your new table unless you specify in row. If you do not specify the off row clause and you set the database-wide in-row length, create table creates the LOB column as an in-row LOB column.

off row | in row
: specifies whether a Java-SQL column is stored separate from the row (off row) or in storage allocated directly in the row (in row).

  The default value is off row. See *Java in Adaptive Server Enterprise*.

size_in_bytes
: specifies the maximum size of the in-row column. An object stored in-row can occupy up to approximately 16K bytes, depending on the page size of the database server and other variables. The default value is 255 bytes.

constraint *constraint_name*
: introduces the name of an integrity constraint.

  constraint_name is the name of the constraint. It must conform to the rules for identifiers and be unique in the database. If you do not specify the name for a referential or check constraint, Adaptive Server generates a name in the form *tabname_colname_objectid* where:

  - *tabname* – is the first 10 characters of the table name
  - *colname* – is the first 5 characters of the column name
  - *objectid* – is the object ID number for the constraint

  If you do not specify the name for a unique or primary key constraint, Adaptive Server generates a name in the format *tabname_colname_tabindid*, where *tabindid* is a string concatenation of the table ID and index ID.

unique
: constrains the values in the indicated column or columns so that no two rows have the same value. This constraint creates a unique index that can be dropped only if the constraint is dropped using alter table.

primary key
: constrains the values in the indicated column or columns so that no two rows have the same value, and so that the value cannot be NULL. This constraint creates a unique index that can be dropped only if the constraint is dropped using alter table.

clustered | nonclustered

specifies that the index created by a unique or primary key constraint is a clustered or nonclustered index. clustered is the default for primary key constraints; nonclustered is the default for unique constraints. There can be only one clustered index per table. See create index for more information.

asc | desc

specifies whether the index created for a constraint is to be created in ascending or descending order for each column. The default is ascending order.

fillfactor

specifies how full Adaptive Server makes each page when it creates a new index on existing data. The fillfactor percentage is relevant only when the index is created. As the data changes, the pages are not maintained at any particular level of fullness.

The default for fillfactor is 0; this is used when you do not include with fillfactor in the create index statement (unless the value has been changed with sp_configure). When specifying a fillfactor, use a value between 1 and 100.

A fillfactor of 0 creates clustered indexes with completely full pages and nonclustered indexes with completely full leaf pages. It leaves a comfortable amount of space within the index B-tree in both the clustered and nonclustered indexes. There is seldom a reason to change the fillfactor.

If the fillfactor is set to 100, Adaptive Server creates both clustered and nonclustered indexes with each page 100 percent full. A fillfactor of 100 makes sense only for read-only tables—tables to which no data is ever added.

fillfactor values smaller than 100 (except 0, which is a special case) cause Adaptive Server to create new indexes with pages that are not completely full. A fillfactor of 10 might be a reasonable choice if you are creating an index on a table that will eventually hold a great deal more data, but small fillfactor values cause each index (or index and data) to take more storage space.

If CIS is enabled, you cannot use fillfactor for remote servers.

Warning! Creating a clustered index with a fillfactor affects the amount of storage space your data occupies, since Adaptive Server redistributes the data as it creates the clustered index.

---

decrypt_default allows the sso to specify a value to be returned to users who do not have decrypt permissions on the encrypted column. Decrypt default values will be substituted for text, image, or unitext columns retrieved through the select statement.

max_rows_per_page
limits the number of rows on data pages and the leaf-level pages of indexes. Unlike fillfactor, the max_rows_per_page value is maintained when data is inserted or deleted.

If you do not specify a value for max_rows_per_page, Adaptive Server uses a value of 0 when creating the table. Values for tables and clustered indexes are between 0 and 256. The maximum number of rows per page for nonclustered indexes depends on the size of the index key; Adaptive Server returns an error message if the specified value is too high.

A max_rows_per_page of 0 creates clustered indexes with full data pages and nonclustered indexes with full leaf pages. It leaves a comfortable amount of space within the index B-tree in both clustered and nonclustered indexes.

Using low values for max_rows_per_page reduces lock contention on frequently accessed data. However, using low values also causes Adaptive Server to create new indexes with pages that are not completely full, uses more storage space, and may cause more page splits.

If CIS is enabled, and you create a proxy table, then max_rows_per_page is ignored. Proxy tables do not contain any data. If max_rows_per_page is used to create a table, and later a proxy table is created to reference that table, then the max_rows_per_page limits apply when you insert or delete through the proxy table.

reservepagegap = *num_pages*
specifies the ratio of filled pages to empty pages that are to be left during extent I/O allocation operations. For each specified *num_pages*, an empty page is left for future expansion of the table. Valid values are 0 – 255. The default value is 0.

dml_logging = {full | minimal}
determines the amount of logging for insert, update and delete operations, and for some forms of bulk inserts. One of

- full – Adaptive Server logs all transactions
- minimal – Adaptive Sever does not log row or page changes

on *segment_name*

when used with the constraint option, specifies that the index is to be created on the named segment. Before the on *segment_name* option can be used, the device must be initialized with disk init, and the segment must be added to the database with sp_addsegment. See your system administrator or use sp_helpsegment for a list of the segment names available in your database.

If you specify clustered and use the on *segment_name* option, the entire table migrates to the segment you specify, since the leaf level of the index contains the actual data pages.

references

specifies a column list for a referential integrity constraint. You can specify only one column value for a column constraint. By including this constraint with a table that references another table, any data inserted into the *referencing* table must already exist in the *referenced* table.

To use this constraint, you must have references permission on the referenced table. The specified columns in the referenced table must be constrained by a unique index (created by either a unique constraint or a create index statement). If no columns are specified, there must be a primary key constraint on the appropriate columns in the referenced table. Also, the datatypes of the referencing table columns must match the datatype of the referenced table columns.

ref_table

is the name of the table that contains the referenced columns. You can reference tables in another database. Constraints can reference as many as 192 user tables and internally generated worktables.

ref_column

is the name of the column or columns in the referenced table.

match full

specifies that if all values in the referencing columns of a referencing row are:

- Null – the referential integrity condition is true.
- Non-null values – if there is a referenced row where each corresponding column is equal in the referenced table, then the referential integrity condition is true.

If they are neither, then the referential integrity condition is false when:

- All values are non-null and not equal, or
- Some of the values in the referencing columns of a referencing row are non-null values, while others are null.

check (*search_condition*)

specifies the check constraint on the column values and a *search_condition* constraint that Adaptive Server enforces for all the rows in the table. You can specify check constraints as table or column constraints; create table allows multiple check constraints in a column definition.

Although you can reference global variables in the default section of create table statements, you cannot use them in the check section.

The constraints can include:

- A list of constant expressions introduced with in
- A set of conditions introduced with like, which may contain wildcard characters

Column and table check constraints can reference any columns in the table.

An expression can include arithmetic operators and functions. The *search_condition* cannot contain subqueries, aggregate functions, host variables, or parameters.

encrypt [with *key_name*]

creates an encrypted column. Specify the database name if the key is in another database. Specify the owner's name if *key_name* is not unique to the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

The table creator must have select permission on the key. If you do nto supply *key_name*, Adaptive Server looks for a default key in the database.

keyname identifies a key created using create encryption key. The creator of the table must have select permission on *keyname*. If *keyname* is not supplied, Adaptive Server looks for a default key created using the as default clause on create encryption key or alter encryption key.

See Chapter 4, "Encrypting Data," in the User Guide for Encrypted Columns for a list of supported datatypes.

decrypt_default *constant_expression*

specifies that this column returns a default value for users who do not have decrypt permissions, and *constant_expression* is the constant value Adaptive Server returns on select statements instead of the decrypted value. The value can be NULL on nullable columns only. If the decrypt default value cannot be converted to the column's datatype, Adaptive Server catches the conversion error only when it executes the query.

compression = *compression_level* | not compressed

indicates if the data in the row is compressed and to what level.

foreign key

specifies that the listed columns are foreign keys in this table whose target keys are the columns listed in the following references clause. The foreign-key syntax is permitted only for table-level constraints, not for column-level constraints.

next_column | *next_constraint*

indicates that you can include additional column definitions or table constraints (separated by commas) using the same syntax described for a column definition or table constraint definition.

lock datarows | datapages | allpages

specifies the locking scheme to be used for the table. The default is the server-wide setting for the configuration parameter lock scheme.

exp_row_size = *num_bytes*

specifies the expected row size; applies only to datarows and datapages locking schemes, and only to tables with variable-length rows. Valid values are 0, 1, and any value between the minimum and maximum row length for the table. The default value is 0, which means a server-wide setting is applied.

identity_gap *value*

specifies the identity gap for the table. This value overrides the system identity gap setting for this table only.

value is the identity gap amount. For more information about setting the identity gap, see "IDENTITY columns" on page 247.

transfer table [on | off]

marks the table for incremental transfer. The default value of this parameter is off.

dml_logging

determines the amount of logging for insert, update and delete operations, and for some forms of bulk inserts. One of

- full – Adaptive Server logs all transactions
- minimal – Adaptive Sever does not log row or page changes

compression

indicates the level of compression at the table or the partition level. Specifying the compression level for the partition overrides the compression level for the table. Adaptive Server compresses individual columns only in partitions that are configured for compression.

- none – the data in this table or partition is not compressed. For partitions, none indicates that data in this partition remains uncompressed even if the table compression is altered to row or page compression.
- row – compresses one or more data items in an individual row. Adaptive Server stores data in a row compressed form only if the compressed form saves space compared to an uncompressed form. Set row compression at the partition or table level.
- page – when the page fills, existing data rows that are row-compressed are then compressed using page-level compression to create page-level dictionary, index, and character-encoding entries. Set page compression at the partition or table level.

  Adaptive Server compresses data at the page level only after it has compressed data at the row level, so setting the compression-level to page implies both page and row compression.

lob_compression = off | *compression_level*

Determines the compression level for the table. The table has no LOB compression if you select off.

compression_level

Table compression level. The compression levels are:

- 0 – the row is not compressed.
- 1 through 9 – Adaptive Server uses ZLib compression. Generally, the higher the compression number, the more Adaptive Server compresses the LOB data, and the greater the ratio between compressed and uncompressed data (that is the greater the amount of space savings, in bytes, for the compressed data versus the size of the uncompressed data).

  However, the amount of compression depends on the LOB content, and the higher the compression level , the more CPU-intensive the process. That is, level 9 provides the highest compression ratio but also the heaviest CPU usage.
- 100 – Adaptive Server uses FastLZ compression. The compression ratio that uses the least CPU usage; generally used for shorter data.
- 101 – Adaptive Server uses FastLZ compression. A value of 101 uses slightly more CPU than a value of 100, but uses a better compression ratio than a value of 100.

The compression algorithm ignores rows that do not use LOB data.

on *segment_name*

specifies the name of the segment on which to place the table. When using on *segment_name*, the logical device must already have been assigned to the database with create database or alter database, and the segment must have been created in the database with sp_addsegment. See your system administrator or use sp_helpsegment for a list of the segment names available in your database.

When used for partitions, specifies the segment on which to place the partition.

external table

specifies that the object is a remote table or view. external table is the default, so specifying this is optional.

for load

creates a table available only to bcp in and alter table unpartition operations.

partition by range

specifies records are to be partitioned according to specified ranges of values in the partitioning column or columns.

column_name

when used in the *partition_clause*, specifies a partition key column.

partition_name

specifies the name of a new partition on which table records are stored. Partition names must be unique within the set of partitions on a table or index. Partition names can be delimited identifiers if set quoted_identifier is on. Otherwise, they must be valid identifiers.

If *partition_name* is omitted, Adaptive Server creates a name in the form *table_name_patition_id*. Adaptive Server truncates partition names that exceed the allowed maximum length.

on *segment_name*

when used in the *partition_clause*, specifies the segment on which the partition is to be placed. Before the on *segment_name* option can be used, the device must be initialized with disk init, and the segment must be added to the database using the sp_addsegment system procedure. See your system administrator or use sp_helpsegment for a list of the segment names available in your database.

values <= constant | MAX

specifies the inclusive upper bound of values for a named partition. Specifying a constant value for the highest partition bound imposes an implicit integrity constraint on the table. The keyword MAX specifies the maximum value in a given datatype.

partition by hash

specifies records are to be partitioned by a system-supplied hash function. The function computes the hash value of the partition keys that specify the partition to which records are assigned.

partition by list

specifies records are to be partitioned according to literal values specified in the named column. Only one column can partition a list-partitioned table. You can specify up to 250 distinct list values for each partition.

partition by round-robin

specifies records are to be partitioned in a sequential manner. A round-robin-partitioned table has no partitioning key. Neither the user nor the optimizer knows the partition of a particular record.

at *pathname*

specifies the location of the remote object. Using the at *pathname* clause results in the creation of a proxy table.

pathname takes the form *server_name.dbname.owner.object;aux1.aux2*, where:

- *server_name* (required) – is the name of the server that contains the remote object.
- *dbname* (optional) – is the name of the database managed by the remote server that contains this object.
- *owner* (optional) – is the name of the remote server user that owns the remote object.
- *object* (required) – is the name of the remote table or view.
- *aux1.aux2* (optional) – is a string of characters that is passed to the remote server during a create table or create index command. This string is used only if the server is class db2. aux1 is the DB2 database in which to place the table, and aux2 is the DB2 tablespace in which to place the table.

{compute | as}

reserved keywords that you can use interchangeably to indicate that a column is a computed column.

computed_column_expression

is any valid T-SQL expression that does not contain columns from other tables, local variables, aggregate functions, or subqueries. It can be one or a combination of column name, constant, function, global variable, or case expression, connected by one or more operators. You cannot cross-reference between computed columns except when virtual computed columns reference materialize computed columns.

materialized | not materialized

specifies whether or not the computed column is materialized and physically stored in the table. If neither keyword is specified, a computed column by default is not materialized, and thus not physically stored in the table.

using clustered

indicates you are creating a virtually hashed table. The list of columns are treated as key columns for this table.

column_name [asc | desc]

because rows are placed based on their hash function, you cannot use [asc | desc] for the hash region. If you provide an order for the key columns of virtually hashed tables, it is used only in the overflow clustered region.

hash_factor

required for the hash function for virtually hashed tables. For the hash function, a hash factor is required for every key column. These factors are used with key values to generate hash value for a particular row.

with max *num_hash_values* key

the maximum number of hash values that you can use. Defines the upper bound on the output of this hash function.

Examples

Example 1 Creates the foo table using the *@@spid* global variable with the default parameter:

```
create table foo (
      a      int
    , b      int      default @@spid
)
```

Example 2 Creates the titles table:

```
create table titles (
      title_id       tid              not null
    , title          varchar (80)     not null
    , type           char (12)        not null
    , pub_id         char (4)         null
    , price          money            null
    , advance        money            null
    , total_sales    int              null
    , notes          varchar (200)    null
    , pubdate        datetime         not null
    , contract       bit              not null
)
```

Example 3 Creates a table mytable using for load:

```
create table mytable (
      col1    int
    , col2    int
    , col3    (char 50)
)
partitioned by roundrobin 3 for load
```

The new table is unavailable to any user activities until it is unpartitioned.

1. Load the data into mytable, using bcp in.

2 Unpartition mytable.

The table is now available for any user activities.

Example 4 Creates the compute table. The table name and the column names, max and min, are enclosed in double quotes because they are reserved words. The total score column name is enclosed in double quotes because it contains an embedded blank. Before creating this table, you must set quoted_identifier on.

```
create table "compute" (
      "max"             int
    , "min"             int
    , "total score"     int
)
```

Example 5 Creates the sales table and a clustered index in one step with a unique constraint. (In the pubs2 database installation script, there are separate create table and create index statements):

```
create table sales (
      stor_id           char (4)      not null
    , ord_num           varchar (20)  not null
    , date              datetime      not null
    , unique clustered (stor_id, ord_num)
)
```

Example 6 Creates the salesdetail table with two referential integrity constraints and one default value. There is a table-level, referential integrity constraint named salesdet_constr and a column-level, referential integrity constraint on the title_id column without a specified name. Both constraints specify columns that have unique indexes in the referenced tables (titles and sales). The default clause with the qty column specifies 0 as its default value.

```
create table salesdetail (
      stor_id   char (4)                  not null
    , ord_num   varchar (20)              not null
    , title_id  tid                       not null
           references titles (title_id)
    , qty       smallint default 0        not null
    , discount  float                     not null,

constraint salesdet_constr
    foreign key (stor_id, ord_num)
    references sales (stor_id, ord_num)
)
```

Example 7 Creates the table publishers with a check constraint on the pub_id column. This column-level constraint can be used in place of the pub_idrule included in the pubs2 database.

```
create rule pub_idrule
as @pub_id in ("1389", "0736", "0877", "1622", "1756")
or @pub_id like "99[0-9][0-9]"
```

```
create table publishers (
    pub_id char (4) not null
    check (pub_id in ("1389", "0736", "0877", "1622",
        "1756")
        or pub_id like "99[0-9][0-9]")
    , pub_name     varchar (40)      null
    , city         varchar (20)      null
    , state        char (2)          null
)
```

Example 8 Specifies the ord_num column as the IDENTITY column for the sales_daily table. The first time you insert a row into the table, Adaptive Server assigns a value of 1 to the IDENTITY column. On each subsequent insert, the value of the column increments by 1.

```
create table sales_daily (
      stor_id         char (4)         not null
    , ord_num         numeric (10,0)   identity
    , ord_amt         money            null
)
```

Example 9 Specifies the datapages locking scheme for the new_titles table and an expected row size of 200:

```
create table new_titles (
      title_id      tid
    , title          varchar (80)    not null
    , type           char (12)
    , pub_id         char (4)        null
    , price          money           null
    , advance        money           null
    , total_sales    int             null
    , notes          varchar (200)   null
    , pubdate        datetime
    , contract       bit
)
lock datapages
with exp_row_size = 200
```

Example 10 Specifies the datarows locking scheme and sets a reservepagegap value of 16 so that extent I/O operations leave 1 blank page for each 15 filled pages:

```
create table new_publishers (
      pub_id      char (4)       not null
    , pub_name    varchar (40)   null
    , city        varchar (20)   null
    , state       char (2)       null
)
lock datarows
with reservepagegap = 16
```

Example 11 Creates a table named big_sales with minimal logging:

```
create table big_sales (
      storid        char(4)        not null
    , ord_num       varchar(20)    not null
    , order_date    datetime       not null
)
with dml_logging = minimal
```

Example 12 Creates a table named mytable, that uses the locking scheme datarows, and permits incremental transfer:

```
create table mytable (
      f1 int
    , f2 bigint not null
    , f3 varchar (255) null
)
lock datarows
with transfer table on
```

Example 13 Creates a table named genre with row-level compression:

```
create table genre (
      mystery      varchar(50)    not null
    , novel        varchar(50)    not null
    , psych        varchar(50)    not null
    , history      varchar(50)    not null
    , art          varchar(50)    not null
    , science      varchar(50)    not null
    , children     varchar(50)    not null
    , cooking      varchar(50)    not null
    , gardening    varchar(50)    not null
    , poetry       varchar(50)    not null
)
with compression = row
```

Example 14 Creates a table named sales on segments seg1, seg2, and seg3, with compression on seg1:

```
create table sales (
      store_id     int    not null
    , order_num    int    not null
    , date         datetime    not null
)
partition by range (date)
    ( Y2008 values <= ('12/31/2008')
      with compression = page on seg1,
      Y2009 values <= ('12/31/2009') on seg2,
      Y2010 values <= ('12/31/2010') on seg3)
```

Example 15 Creates the email table, which uses a LOB compression level of 5:

```
create table email (
      user_name      char (10)
    , mailtxt        text
    , photo          image
    , reply_mails    text)
    with lob_compression = 5
```

Example 16 Creates a constraint supported by a unique clustered index; the index order is ascending for stor_id and descending for ord_num:

```
create table sales_south (
      stor_id     char (4)        not null
    , ord_num     varchar (20)    not null
    , date        datetime        not null
    , unique clustered (stor_id asc, ord_num desc)
)
```

Example 17 Creates a table named t1 at the remote server SERVER_A and creates a proxy table named t1 that is mapped to the remote table:

```
create table t1 (
      a    int
    , b    char (10)
)
at "SERVER_A.db1.joe.t1"
```

Example 18 Creates a table named employees. name is of type varchar, home_addr is a Java-SQL column of type Address, and mailing_addr is a Java-SQL column of type Address2Line. Both Address and Address2Line are Java classes installed in the database:

```
create table employees (
```

```
          name             varchar (30)
        , home_addr        Address
        , mailing_addr     Address2Line
    )
```

Example 19 Creates a table named mytable with an identity column. The identity gap is set to 10, which means ID numbers are allocated in memory in blocks of ten. If the server fails or is shut down with no wait, the maximum gap between the last ID number assigned to a row and the next ID number assigned to a row is 10 numbers:

```
create table mytable (
      IdNum    numeric (12,0)    identity
)
with identity_gap = 10
```

Example 20 Creates a table my_publishers, which is partitioned by list according to values in the state column. See the *Transact-SQL Users Guide* for more information about creating table partitions.

```
create table my_publishers (
      pub_id      char (4)        not null
    , pub_name    varchar (40)    null
    , city        varchar (20)    null
    , state       char (2)        null
)
partition by list (state) (
      west values ('CA', 'OR', 'WA') on seg1
    , east values ('NY', 'MA') on seg2
)
```

Example 21 Creates the table fictionsales, which is partitioned by range according to values in the date column:

```
create table fictionsales (
      store_id     int          not null
    , order_num    int          not null
    , date         datetime     not null
)
partition by range (date) (
      q1 values <= ("3/31/2005") on seg1
    , q2 values <= ("6/30/2005") on seg2
    , q3 values <= ("9/30/2005") on seg3
    , q4 values <= ("12/31/2005") on seg4
)
```

Example 22 Creates the table currentpublishers, which is partitioned by round-robin:

```
create table currentpublishers (
      pub_id      char (4)        not null
    , pub_name    varchar (40)    null
    , city        varchar (20)    null
    , state       char (2)        null
)
partition by roundrobin 3 on (seg1)
```

Example 23 Creates the table mysalesdetail, which is partitioned by hash according to values in the ord_num column:

```
create table mysalesdetail (
      store_id    char (4)        not null
    , ord_num     varchar (20)    not null
    , title_id    tid             not null
    , qty         smallint        not null
    , discount    float           not null
)
partition by hash (ord_num) (
      p1 on seg1
    , p2 on seg2
    , p3 on seg3
)
```

Example 24 Creates a table called mytitles with one materialized computed column:

```
create table mytitles (
      title_id    tid    not null
    , title    varchar (80)     not null
    , type    char (12)         not null
    , pub_id    char (4)        null
    , price    money            null
    , advance    money          null
    , total_sales    int        null
    , notes    varchar (200)    null
    , pubdate    datetime       not null
    , sum_sales    compute price * total_sales
          materialized
)
```

Example 25 Creates an employee table with a nullable encrypted column. Adaptive Server uses the database default encryption key to encrypt the ssn data:

```
create table employee_table (
      ssn             char(15)    null
      encrypt name    char(50)
```

```
        , deptid          int
    )
```

Example 26 Creates a customer table with an encrypted column for credit card data:

```
    create table customer (
    ccard char(16) unique
       encrypt with cc_key
       decrypt_default 'XXXXXXXXXXXXXXXX', name char(30)
    )
```

The ccard column has a unique constraint and uses cc_key for encryption. Because of the decrypt_default specifier, Adaptive Server returns the value 'XXXXXXXXXXXXXXXX' instead of the actual data when a user without decrypt permission selects the ccard column.

Example 27 Creates a table that specifies description as an in-row LOB column 300 bytes long, notes as an in-row LOB column without a specified length (inheriting the size of the off-row storage), and the reviews column as stored off-row regardless of condition:

```
    create table new_titles (
          title_id       tid               not null
        , title          varchar (80)      not null
        , type           char (12)         null
        , price          money             null
        , pubdate        datetime          not null
        , description    text              in row (300)
        , notes          text              in row
        , reviews        text              off row
    )
```

Example 28 Creates a virtually hashed table named orders on the pubs2 database on the order_seg segment:

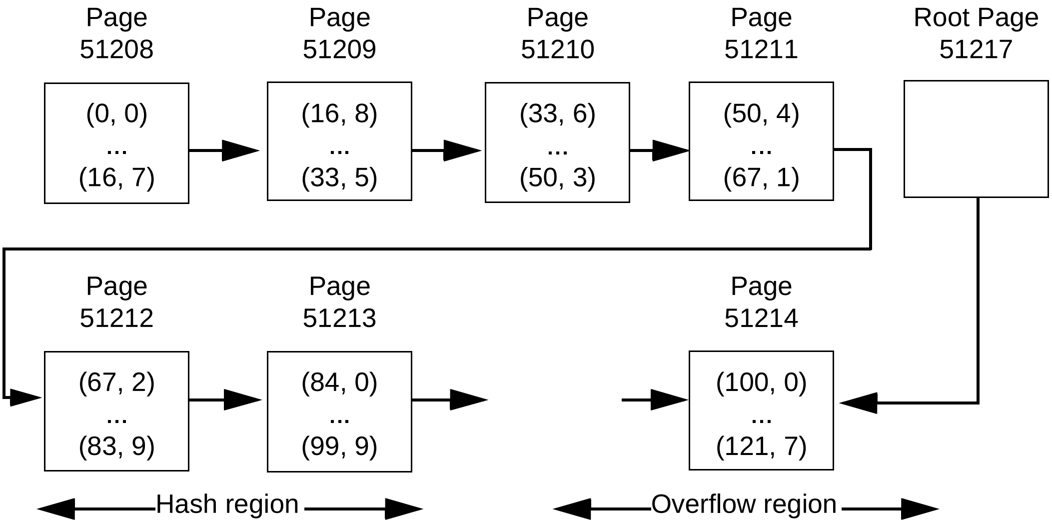
```
    create table orders (
          id    int
        , age    int
        , primary key using clustered (id,age) = (10,1) with
    max 1000 key
    )
    on order_seg
```

The layout for the data is:

- The order_seg segment starts on page ID 51200.
- The ID for the first data object allocation map (OAM) page is 51201.

- The maximum rows per page is 168.
- The row size is 10.
- The root index page of the overflow clustered region is 51217.

Figure 1-1: The data layout for the example



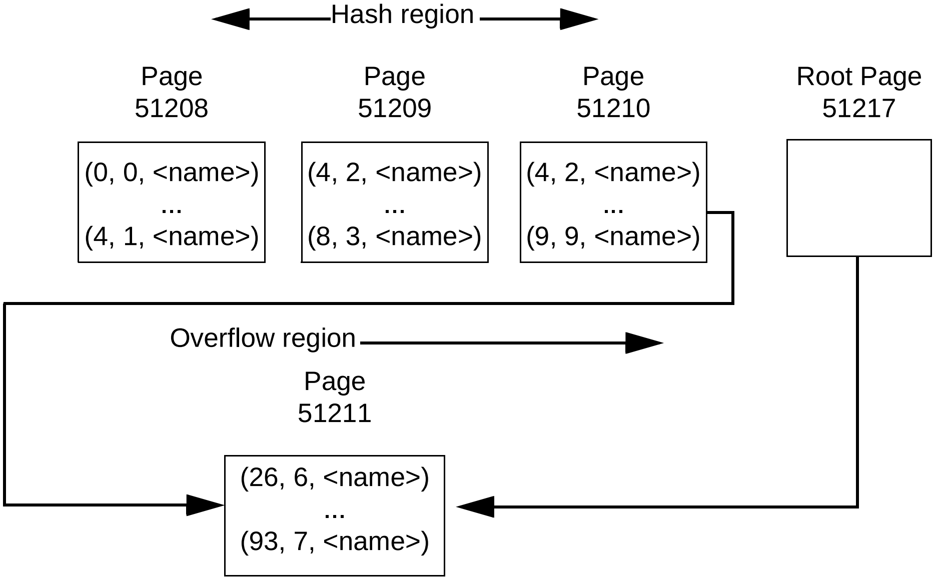
Example 29 Creates a virtually hashed table named orders on the pubs2 database on the order_seg segment:

```
create table orders (
      id    int default NULL
    , age    int
    , primary key using
          clustered (id,age) = (10,1) with max 100 key
    , name    varchar(30)
)
on order_seg
```

The layout for the data is:

- The order_seg segment starts on page ID 51200.
- The ID for the first data OAM page is 51201.
- The maximum rows per page is 42.
- The row size is 45.
- The root index page of the overflow clustered region is 51217.

Figure 1-2: The data layout for the example



Usage

- create table creates a table and optional integrity constraints. The table is created in the currently open database unless you specify a different database in the create table statement. You can create a table or index in another database, if you are listed in the sysusers table and have create table permission in the database.
- Space is allocated to tables and indexes in increments of one extent, or eight pages, at a time. Each time an extent is filled, another extent is allocated. To see the amount of space allocated and used by a table, use sp_spaceused.
- The maximum length for in-row Java columns is determined by the maximum size of a variable-length column for the table's schema, locking style, and page size.
- create table performs error checking for check constraints before it creates the table.
- When using create table from CIS with a column defined as char (*n*) NULL, CIS creates the column as varchar (*n*) on the remote server.
- Use the asc and desc keywords after index column names to specify the sort order for the index. Creating indexes so that columns are in the same order specified in the order by clause of queries eliminates the sorting step during query processing.

- If an application inserts short rows into a data-only-locked table and updates them later so that their length increases, use exp_row_size to reduce the number of times that rows in data-only-locked tables are forwarded to new locations.
- The location information provided by the at keyword is the same information that is provided by sp_addobjectdef. The information is stored in the sysattributes table.

Restrictions

- The maximum number of columns in a table depends on the width of the columns and the server's logical page size:
  - The sum of the columns' sizes cannot exceed the server's logical page size.
  - The maximum number of columns per table cannot exceed 1024.
  - The maximum number of variable-length columns for an all-pages lock table is 254.

    For example, if your server uses a 2K logical page size and includes a table of integer columns, the maximum number of columns in the table is far fewer than 1024. (1024 * 4 bytes exceeds a 2K logical page size.)

    You can mix variable- and fixed-length columns in a single table as long as the maximum number of columns does not exceed 1024. For example, if your server uses a 8K logical page size, a table configured for APL can have 254 nullable integer columns (these are variable-length columns) and 770 non-nullable integers, for a total of 1024 columns.
- There can be as many as 2,000,000,000 tables per database and 1024 user-defined columns per table. The number of rows per table is limited only by available storage.
- Although Adaptive Server does create tables in the following circumstances, you will receive errors about size limitations when you perform DML operations:
  - If the total row size for rows with variable-length columns exceeds the maximum column size
  - If the length of a single variable-length column exceeds the maximum column size

- For data-only-locked tables, if the offset of any variable-length column other than the initial column exceeds the limit of 8191 bytes

- Adaptive Server reports an error if the total size of all fixed-length columns, plus the row overhead, is greater than the table's locking scheme and page size allows. These limits are described in Table 1-10.

Table 1-10: Maximum row and column length—APL and DOL

Locking scheme	Page size	Maximum row length	Maximum column length
APL tables	2K (2048 bytes)	1962 bytes	1960 bytes
	4K (4096 bytes)	4010 bytes	4008 bytes
	8K (8192 bytes)	8106 bytes	8104 bytes
	16K (16384 bytes)	16298 bytes	16296 bytes
DOL tables	2K (2048 bytes)	1964 bytes	1958 bytes
	4K (4096 bytes)	4012 bytes	4006 bytes
	8K (8192 bytes)	8108 bytes	8102 bytes
	16K (16384 bytes)	16300 bytes	16294 bytes If table does not include any variable-length columns
	16K (16384 bytes)	16300 (subject to a max start offset of varlen = 8191)	8191-6-2 = 8183 bytes If table includes at least one variable-length column.*
	* This size includes six bytes for the row overhead and two bytes for the row length field		

- The maximum number of bytes of variable length data per row depends on the locking scheme for the table:

Page size	Maximum row length	Maximum column length
2K (2048 bytes)	1962	1960
4K (4096 bytes)	4010	4008
8K (8192 bytes)	8096	8104
16K (16384 bytes)	16298	16296

The maximum size of columns for a DOL table:

Page size	Maximum row length	Maximum column length
2K (2048 bytes)	1964	1958
4K (4096 bytes)	4012	4006
8K (8192 bytes)	8108	8102
16K (16384 bytes)	16300	16294

- If you create a DOL table with a variable-length column that exceeds a 8191-byte offset, you cannot add any rows to the column.
- If you create tables with varchar, nvarchar, univarchar, or varbinary columns for which total defined width is greater than the maximum allowed row size, a warning message appears, but the table is created. If you try to insert more than the maximum number bytes into such a row, or to update a row so that its total row size is greater than the maximum length, Adaptive Server produces an error message, and the command fails.
- When a create table command occurs within an if...else block or a while loop, Adaptive Server creates the schema for the table before determining whether the condition is true. This may lead to errors if the table already exists. To avoid this situation, either make sure a view with the same name does not already exist in the database or use an execute statement, as follows:

```
if not exists
    (select * from sysobjects where name="my table")
begin
execute "create table mytable (x int)"
end
```

- You cannot issue create table with a declarative default or check constraint and then insert data into the table in the same batch or procedure. Either separate the create and insert statements into two different batches or procedures, or use execute to perform the actions separately.
- You cannot use the following variable in create table statements that include defaults:

```
declare @p int
select @p = 2
create table t1 (c1 int default @p, c2 int)
```

  Doing so results in error message 154: “Variable is not allowed in default.”
- Virtually-hashed tables have these restrictions:

SQL user-defined functions are not currently supported with create proxy table, create table at remote server, or alter table.

Note The execution of SQL functions requires the syntax username.functionname().

- Virtually-hashed tables must have unique rows. Virtually hashed tables do not allow multiple rows with the same key-column values because Adaptive Server cannot keep one row in the hash region and another with the same key-column value in the overflow clustered region.
- You must create each virtually-hashed table on an exclusive segment.

Creating compressed tables

- Unless you state otherwise, Adaptive Server:
  - Sets data compression to NULL when you create a table.
  - Preserves the existing compression level when you modify a table.
  - Sets all partitions to the compression level specified in the create table clause.
- You can create a table with table-level compression but leave some partitions uncompressed, which allows you to maintain uncompressed data in an active partitions format, and to periodically compress the data when appropriate.
- Adaptive Server supports partition-level compression for all forms of partitioning except round-robin partitions.
- Columns marked as not compressed are not selected for row or page compression. However, in-row columns (including materialized computed columns) are eligible for compression:
  - All fixed-length data smaller than 4 bytes is ineligible for row compression. However, Adaptive Server may compress these datatypes during page-index compression.
  - All data, fixed or with a variable length of 4 bytes or larger, is eligible for row compression.
- By default, Adaptive Server creates uncompressed nonmaterialized computed columns.

- Adaptive Server first compresses the columns eligible for compression at the row level. If the compressed row is longer than the uncompressed row, Adaptive Server discards the compressed row and stores the uncompressed row on disk, ensuring that compression does not waste space.
- Data pages may simultaneously contain compressed and uncompressed data rows.
- You may compress fixed-length columns.
- You can use the with exp_row_size clause to create compressed data-only-locked (DOL) tables only for fixed-length rows. You cannot use the with exp_row_size clause on allpages-locked (APL) tables.
- If you specify an expected row size, but the uncompressed row length is smaller than the expected row size, Adaptive Server does not compress the row.
- After you enable compression for a table, all bcp and DML operations that are executed on the table compress the data.
- Compression may allow you to store more rows on a page, but it does not change the maximum row size of a table. However, it can change the effective minimum row size of a table.
- Use not compressed for columns that could be row- or page-index compressed, but for which the nature of the column makes compression inapplicable or meaningless (for example, columns that use the bit datatype, encryption, or a timestamp column).
- Compressing a table does not compress its indexes.

Restrictions for compression

- You cannot compress:
  - System tables
  - Worktables
  - In-row Java columns
  - Nonmaterialzed computed columns
  - IDENTITY columns
  - Timestamps added for data transfer
  - All datatypes; see the *Compression Users Guide* for a list of unsupported datatypes

    - Encrypted columns

- You cannot create a table for compression if the minimum row size exceeds the size of the maximum user data row for the configured locking scheme and page size combination. For example, you cannot create a data-only-locked table with a 2K page size that includes column c1 with a char(2007) datatype because it exceeds the maximum user data row size. For row and page compression, Adaptive Server performs the same row size check as for a new table.
- You cannot create a table for row or page compression that has only short, fixed-length columns smaller than 4 bytes.

Compressing tables that use large object (LOB) data

Compressing data on LOB tables include these restrictions. You cannot:

- Compress computed text columns
- Issue LOB compression clauses (for example, lob_compression =) on regular columns, XML data
- Use LOB compression for system and worktables

Column definitions

- When you create a column from a user-defined datatype:
    - You cannot change the length, precision, or scale.
    - You can use a NULL type to create a NOT NULL column, but not to create an IDENTITY column.
    - You can use a NOT NULL type to create a NULL column or an IDENTITY column.
    - You can use an IDENTITY type to create a NOT NULL column, but the column inherits the IDENTITY property. You cannot use an IDENTITY type to create a NULL column.
- Only columns with variable-length datatypes can store null values. When you create a NULL column with a fixed-length datatype, Adaptive Server automatically converts it to the corresponding variable-length datatype. Adaptive Server does not inform the user of the type change.

  Table 1-11 lists the fixed-length datatypes and the variable-length datatypes to which they are converted. Certain variable-length datatypes, such as moneyn, are reserved types that cannot be used to create columns, variables, or parameters:

Table 1-11: Variable-length datatypes used to store nulls

Original fixed-length datatype	Converted to
char	varchar
nchar	nvarchar
binary	varbinary
datetime	datetimn
float	floatn
bigint, int, smallint, tinyint	intn
unsigned bigint, unsigned int, unsigned smallint	uintn
decimal	decimaln
numeric	numericn
money and smallmoney	moneyn

- You can create column defaults in two ways: by declaring the default as a column constraint in the create table or alter table statement, or by creating the default using the create default statement and binding it to a column using sp_bindefault.
- For a report on a table and its columns, execute the system procedure sp_help.

Temporary tables

- Temporary tables are stored in the temporary database, tempdb.
- The first 13 characters of a temporary table name must be unique per session. Such tables can be accessed only by the current Adaptive Server session. They are stored in tempdb..objects by their names plus a system-supplied numeric suffix, and they disappear at the end of the current session or when they are explicitly dropped.
- Temporary tables created with the "tempdb.." prefix are shareable among Adaptive Server user sessions. Create temporary tables with the "tempdb.." prefix from inside a stored procedure only if you intend to share the table among users and sessions. To avoid inadvertent sharing of temporary tables, use the "#" prefix when creating and dropping temporary tables in stored procedures.

- Temporary tables can be used by multiple users during an Adaptive Server session. However, the specific user session usually cannot be identified because temporary tables are created with the "guest" user ID of 2. If more than one user runs the process that creates the temporary table, each user is a "guest" user, so the uid values are all identical. Therefore, there is no way to know which user session in the temporary table is for a specific user. The system administrator can add the user to the temporary table using create login, in which case the individual uid is available for that user's session in the temporary table.
- You can associate rules, defaults, and indexes with temporary tables, but you cannot create views on temporary tables or associate triggers with them.
- When you create a temporary table, you can use a user-defined datatype only if the type is in tempdb..systypes. To add a user-defined datatype to tempdb for only the current session, execute sp_addtype while using tempdb. To add the datatype permanently, execute sp_addtype while using model, then restart Adaptive Server so that model is copied to tempdb.

Using indexes

- A table "follows" its clustered index. If you create a table on one segment, then create its clustered index on another segment, the table migrates to the segment where the index is created.
- You can make inserts, updates, and selects faster by creating a table on one segment and its nonclustered indexes on another segment, if the segments are on separate physical devices. See Chapter 12, "Using clustered or nonclustered indexes," in *Transact-SQL User's Guide*.

Renaming a table or its columns

- Use sp_rename to rename a table or column.
- After renaming a table or any of its columns, use sp_depends to determine which procedures, triggers, and views depend on the table, and redefine these objects.

Warning! If you do not redefine these dependent objects, they no longer work after Adaptive Server recompiles them.

Defining integrity constraints

- The create table statement helps control a database's integrity through a series of integrity constraints as defined by the SQL standards. These integrity constraint clauses restrict the data that users can insert into a table. You can also use defaults, rules, indexes, and triggers to enforce database integrity.

  Integrity constraints offer the advantages of defining integrity controls in one step during the table creation process and of simplifying the creation of those integrity controls. However, integrity constraints are more limited in scope and less comprehensive than defaults, rules, indexes, and triggers.

- You must declare constraints that operate on more than one column as table-level constraints; declare constraints that operate on only one column as column-level constraints. Although the difference is rarely noticed by users, column-level constraints are checked only if a value in the column is being modified, while the table-level constraints are checked if there is any modification to a row, regardless of whether or not it changes the column in question.

  Place column-level constraints after the column name and datatype, before the delimiting comma (see Example 5). Enter table-level constraints as separate comma-delimited clauses (see Example 4). Adaptive Server treats table-level and column-level constraints the same way; neither way is more efficient than the other.

- You can create the following types of constraints at the table level or the column level:

  - A unique constraint does not allow two rows in a table to have the same values in the specified columns. In addition, a primary key constraint disallows null values in the column.
  - A **referential integrity** (references) constraint requires that the data being inserted or updated in specific columns has matching data in the specified table and columns.
  - A check constraint limits the values of the data inserted into the columns.

  You can also enforce data integrity by restricting the use of null values in a column (using the null or not null keywords) and by providing default values for columns (using the default clause).

- You can use sp_primarykey, sp_foreignkey, and sp_commonkey to save information in system tables, which can help clarify the relationships between tables in a database. These system procedures do not enforce key relationships or duplicate the functions of the primary key and foreign key keywords in a create table statement. For a report on keys that have been defined, use sp_helpkey. For a report on frequently used joins, execute sp_helpjoins.
- Transact-SQL provides several mechanisms for integrity enforcement. In addition to the constraints you can declare as part of create table, you can create rules, defaults, indexes, and triggers. Table 1-12 summarizes the integrity constraints and describes the other methods of integrity enforcement:

Table 1-12: Methods of integrity enforcement

In create table	Other methods
unique constraint	create unique index (on a column that allows null values)
primary key constraint	create unique index (on a column that does not allow null values)
references constraint	create trigger
check constraint (table level)	create trigger
check constraint (column level)	create trigger or create rule and sp_bindrule
default clause	create default and sp_bindefault

The method you choose depends on your requirements. For example, triggers provide more complex handling of referential integrity (such as referencing other columns or objects) than those declared in create table. Also, the constraints defined in a create table statement are specific for that table; unlike rules and defaults, you cannot bind them to other tables, and you can only drop or change them using alter table. Constraints cannot contain subqueries or aggregate functions, even on the same table.

- create table can include many constraints, with these limitations:
  - The number of unique constraints is limited by the number of indexes that a table can have.
  - A table can have only one primary key constraint.
  - You can include only one default clause per column in a table, but you can define different constraints on the same column.

  For example:

```
create table discount_titles
 (title_id   varchar (6)   default "PS7777" not null
        unique clustered
```

```
            references titles (title_id)
            check (title_id like "PS%"),
                new_price   money)
```

Column title_id of the new table discount_titles is defined with each integrity constraint.

- You can create error messages and bind them to referential integrity and check constraints. Create messages with sp_addmessage and bind them to the constraints with sp_bindmsg. See sp_addmessage and sp_bindmsg.
- Adaptive Server evaluates check constraints before enforcing the referential constraints, and evaluates triggers after enforcing all the integrity constraints. If any constraint fails, Adaptive Server cancels the data modification statement; any associated triggers do not execute. However, a constraint violation *does not* roll back the current transaction.
- In a referenced table, you cannot update column values or delete rows that match values in a referencing table. Update or delete from the referencing table first, then try updating or deleting from the referenced table.
- You must drop the referencing table before you drop the referenced table; otherwise, a constraint violation occurs.
- For information about constraints defined for a table, use sp_helpconstraint.

Unique and primary key constraints

- You can declare unique constraints at the column level or the table level. unique constraints require that all values in the specified columns be unique. No two rows in the table can have the same value in the specified column.
- A primary key constraint is a more restrictive form of unique constraint. Columns with primary key constraints cannot contain null values.

Note The create table statement's unique and primary key constraints create indexes that define unique or primary key attributes of columns. sp_primarykey, sp_foreignkey, and sp_commonkey define logical relationships between columns. These relationships must be enforced using indexes and triggers.

- Table-level unique or primary key constraints appear in the create table statement as separate items and must include the names of one or more columns from the table being created.

- unique or primary key constraints create a unique index on the specified columns. The unique constraint in Example 3 creates a unique, clustered index, as does:

```
create unique clustered index salesind
    on sales (stor_id, ord_num)
```

  The only difference is the index name, which you could set to salesind by naming the constraint.

- The definition of unique constraints in the SQL standard specifies that the column definition cannot allow null values. By default, Adaptive Server defines the column as not allowing null values (if you have not changed this using sp_dboption) when you omit null or not null in the column definition. In Transact-SQL, you can define the column to allow null values along with the unique constraint, since the unique index used to enforce the constraint allows you to insert a null value.
- unique constraints create unique, nonclustered indexes by default; primary key constraints create unique, clustered indexes by default. There can be only one clustered index on a table, so you can specify only one unique clustered or primary key clustered constraint.
- The unique and primary key constraints of create table offer a simpler alternative to the create index statement. However:
  - You cannot create nonunique indexes.
  - You cannot use all the options provided by create index.
  - You must drop these indexes using alter table drop constraint.

Referential integrity constraints

- Referential integrity constraints require that data inserted into a *referencing* table that defines the constraint must have matching values in a *referenced* table. A referential integrity constraint is satisfied for either of the following conditions:
  - The data in the constrained columns of the referencing table contains a null value.
  - The data in the constrained columns of the referencing table matches data values in the corresponding columns of the referenced table.

Using the pubs2 database as an example, a row inserted into the salesdetail table (which records the sale of books) must have a valid title_id in the titles table. salesdetail is the referencing table and titles table is the referenced table. Currently, pubs2 enforces this referential integrity using a trigger. However, the salesdetail table could include this column definition and referential integrity constraint to accomplish the same task:

```
title_id tid
    references titles (title_id)
```

- The maximum number of table references allowed for a query is 192. Use sp_helpconstraint to check a table's referential constraints.
- A table can include a referential integrity constraint on itself. For example, the store_employees table in pubs3, which lists employees and their managers, has the following self-reference between the emp_id and mgr_id columns:

```
emp_id id primary key,
mgr_id id null
        references store_employees (emp_id),
```

  This constraint ensures that all managers are also employees, and that all employees have been assigned a valid manager.

- You cannot drop a referenced table until the referencing table is dropped or the referential integrity constraint is removed (unless it includes only a referential integrity constraint on itself).
- Adaptive Server does not enforce referential integrity constraints for temporary tables.
- To create a table that references another user's table, you must have references permission on the referenced table. For information about assigning references permissions, see the grant command.
- Table-level, referential integrity constraints appear in the create table statement as separate items. They must include the foreign key clause and a list of one or more column names.

  Column names in the references clause are optional only if the columns in the referenced table are designated as a primary key through a primary key constraint.

  The referenced columns must be constrained by a unique index in that referenced table. You can create that unique index using either the unique constraint or the create index statement.

- The datatypes of the referencing table columns must match the datatypes of the referenced table columns. For example, the datatype of col1 in the referencing table (test_type) matches the datatype of pub_id in the referenced table (publishers):

```
create table test_type
 (col1 char (4) not null
    references publishers (pub_id),
col2 varchar (20) not null)
```

- The referenced table must exist when you define the referential integrity constraint. For tables that cross-reference one another, use the create schema statement to define both tables simultaneously. As an alternative, create one table without the constraint and add it later using alter table. See create schema or alter table for more information.
- The create table referential integrity constraints offer a simple way to enforce data integrity. Unlike triggers, constraints cannot:
  - Cascade changes through related tables in the database
  - Enforce complex restrictions by referencing other columns or database objects
  - Perform "what-if" analysis

  Referential integrity constraints do not roll back transactions when a data modification violates the constraint. Triggers allow you to choose whether to roll back or continue the transaction depending on how you handle referential integrity.

  Note Adaptive Server checks referential integrity constraints before it checks any triggers, so a data modification statement that violates the constraint does not also fire the trigger.

Using cross-database referential integrity constraints

- When you create a cross-database constraint, Adaptive Server stores the following information in the sysreferences system table of each database:

Table 1-13: Information stored for referential integrity constraints

Information stored in sysreferences	Columns with information about the referenced table	Columns with information about the referencing table
Key column IDs	refkey1 through refkey16	fokey1 through fokey16
Table ID	reftabid	tableid
Database ID	pmrydbid	frgndbid
Database name	pmrydbname	frgndbname

- You can drop the referencing table or its database. Adaptive Server automatically removes the foreign-key information from the referenced database.
- Because the referencing table depends on information from the referenced table, Adaptive Server does not allow you to:
  - Drop the referenced table,
  - Drop the external database that contains the referenced table, or
  - Use sp_renamedb to rename either database.

  You must use alter table to remove the cross-database constraint before you can do any of these actions.
- Each time you add or remove a cross-database constraint, or drop a table that contains a cross-database constraint, dump *both* of the affected databases.

Warning! Loading earlier dumps of databases containing cross-database constraints may cause database corruption.

- The sysreferences system table stores the name and the ID number of the external database. Adaptive Server cannot guarantee referential integrity if you use load database to change the database name or to load it onto a different server.

Warning! Before dumping a database to load it with a different name or move it to another Adaptive Server, use alter table to drop all external referential integrity constraints.

check constraints

- A check constraint limits the values a user can insert into a column in a table. A check constraint specifies a *search_condition* that any non-null value must pass before it is inserted into the table. A *search_condition* can include:
  - A list of constant expressions introduced with in
  - A range of constant expressions introduced with between
  - A set of conditions introduced with like, which can contain wildcard characters

An expression can include arithmetic operators and Transact-SQL built-in functions. The *search_condition* cannot contain subqueries, aggregate functions, or a host variable or parameter. Adaptive Server does not enforce check constraints for temporary tables.

- A column-level check constraint can reference only the column in which it is defined; it cannot reference other columns in the table. Table-level check constraints can reference any column in the table.
- create table allows multiple check constraints in a column definition.
- check integrity constraints offer an alternative to using rules and triggers. They are specific to the table in which they are created, and cannot be bound to columns in other tables or to user-defined datatypes.
- check constraints do not override column definitions. If you declare a check constraint on a column that allows null values, you can insert NULL into the column, implicitly or explicitly, even though NULL is not included in the *search_condition*. For example, if you create a check constraint specifying “pub_id in (“1389”, “0736”, “0877”, “1622”, “1756”)” or “@amount > 10000” in a table column that allows null values, you can still insert NULL into that column. The column definition overrides the check constraint.

IDENTITY columns

- The first time you insert a row into the table, Adaptive Server assigns the IDENTITY column a value of 1. Each new row gets a column value that is 1 higher than the last value. This value takes precedence over any defaults declared for the column in the create table statement or bound to the column with sp_bindefault.

  The maximum value that can be inserted into an IDENTITY column is $10^{precision} - 1$ for a numeric. For integer identities, it is the maximum permissible value of its type (such as 255 for tinyint, 32767 for smallint).

  See Chapter 1, “System and User-Defined Datatypes” in *Reference Manual: Building Blocks* for more information about identifiers.
- Inserting a value into the IDENTITY column allows you to specify a seed value for the column or to restore a row that was deleted in error. The table owner, database owner, or system administrator can explicitly insert a value into an IDENTITY column after using set identity_insert *table_name* on for the base table. Unless you have created a unique index on the IDENTITY column, Adaptive Server does not verify the uniqueness of the value. You can insert any positive integer.

- You can reference an IDENTITY column using the syb_identity keyword, qualified by the table name where necessary, instead of using the actual column name.
- System administrators can use the auto identity database option to automatically include a 10-digit IDENTITY column in new tables. To turn on this feature in a database, use:

  ```
  sp_dboption database_name, "auto identity", "true"
  ```

  Each time a user creates a table in the database without specifying a primary key, a unique constraint, or an IDENTITY column, Adaptive Server automatically defines an IDENTITY column. This column, SYB_IDENTITY_COL, is not visible when you retrieve columns with the select * statement. You must explicitly include the column name in the select list.
- Server failures can create gaps in IDENTITY column values. Gaps can also occur due to transaction rollbacks, the deletion of rows, or the manual insertion of data into the IDENTITY column. The maximum size of the gap depends on the setting of the identity burning set factor and identity grab size configuration parameters, or the identity_gap value given in the create table or select into statment. See “Managing Identity Gaps in Tables” in Chapter 7, “Creating Databases and Tables” in the *Transact-SQL Users Guide*.

Specifying a locking scheme

To specify the locking scheme for a table, use the keyword lock and one of the following locking schemes:

- Allpages locking, which locks data pages and the indexes affected by queries
- Datapages locking, which locks only data pages
- Datarows locking, which locks only data rows

If you do not specify a locking scheme, the default locking scheme for the server is used. The server-wide default is set with the configuration parameter lock scheme.

You can use alter table to change the locking scheme for a table.

Space management properties

- The space management properties fillfactor, max_rows_per_page, exp_row_size, and reservepagegap help manage space usage for tables in the following ways:

- fillfactor leaves extra space on pages when indexes are created, but the fillfactor is not maintained over time.
- max_rows_per_page limits the number of rows on a data or index page. Its main use is to improve concurrency in allpages-locked tables, since reducing the number of rows can reduce lock contention. If you specify a max_rows_per_page value and datapages or datarows locking, a warning message is printed. The table is created, and the value is stored in sysindexes, but it is applied only if the locking scheme is changed later to allpages.
- exp_row_size specifies the expected size of a data row. It applies only to data rows, not to indexes, and applies only to data-only-locked tables that have variable-length columns. It is used to reduce the number of forwarded rows in data-only-locked tables. It is needed mainly for tables where rows have null or short columns when first inserted, but increase in size as a result of subsequent updates. exp_row_size reserves space on the data page for the row to grow to the specified size. If you specify exp_row_size when you create an allpages-locked table, a warning message is printed. The table is created, and the value is stored in sysindexes, but it is applied only if the locking scheme is changed later to datapages or datarows.
- reservepagegap specifies the ratio of empty pages to full pages to apply for commands that perform extent allocation. It applies to both data and index pages, in all locking schemes.

- Table 1-14 shows the valid combinations of space management properties and locking scheme. If a create table command includes incompatible combinations, a warning message is printed and the table is created. The values are stored in system tables, but are not applied. If the locking scheme for a table changes so that the properties become valid, then they are used.

Table 1-14: Space management properties and locking schemes

Property	allpages	datapages	datarows
max_rows_per_page	Yes	No	No
exp_row_size	No	Yes	Yes
reservepagegap	Yes	Yes	Yes
fillfactor	Yes	Yes	Yes

- Table 1-15 shows the default values and the effects of using default values for the space management properties.

Table 1-15: Defaults and effects of space management properties

Property	Default	Effect of using the default
max_rows_per_page	0	Fits as many rows as possible on the page, up to a maximum of 255
exp_row_size	0	Uses the server-wide default value, which is set with the configuration parameter default exp_row_size percent
reservepagegap	0	Leaves no empty pages during extent allocations
fillfactor	0	Fully packs leaf pages, with space left on index pages

Using *reservepagegap*

- Commands that use large amounts of space allocate new space by allocating an extent rather than allocating single pages. The reservepagegap keyword causes these commands to leave empty pages so that subsequent page allocations happen close to the page being split or close to the page from which a row is being forwarded. Table 1-16 shows when reservepagegap is applied.

Table 1-16: When reservepagegap is applied

Command	Applies to data pages	Applies to index pages
Fast bcp	Yes	Fast bcp is not used if indexes exist
Slow bcp	Only for heap tables, not for tables with a clustered index	Extent allocation not performed
select into	Yes	No indexes exist on the target table
create index or alter table...constraint	Yes, for clustered indexes	Yes
reorg rebuild	Yes	Yes
alter table...lock (For allpages-locking to data-only locking, or vice versa)	Yes	Yes

- The reservepagegap value for a table is stored in sysindexes and is applied when any of the above operations on a table are executed. Use sp_chgattribute to change the stored value.
- reservepagegap is not applied to worktables or sorts on worktables.

Getting information about tables

- sp_help displays information about tables, listing any attributes (such as cache bindings) assigned to the specified table and its indexes, giving the attribute's class, name, integer value, character value, and comments.
- sp_depends displays information about the views, triggers, and procedures in the database that depend on a table.
- sp_helpindex reports information about the indexes created on a table.

- sp_helpartition reports information about the table's partition properties.

Creating tables with partitions

- Before you create a table with partitions, you must prepare the disk devices and segments that you will use for the partitions.
- Range partitioning is dependent on sort order. If the sort order is changed, you must repartition the table for the new sort order.
- Range-partition bounds must be in ascending order according to the order in which the partitions are created.
- A olumn of text, unitext, image, or bit, Java datatype, or computed column cannot be part of a partition key, but a partitioned table can include columns with these datatypes. A composite partition key can contain up to 31 columns.
- For range and hash partitions, the partition key can be a composite key with as many as 31 columns. In general, however, a table with more than four partition columns becomes hard to manage and is not useful.
- Bound values for range and list partitions must be compatible with the corresponding partition key datatype. If a bound value is specified in a compatible but different datatype, Adaptive Server converts the bound value to the partition key's datatype. Adaptive Server does not support:
  - Explicit conversions.
  - Implicit conversions that result in data loss.
  - NULL as a boundary in a range-partitioned table.
  - Conversions from nonbinary datatypes to binary or varbinary datatypes.
- You can use NULL in a value list for list-partitioned tables.
- You can partition a table that contains text and image columns, but partitioning has no effect on the way Adaptive Server stores the text and image columns because they reside on their own partition.
- You cannot partition remote tables.
- Adaptive Server considers NULL to be lower than any other partition key value for a given parition key column.

Creating tables with computed columns

- *computed_column_expression* can reference only columns in the same table.

- The deterministic property of *computed_column_expression* significantly affects data operations. See "Deterministic property" in the *Transact-SQL Users Guide*.
- Computed columns cannot have default values, and cannot be identity or timestamp columns.
- You can specify nullability only for materialized computed columns. If you do not specify nullability, all computed columns are, by default, nullable. Virtual computed columns are always nullable.
- Triggers and constraints, such as check, rule, unique, primary key, or foreign key) support only materialized computed columns. You cannot use them with virtual computed columns.
- If a user-defined function in a computed column definition is dropped or becomes invalid, any computed column operations that call that function fail.

Creating tables with encrypted columns

- You can encrypt these datatypes:
  - int, smallint, tinyint
  - unsigned int, unsigned smallint, unsigned tinyint
  - bigint, unsigned bigint
  - decimal, numeric
  - float4, float8
  - money, smallmoney
  - date, time, smalldatetime, datetime, bigdatetime
  - char, varchar
  - unichar, univarchar
  - binary, varbinary
  - bit
- The underlying datatype of encrypted data on disk is varbinary. Null values are not encrypted.
- create table displays an error if you:
  - Specify a computed column based on an expression that references one or more encrypted columns.

  - Use the encrypt and compute parameters on the same column.
  - List an encrypted column in the partition clause
- During create table, alter table, and select into operations, Adaptive Server calculates the maximum internal length of the encrypted column. The database owner must know the maximum length of the encrypted columns before he or she can make decisions about schema arrangements and page sizes.
- You can create an index on an encrypted column if you specify the encryption key without any initialization vector or random padding. Adpative Server issues an error if you execute create index on an encrypted column with an initialization vector or random padding.
- You can define referential integrity constraints on encrypted columns when:
  - Both referencing and referenced columns are encrypted.
  - The key you use to encrypt the columns specifies init_vector null and you have not specified pad random.
- You cannot encrypt a computed column, and an encrypted column cannot appear in the expression defining a computed column. You cannot specify an encrypted column in the *partition_clause* of create table.

  See Chapter 3, "Encrypted Data," in the *User Guide for Encrypted Columns*.

Limitations when creating virtually hashed tables

- You cannot use create table on the segment that includes a virtually hashed table, since a virtually hashed table must take only one exclusive segment, which cannot be shared by other tables or databases.
- Virtually hashed tables must have unique rows. Virtually hashed tables do not allow multiple rows with the same key column values because Adaptive Server cannot keep one row in the hash region and another with the same key column value in the overflow clustered region.
- truncate table is not supported. Use delete from *table_name* instead.
- SQL92 does not allow two unique constraints on a relation to have the same key columns. However, the primary key clause for a virtually hashed table is not a standard unique constraint, so you can declare a separate unique constraint with the same key columns as the virtually hashed keys.
- Because you cannot create a virtually hashed clustered index after you create a table, you also cannot drop a virtually hashed clustered index.

- You must create a virtually hashed table on an exclusive segment. You cannot share disk devices you assign to the segments for creating a virtually hashed table with other segments.
- You cannot create two virtually hashed tables on the same exclusive segment. Adaptive Server supports 32 different segments per database. Three segments are reserved for the default, system, and log segments, so the maximum number of virtually-hashed tables per database is 29.
- You cannot use the alter table or drop clustered index commands on virtually hashed tables.
- Virtually hashed tables must use all-pages locking.
- The key columns and hash factors of a virtually hashed table must use the int datatype.
- You cannot include text or image columns in virtually hashed tables, or columns with datatypes based on the text or image datatypes.
- You cannot create a partitioned virtually hashed table.

Creating tables for in-memory and relaxed durability databases

- Table-level logging settings defined by create table also apply to tables created via select into.
- Although you can create tables with minimal logging in databases using full durability, the databases do not use minimal logging for these tables. Adaptive Server allows you to set these tables to minimal logging so you can use these databases as templates for other databases with durability set to no_recovery, where minimal logging takes effect in the dependent database.

Determining values for hash_factor

You can keep the hash factor for the first key as 1. The hash factor for all the remaining key columns is greater than the maximum value of the previous key allowed in the hash region multiplied by its hash factor.

Adaptive Server allows tables with hash factors greater than 1 for the first key column to have fewer rows on a page. For example, if a table has a hash factor of 5 for the first key column, after every row in a page, space for the next four rows is kept empty. To support this, Adaptive Server requires five times the amount of table space.

If the value of a key column is greater than or equal to the hash factor of the next key column, the current row is inserted in the overflow clustered region to avoid collisions in the hash region.

For example, t is a virtually hashed table with key columns id and age, and corresponding hash factors of (10,1). Because the hash value for rows (5, 5) and (2, 35) is 55, this may result in a hash collision.

However, because the value 35 is greater than or equal to 10 (the hash factor for the next key column, id), Adaptive Server stores the second row in the overflow clustered region, avoiding collisions in the hash region.

In another example, if u is a virtually hashed table with a primary index and hash factors of (id1, id2, id3) = (125, 25, 5) and a *max hash_value* of 200:

- Row (1,1,1) has a hash value of 155 and is stored in the hash region.
- Row (2,0,0) has a hash value 250 and is stored in overflow clustered region.
- Row (0,0,6) has a hash factor of 6 x 5, which is greater than or equal to 25, so it is stored in the overflow clustered region.
- Row (0,7,0) has a hash factor of 7 x 25, which is greater than or equal to 125, so it is stored in the overflow clustered region

Restrictions for shared-disk clusters

- You cannot include a referential integrity constraint that references a column on a local temporary database unless it is from a table on the same local temporary database. create table fails if it attempts to create a reference to a column on a local temporary database from a table in another database.
- You cannot encrypt a column with an encryption key stored in a local temporary database unless the column's table resides on the same local temporary database. alter table fails if it attempts to encrypt a column with an encryption key on the local temporary database and the table is in another database.

Java-SQL columns

- If Java is enabled in the database, you can create tables with Java-SQL columns. Refer to *Java in Adaptive Server Enterprise* for detailed information.
- The declared class (*datatype*) of the Java-SQL column must implement either the Serializable or Externalizable interface.
- When you create a table, you cannot specify a Java-SQL column:
    - As a foreign key
    - In a references clause

- As having the UNIQUE property
- As the primary key

- If in row is specified, the value stored cannot exceed 16K bytes, depending on the page size of the database server and other variables.
- If off row is specified:
  - The column cannot be referenced in a check constraint.
  - The column cannot be referenced in a select that specifies distinct.
  - The column cannot be specified in a comparison operator, in a predicate, or in a group by clause.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

Transact-SQL extensions include:

- Use of a database name to qualify a table or column name
- IDENTITY columns
- The not null column default
- The asc and desc options
- The reservepagegap option
- The lock clause
- The on *segment_name* clause

  See Chapter 1, “System and User-Defined Datatypes”of *Reference Manual: Building Blocks* for datatype compliance information.

Permissions

create table permission defaults to the database owner, who can transfer it to other users. Any user can create temporary tables and new tables with logging disabled.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo

10	create	create table	• *Roles* – current active roles
			• *Keywords or options* – NULL
			• *Previous value* – NULL
			• *Current value* – NULL
			• *Other information* – NULL
			• *Proxy information* – original login name, if set proxy is in effect
			• If the with option for with transfer table [on | off] is:
			  • on – Adaptive Server prints `WITH TRANSFER TABLE ON` in the extra info in the audit record.
			  • off – Adaptive Server prints `WITH TRANSFER TABLE OFF`.

See also

Commands alter table, create existing table, create index, create rule, create schema, create view, drop index, drop rule, drop table

System procedures sp_addmessage, sp_addsegment, sp_addtype, sp_bindmsg, sp_chgattribute, sp_commonkey, sp_depends, sp_foreignkey, sp_help, sp_helpjoins, sp_helpsegment, sp_primarykey, sp_rename, sp_spaceused

create thread pool

Description

Creates a user-defined thread pool.

Considerations for process mode

create thread pool is not supported in process mode.

Syntax

create thread pool *pool_name* with thread count = *count*
[, pool description = *description*]
[idle timeout = *time_period*]

Parameters

pool_name
name of the pool you are creating.

thread count = *count*
number of threads in the pool. Must be greater than or equal to 1.

pool description = *description*
(Optional) describes the pool's purpose. Must be fewer than 256 characters.

idle timeout = *time_period*
time, in microseconds, that threads look for work before going to sleep. The default is 100 microseconds. A value of -1 means the threads never go to sleep, and continue to consume CPU if no work is available. A value of 0 indicates that threads immediately go to sleep if they find no work.

Examples

Example 1 Creates a thread pool named sales_pool with 10 threads:

```
create thread pool sales_pool with thread count = 10
```

Example 2 Creates a thread pool named order_pool, which includes a description:

```
create thread pool order_pool with thread count = 10,
pool description = 'used for handling order entry users'
```

Example 3 Creates a thread pool named order_pool with 2 threads and an idle timeout of 500 microseconds:

```
create thread pool order_pool with thread count = 2,
idle timeout = 500
```

Usage

- Use sp_addexeclass to associate workload with a user-created thread pool.
- Adaptive Server must have a sufficient number of free engines to bring online all threads (specified by *count*) in an engine pool. The value for max online engines determines the total number of engines. The total number of active threads in all engine pools cannot exceed the value of max online engines.

- *pool_name* cannot start with syb_, which is reserved for Sybase-created thread pools.
- You cannot use Transact-SQL variables as parameters to create thread pool.
- A value of 0 for idle timeout 0 indicates that threads immediately go to sleep if they find no work.
- A value of -1 for idle timeout 0 indicates that threads never go to sleep, and continue to consume CPU if no work is available.
- You can issue create thread pool with execute immediate.

Standards

ANSI SQL – Compliance level: Transact-SQL extension

Permissions

create thread pool permission defaults to the system administrator. create thread pool permission is not included in the grant all command.

Auditing

Event	Audit option	Command or access audited	Information in extrainfo
42			Pool name and thread count

create trigger

Description

Creates a trigger, which is a type of stored procedure that is often used for enforcing integrity constraints. A trigger executes automatically when a user attempts a specified data modification statement on a specified table.

Syntax

```
create trigger [owner.]trigger_name
        on [owner.]table_name
        {for {insert , update} | instead of {insert, update, delete}}
        [as
            [if update (column_name)
                [{and | or} update (column_name)]...]
                SQL_statements
            [if update (column_name)
                [{and | or} update (column_name)]...
                SQL_statements]...]
```

Parameters

trigger_name

is the name of the trigger, which must conform to the rules for identifiers and be unique in the database. Specify the owner's name to create another trigger of the same name owned by a different user in the current database. The default value for *owner* is the current user. If you use an owner name to qualify a trigger, you must explicitly qualify the table name the same way.

You cannot use a variable for a trigger name.

table_name

is the name of the table on which to create the trigger. If more than one table of the same name exists in the database, specify the owner's name. The default value for *owner* is the current user.

for | instead of

for – used before insert, delete, or update to indicate what you are creating the trigger for.

instead of – creates and fills the inserted and deleted **pseudo tables**, which are used in the trigger to examine the rows that would have been modified by the original insert, delete, or update query.

insert, update, delete

can be included in any combination. delete cannot be used with the if update clause.

SQL_statements

specifies trigger conditions and trigger actions. Trigger conditions determine whether the attempted insert, update, or delete causes the trigger actions to be carried out. The SQL statements often include a subquery preceded by the keyword if. In Example 2, below, the subquery that follows the keyword if is the trigger condition.

Trigger actions take effect when the user action (insert, update, or delete) is attempted. If multiple trigger actions are specified, they are grouped with begin and end.

See “Triggers and transactions” on page 267 for a list of statements that are not allowed in a trigger definition. See “The deleted and inserted logical tables” on page 265 for information about the deleted and inserted logical tables that can be included in trigger definitions.

if update

tests whether the specified column is included in the set list of an update statement or is affected by aninsert. if update allows specified trigger actions to be associated with updates to specified columns (see Example 3). More than one column can be specified, and you can use more than one if update statement in a create trigger statement (see Example 5).

Examples

Example 1 Prints a message when anyone tries to add data or change data in the titles table:

```
create trigger reminder
on titles
for insert, update as
print "Don't forget to print a report for accounting."
```

Example 2 Prevents insertion of a new row into titleauthor if there is no corresponding title_id in the titles table:

```
create trigger t1
on titleauthor
for insert as
if (select count (*)
    from titles, inserted
    where titles.title_id = inserted.title_id) = 0
begin
print "Please put the book's title_id in the
        titles table first."
rollback transaction
end
```

Example 3 If the pub_id column of the publishers table is changed, make the corresponding change in the titles table:

```
create trigger t2
on publishers
for update as
if update (pub_id) and @@rowcount = 1
begin
    update titles
    set titles.pub_id = inserted.pub_id
    from titles, deleted, inserted
    where deleted.pub_id = titles.pub_id
end
```

Example 4 Deletes title from the titles table if any row is deleted from titleauthor. If the book was written by more than one author, other references to it in titleauthor are also deleted:

```
create trigger t3
on titleauthor
for delete as
begin
    delete titles
    from titles, deleted
    where deleted.title_id = titles.title_id
    delete titleauthor
    from titleauthor, deleted
    where deleted.title_id = titleauthor.title_id
    print "All references to this title have been
    deleted from titles and titleauthor."
end
```

Example 5 Prevents updates to the primary key on weekends. Prevents updates to the price or advance of a title unless the total revenue amount for that title surpasses its advance amount:

```
create trigger stopupdatetrig
on titles
for update
as
if update (title_id)
  and datename (dw, getdate ())
  in ("Saturday", "Sunday")
  begin
    rollback transaction
    print "We don't allow changes to"
    print "primary keys on the weekend!"
  end
if update (price) or update (advance)
  if (select count (*) from inserted
    where (inserted.price * inserted.total_sales)
```

```
< inserted.advance) > 0
begin
rollback transaction
print "We don't allow changes to price or"
print "advance for a title until its total"
print "revenue exceeds its latest advance."
end
```

Example 6 Uses instead of triggers to update union views:

```
create table EmployeeWest (

    empid                         int primary key,
    empname                       varchar(30),
    empdob                        datetime,
    region                        char(5)
        constraint region_chk
           check (region='West'))

create table EmployeeEast (
    empid                         int primary key,
    empname                       varchar(30),
    empdob                        datetime,
    region                        char(5)
        constraint region_chk
           check (region='East’))

create view Employees as
    select * from EmployeeEast
    union all
    select * from EmployeeWest

create trigger EmployeesInsertTrig on Employees
instead of insert as
begin

    insert into EmployeeEast select * from inserted where region = "East"

    insert into EmployeeWest select * from inserted where region = "West"
end

--will insert the data into the EmployeeEast table
insert into Employees values (10, 'Jane Doe', '11/11/1967', 'East')

--will insert the data into the EmployeeWest table
insert into Employees values (11, 'John Smith', '01/12/1977', 'West')
```

```
--will insert multiple rows into EmployeeEast and
--EmployeeWest tables. Employee2 table includes employees
--from both East and West.
insert into Employees select * from Employee2
```

Example 7 Uses instead of triggers to implement encrypted column support, storing data in the database in encrypted form without changing applications (the user-defined functions, my_encrypt and my_decrypt, perform the encryption and decryption operations on the data):

```
CREATE TABLE Employee_t (id int PRIMARY KEY, name varchar(20),
            salary binary (64))
--where the id and name columns are stored unencrypted, salary is
--encrypted and id is a primary key.

create view employee_v as select id, name, my_decrypt (salary)
from employee_t

CREATE TRIGGER EmployeeInsert
ON employee_v
INSTEAD OF INSERT
AS
BEGIN
    INSERT employee_t SELECT id, name, my_encrypt (salary)
    FROM inserted
END

CREATE TRIGGER employeeUpdate
ON employee_v
INSTEAD OF UPDATE
AS
BEGIN
    DELETE FROM employee_t WHERE id IN (SELECT id FROM deleted)
    INSERT employee_t SELECT id, name, my_encrypt (salary)
    FROM inserted
END

CREATE TRIGGER employeeDelete
ON employee_v
INSTEAD OF DELETE
AS
BEGIN
    DELETE FROM employee_t WHERE id IN (SELECT id FROM deleted)
END
```

Usage

- To avoid seeing unexpected results due to changes in settings, run set rowcount 0 as your initial statement before executing create trigger. The scope of set is limited to only the create trigger command, and resets to your previous setting once the procedure exits.
- A trigger fires only once per data modification statement. A complex query containing a while loop may repeat an update or insert many times, and the trigger is fired each time.

Triggers and referential integrity

- Triggers are commonly used to enforce **referential integrity** (integrity rules about relationships between the primary and foreign keys of tables or views), to supply cascading deletes, and to supply cascading updates (see Examples 2, 3, and 4, respectively).
- A trigger fires only after the data modification statement has completed and Adaptive Server has checked for any datatype, rule, or integrity constraint violations. The trigger and the statement that fires it are treated as a single transaction that can be rolled back from within the trigger. If a severe error is detected, the entire transaction is rolled back.
- You can also enforce referential integrity using constraints defined with the create table statement as an alternative to using create trigger. See create table and alter table for information about integrity constraints.

The *deleted* and *inserted* logical tables

- deleted and inserted are logical (conceptual) tables. They are structurally identical to the table for which the trigger is defined—that is, the table on which the user action is attempted—and hold the old values or new values of the rows that would be changed by the user action.

Note Both inserted and deleted tables appear as views on the transaction log, but they are fake tables on syslogs.

- deleted and inserted tables can be examined by the trigger to determine whether or how the trigger action should be carried out, but the tables themselves cannot be altered by the trigger's actions.
- deleted tables are used with delete and update; inserted tables, with insert and update. An update is a delete followed by an insert: it affects the deleted table first, and then the inserted table.

Trigger restrictions

- You can create a trigger only in the current database. If you use an owner name to qualify a trigger, you must explicitly qualify the table name the same way. A trigger can reference objects outside the current database.
- A trigger cannot apply to more than one table. However, the same trigger action can be defined for more than one user action (for example, insert and update) in the same create trigger statement. A table can have a maximum of three triggers—one each for insert, update, and delete.
- Each new trigger in a table or column for the same operation (insert, update, or delete) overwrites the previous one. No warning message appears before the previous trigger is overwritten.
- You cannot create a trigger on a session-specific temporary table.
- You cannot create a trigger on a view.
- You cannot create a trigger on a system table.
- You cannot use triggers that select from a text, unitext, or image column of the inserted or deleted table.
- Sybase recommends that triggers not include select statements that return results to the user, since special handling that allows modifications to the trigger table must be written into every application program for the returned results.
- If a trigger references table names, column names, or view names that are not valid identifiers, you must set quoted_identifier on before the create trigger command, and enclose each such name in double quotes. The quoted_identifier option does not need to be on when the trigger fires.

Triggers and performance

- In performance terms, trigger overhead is usually very low. The time involved in running a trigger is spent mostly in referencing other tables, which are either in memory or on the database device.
- The deleted and inserted tables often referenced by triggers are always in memory rather than on the database device, because they are logical tables. The location of other tables referenced by the trigger determines the amount of time the operation takes.

Setting options within triggers

You can use the set command inside a trigger. The set option you invoke remains in effect during the execution of the trigger, then reverts to its former setting. In particular, you can use the self_recursion option inside a trigger so that data modifications by the trigger itself can cause the trigger to fire again.

Dropping a trigger

- You must drop and re-create the trigger if you rename any of the objects referenced by the trigger. You can rename a trigger with sp_rename.
- When you drop a table, any triggers associated with it are also dropped.

Actions that do not cause triggers to fire

- A truncate table command is not caught by a delete trigger. Although a truncate table statement is, in effect, like a delete without a where clause (it removes all rows), changes to the data rows are not logged, and so cannot fire a trigger.

  Since permission for the truncate table command defaults to the table owner and is not transferable, only the table owner need worry about inadvertently circumventing a delete trigger with a truncate table statement.
- The writetext command, whether logged or unlogged, does not cause a trigger to fire.

Triggers and transactions

- When a trigger is defined, the action it specifies on the table to which it applies is always implicitly part of a transaction, along with the trigger itself. Triggers are often used to roll back an entire transaction if an error is detected, or they can be used roll back the effects of a specific data modification:
  - When the trigger contains the rollback transaction command, the rollback aborts the entire batch, and any subsequent statements in the batch are not executed.
  - When the trigger contains the rollback trigger, the rollback affects only the data modification that caused the trigger to fire. The rollback trigger command can include a raiserror statement. Subsequent statements in the batch are executed.
- Since triggers execute as part of a transaction, the following statements and system procedures are not allowed in a trigger:

    - All create commands, including create database, create default, create index, create procedure, create rule, create table, create trigger, and create view
    - All drop commands
    - alter database and alter table
    - truncate table
    - grant and revoke
    - update statistics
    - sp_configure
    - load database and load transaction
    - disk init, disk refit, disk reinit, disk remirror, disk remirror, disk unmirror
    - select into

- If a desired result (such as a summary value) depends on the number of rows affected by a data modification, use *@@rowcount* to test for multirow data modifications (an insert, delete, or update based on a select statement), and take appropriate actions. Any Transact-SQL statement that does not return rows (such as an if statement) sets *@@rowcount* to 0, so the test of *@@rowcount* should occur at the beginning of the trigger.

Inserting and updating triggers

- When an insert or update command executes, Adaptive Server adds rows to both the trigger table and the inserted table at the same time. The rows in the inserted table are always duplicates of one or more rows in the trigger table.
- An update or insert trigger can use the if update command to determine whether the update or insert changed a particular column. if update (*column_name*) is true for an insert statement whenever the column is assigned a value in the select list or in the values clause. An explicit NULL or a default assigns a value to a column and thus activates the trigger. An implicit NULL, however, does not.

  For example, if you create the following table and trigger:

  ```
  create table junk
   (aaa int null,
  bbb int not null)
  create trigger trigtest on junk
  for insert as
  if update (aaa)
  ```

```
    print "aaa updated"
if update (bbb)
    print "bbb updated"
```

Inserting values into either column or into both columns fires the trigger for both column aaa and column bbb:

```
insert junk (aaa, bbb)
values (1, 2)
aaa updated
bbb updated
```

Inserting an explicit NULL into column aaa also fires the trigger:

```
insert junk
values (NULL, 2)
aaa updated
bbb updated
```

If there was a default for column aaa, the trigger would also fire.

However, with no default for column aaa and no value explicitly inserted, Adaptive Server generates an implicit NULL and the trigger does not fire:

```
insert junk (bbb)
values (2)
bbb updated
```

if update is never true for a delete statement.

Nesting triggers and trigger recursion

- By default, Adaptive Server allows nested triggers. To prevent triggers from nesting, use sp_configure to set the allow nested triggers option to 0 (off):

  ```
  sp_configure "allow nested triggers", 0
  ```

- Triggers can be nested to a depth of 16 levels. If a trigger changes a table on which there is another trigger, the second trigger fires and can then call a third trigger, and so forth. If any trigger in the chain sets off an infinite loop, the nesting level is exceeded and the trigger aborts, rolling back the transaction that contains the trigger query.

Note Since triggers are put into a transaction, a failure at any level of a set of nested triggers cancels the entire transaction: all data modifications are rolled back. Supply your triggers with messages and other error handling and debugging aids to determine where the failure occurred.

- The global variable *@@nestlevel* contains the nesting level of the current execution. Each time a stored procedure or trigger calls another stored procedure or trigger, the nesting level is incremented. The nesting level is also incremented by one when a cached statement is created. If the maximum of 16 is exceeded, the transaction aborts.
- If a trigger calls a stored procedure that performs actions that would cause the trigger to fire again, the trigger is reactivated only if nested triggers are enabled. Unless there are conditions within the trigger that limit the number of recursions, this causes a nesting-level overflow.

  For example, if an update trigger calls a stored procedure that performs an update, the trigger and stored procedure execute once if allow nested triggers is off. If allow nested triggers is on, and the number of updates is not limited by a condition in the trigger or procedure, the procedure or trigger loop continues until it exceeds the 16-level maximum nesting value.
- By default, a trigger does not call itself in response to a second data modification to the same table within the trigger, regardless of the setting of the allow nested triggers configuration parameter. A set option, self_recursion, enables a trigger to fire again as a result of a data modification within the trigger. For example, if an update trigger on one column of a table results in an update to another column, the update trigger fires only once when self_recursion is disabled, but it can fire up to 16 times if self_recursion is set on. The allow nested triggers configuration parameter must also be enabled in order for self-recursion to take place.

instead of and for triggers

- You can interleave nesting instead of and for triggers. For example, an update statement on a view with an instead of update trigger causes the trigger to execute. If the trigger contains a SQL statement updating a table with a for trigger defined on it, that trigger fires. The for trigger may contain a SQL statement that updates another view with an instead of trigger that then executes, and so forth.
- instead of and for triggers have different recursive behaviors. for triggers support recursion, while instead of triggers do not. If an instead of trigger references the same view on which the trigger was fired, the trigger is not called recursively. Rather, the triggering statement applies directly to the view; in other words, the statement is resolved as modifications against the base tables underlying the view. In this case, the view definition must meet all restrictions for an updatable view. If the view is not updatable, an error is raised.

  For example, if a trigger is defined as an instead of update trigger for a view, the update statement executed against the same view within the instead of trigger does not cause the trigger to execute again. The update exercised by the trigger is processed against the view, as though the view did not have an instead of trigger. The columns changed by the update must be resolved to a single base table.

Restrictions for instead of:

- If a trigger references table names, column names, or view names that are not valid identifiers, you must set quoted_identifier on before the create trigger command, and enclose each such name in double quotation marks. The quoted_identifier option does not need to be on when the trigger fires; bracketed identifiers also work.
- Using the set cursor rows command with client cursors, cursors declared through Open Client calls, or Embedded SQL™, may prevent positioned delete and update from firing an instead of trigger. A positioned update statement is a SQL update statement that contains the where current of <*cursorname*> clause to update only the row upon which the cursor, <*cursorname*>, is currently positioned.
- Joins are not allowed in searched delete and update statements that would fire an instead of trigger.
- positioned delete and update on cursors defined with joins does not fire an instead of trigger.

A positioned delete (or positioned update) is a SQL delete (or update) statement containing a where current of <*cursorname*> clause to delete (or update) only the row upon which the cursor, <*cursorname*>, is currently positioned.

- For positioned delete and update statements that fire an instead of trigger, the instead of trigger must exist when the cursor is declared.

Getting information about triggers

- The execution plan for a trigger is stored in sysprocedures.
- Each trigger is assigned an identification number, which is stored as a new row in sysobjects with the object ID for the table to which it applies in the deltrig column, and also as an entry in the deltrig, instrig, and updtrig columns of the sysobjects row for the table to which it applies.
- To display the text of a trigger, which is stored in syscomments, use sp_helptext.

  If the system security officer has reset the allow select on syscomments.text column parameter with sp_configure (as required to run Adaptive Server in the evaluated configuration), you must be the creator of the trigger or a system administrator to view the text of the trigger through sp_helptext.
- For a report on a trigger, use sp_help.
- For a report on the tables and views that are referenced by a trigger, use sp_depends.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only a system security officer can grant or revoke permissions to create triggers. The database owner has implicit permission to create a trigger on any user table. Users can create triggers only on tables that they own.

The system security officer may revoke user permission to create triggers. Revoking permission to create triggers affects only the database in which the systems security officer issues the revoke command. Permission to run the create trigger command is restored to the users whose permission was revoked when the system security officer explicitly grants them create trigger permission.

Permissions on objects at trigger creation When you create a trigger, Adaptive Server makes no permission checks on objects such as tables or views that the trigger references. Therefore, you can successfully create a trigger, even though you do not have access to its objects. All permission checks occur when the trigger fires.

Permissions on objects at trigger execution When the trigger executes, permission checks on its objects depend on whether the trigger and its objects are owned by the same user.

- If the trigger and its objects are not owned by the same user, the user who caused the trigger to fire must have been granted direct access to the objects. For example, if the trigger performs a select from a table the user cannot access, the trigger execution fails. In addition, the data modification that caused the trigger to fire is rolled back.
- If a trigger and its objects are owned by the same user, special rules apply. The user automatically has implicit permission to access the trigger's objects, even though the user cannot access them directly. See the detailed description of the rules for implicit permissions in the *System Administration Guide*.

Permissions for instead of and for triggers instead of triggers have the same permission requirements as for triggers: to create a view with instead of triggers, permission for insert/update/delete for the view, not the underlying tables, must be granted to the user.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
12	create	create trigger	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter table, create procedure, drop trigger, rollback trigger, set

System procedures sp_commonkey, sp_configure, sp_depends, sp_foreignkey, sp_help, sp_helptext, sp_primarykey, sp_rename, sp_spaceused

create view

Description

Creates a view, which is an alternative way to look at the data in one or more tables.

Syntax

```
create view [owner.]view_name
    [(column_name[, column_name]...)]
    as
    select [distinct] select_statement
    [with check option]
```

Parameters

view_name

is the name of the view. The name cannot include the database name. If you have set quoted_identifier on, you can use a delimited identifier. Otherwise, the view name cannot be a variable and must conform to the rules for identifiers. Specify the owner's name to create another view of the same name owned by a different user in the current database. The default value for *owner* is the current user.

column_name

specifies names to be used as headings for the columns in the view. If you have set quoted_identifier on, you can use a delimited identifier. Otherwise, the column name must conform to the rules for identifiers.

You can always supply column names, but they are required only on:

- A column is derived from an arithmetic expression, function, string concatenation, or constant
- Two or more columns have the same name (usually because of a join)
- You want to give a column in a view a different name than the column from which it is derived (see Example 3)

Column names can also be assigned in the select statement (see Example 4). If no column names are specified, the view columns acquire the same names as the columns in the select statement.

select

begins the select statement that defines the view.

distinct

specifies that the view cannot contain duplicate rows.

select_statement

completes the select statement that defines the view. The select statement can use more than one table, and other views.

with check option

indicates that all data modification statements are validated against the view selection criteria. All rows inserted or updated through the view must remain visible through the view.

Examples

Example 1 Creates a view derived from the title, type, price, and pubdate columns of the base table titles:

```
create view titles_view
as select title, type, price, pubdate
from titles
```

Example 2 Creates “new view” from “old view.” Both columns are renamed in the new view. All view and column names that include embedded blanks are enclosed in double quotation marks. Before creating the view, you must use set quoted_identifier on.

```
create view "new view" ("column 1", "column 2")
as select col1, col2 from "old view"
```

Example 3 Creates a view that contains the titles, advances, and amounts due for books that have a price less than $5.00:

```
create view accounts (title, advance, amt_due)
as select title, advance, price * total_sales
from titles
where price > $5
```

Example 4 Creates a view derived from two base tables, authors and publishers. The view contains the names and cities of authors who live in a city in which there is a publisher:

```
create view cities
 (authorname, acity, publishername, pcity)
as select au_lname, authors.city, pub_name,
publishers.city
from authors, publishers
where authors.city = publishers.city
```

Example 5 Creates a view with the same definition as in the previous example, but with column headings included in the select statement:

```
create view cities2
as select authorname = au_lname,
acity = authors.city, publishername = pub_name, pcity =
publishers.city
from authors, publishers
where authors.city = publishers.city
```

Example 6 Creates a view, author_codes, derived from titleauthor that lists the unique author identification codes:

```
create view author_codes
as select distinct au_id
from titleauthor
```

Example 7 Creates a view, price_list, derived from title that lists the unique book prices:

```
create view price_list (price)
as select distinct price
from titles
```

Example 8 Creates a view of the stores table that excludes information about stores outside of California. The with check option clause validates each inserted or updated row against the view's selection criteria. Rows for which state has a value other than "CA" are rejected:

```
create view stores_cal
as select * from stores
where state = "CA"
with check option
```

Example 9 Creates a view, stores_cal30, which is derived from stores_cal. The new view inherits the check option from stores_cal. All rows inserted or updated through stores_cal30 must have a state value of "CA". Because stores_cal30 has no with check option clause, you can insert or update rows through stores_cal30 for which payterms has a value other than "Net 30":

```
create view stores_cal30
as select * from stores_cal
where payterms = "Net 30"
```

Example 10 Creates a view, stores_cal30_check, derived from stores_cal. The new view inherits the check option from stores_cal. It also has a with check option clause of its own. Each row that is inserted or updated through stores_cal30_check is validated against the selection criteria of both stores_cal and stores_cal30_check. Rows with a state value other than "CA" or a payterms value other than "Net 30" are rejected:

```
create view stores_cal30_check
as select * from stores_cal
where payterms = "Net 30"
with check option
```

Example 11 Uses a SQL-derived table in creating a view:

```
create view psych_titles as
   select *
```

```
from (select * from titles
          where type = "psychology") dt_psych
```

Usage

- You can use views as security mechanisms by granting permission on a view, but not on its underlying tables.
- You can use sp_rename to rename a view.
- When you query through a view, Adaptive Server checks to make sure that all the database objects referenced anywhere in the statement exist, that they are valid in the context of the statement, and that data update commands do not violate data integrity rules. If any of these checks fail, you see an error message. If the checks are successful, create view "translates" the view into an action on the underlying tables.
- For more information about views, see the *Transact-SQL Users Guide*.

Restrictions on views

- You can create a view only in the current database.
- The number of columns referenced by a view cannot exceed 1024.
- You cannot create a view on a temporary table.
- You cannot create a trigger or build an index on a view.
- You cannot use readtext or writetext on text, unitext, or image columns in views.
- You cannot include order by, compute clauses, or the keyword into in the select statements that define views.
- You cannot update, insert, or delete from a view with select statements that include the union operator.
- If you create a view using a local or a global variable, Adaptive Server issues error message 7351: "Local or global variables not allowed in view definition."
- You can combine create view statements with other SQL statements in a single batch.

Warning! When a create view command occurs within an if...else block or a while loop, Adaptive Server creates the schema for the view before determining whether the condition is true. This may lead to errors if the view already exists. To avoid this, verify that a view with the same name does not already exist in the database or use an execute statement, as follows:

```
if not exists
    (select * from sysobjects where name="mytable")
begin
execute ("create table mytable (x int)")
end
```

View resolution

- If you alter the structure of a view's underlying tables by adding or deleting columns, the new columns do not appear in a view defined with a select * clause unless the view is dropped and redefined. The asterisk shorthand is interpreted and expanded when the view is first created.
- If a view depends on a table or view that has been dropped, Adaptive Server produces an error message when anyone tries to use the view. If a new table or view with the same name and schema is created to replace the one that has been dropped, the view again becomes usable.
- You can redefine a view without redefining other views that depend on it, unless the redefinition makes it impossible for Adaptive Server to translate any dependent views.

Modifying data through views

- delete statements are not allowed on multitable views.
- insert statements are not allowed unless all not null columns in the underlying table or view are included in the view through which you are inserting new rows. Adaptive Server cannot supply values for not null columns in the underlying table or view.
- You cannot insert directly to a computed column through a view. The value of computed columns can only be generated internally by Adaptive Server.
- insert statements are not allowed on join views created with distinct or with check option.
- update statements are allowed on join views with check option. The update fails if any of the affected columns appear in the where clause, in an expression that includes columns from more than one table.
- If you insert or update a row through a join view, all affected columns must belong to the same base table.
- You cannot update or insert into a view defined with the distinct clause.

- Data update statements cannot change any column in a view that is a computation, and cannot change a view that includes aggregates.

IDENTITY columns and views

- You cannot use the *column_name* = identity (*precision*) syntax to add a new IDENTITY column to a view.
- To insert an explicit value into an IDENTITY column, the table owner, database owner, or system administrator must set identity_insert *table_name* on for the column's base table, not through the view through which it is being inserted.

group by clauses and views

When creating a view for security reasons, be careful when using aggregate functions and the group by clause. A Transact-SQL extension allows you to name columns that do not appear in the group by clause. If you name a column that is not in the group by clause, Adaptive Server returns detailed data rows for the column. For example, this Transact- SQL extended column query returns a row for every 18 rows—more data than you might intend:

```
select title_id, type, sum (total_sales)
from titles
group by type
```

While this ANSI-compliant query returns one row for each type (6 rows):

```
select type, sum (total_sales)
from titles
group by type
```

See "group by and having clauses on page 461."

distinct clauses and views

- The distinct clause defines a view as a database object that contains no duplicate rows. A row is defined to be a duplicate of another row if all of its column values match the same column values in another row. Null values are considered to be duplicates of other null values.

  Querying a subset of a view's columns can result in what appear to be duplicate rows. If you select a subset of columns, some of which contain the same values, the results appear to contain duplicate rows. However, the underlying rows in the view are still unique. Adaptive Server applies the distinct requirement to the view's definition when it accesses the view for the first time (before it does any projection and selection) so that all the view's rows are distinct from each other.

You can specify distinct more than once in the view definition's select statement to eliminate duplicate rows, as part of an aggregate function or a group by clause. For example:

```
select distinct count (distinct title_id), price
from titles
```

- The scope of distinct applies only for that view; it does not cover any new views derived from the distinct view.

with check option clauses and views

- If a view is created with check option, each row that is inserted or updated through the view must meet the selection criteria of the view.
- If a view is created with check option, all views derived from the "base" view must satisfy its check option. Each row inserted or updated through the derived view must remain visible through the base view.

Getting information about views

- To create a report of the tables or views on which a view depends, and of objects that depend on a view, execute sp_depends.
- To display the text of a view, which is stored in syscomments, execute sp_helptext with the view name as the parameter.

Creating views from SQL-derived tables

- To create a view using a SQL-derived table, add the derived table expression in the from clause of the select part of the create view statement (see Example 11).
- A view created using a SQL-derived table can be updated if the derived table expression can be updated. The update rules for the derived table expression follow the update rules for the select part of the create view statement.
- Data can be inserted through a view that contains a SQL-derived table if the insert rules and permission settings for the derived table expression follow the insert rules and permission settings for the select part of the create view statement.
- Temporary tables and local variables are not permitted in a derived table expression that is part of a create view statement.
- SQL-derived tables cannot have unnamed columns.
- For more information about derived table expressions, see the *Transact-SQL Users Guide*.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The use of more than one distinct keyword and the use of "*column_heading = column_name*" in the select list are Transact-SQL extensions.

Permissions

create view permission defaults to the database owner, who can transfer it to other users.

Permissions on objects at view creation When you create a view, Adaptive Server makes no permission checks on objects, such as tables and views, that are referenced by the view. Therefore, you can create successfully a view even if you do not have access to its objects. All permission checks occur when a user invokes the view.

Permissions on objects at view execution When a view is invoked, permission checks on its objects depend on whether the view andall referenced objects are owned by the same user.

- If the view and its objects are not owned by the same user, the invoker must have been granted direct access to the objects. For example, if the view performs a select from a table the invoker cannot access, the select statement fails.
- If the view and its objects are owned by the same user, special rules apply. The invoker automatically has implicit permission to access the view's objects even though the invoker could not access them directly. Without having to grant users direct access to your tables, you can give them restricted access with a view. In this way, a view can be a security mechanism. For example, invokers of the view might be able to access only certain rows and columns of your table. A detailed description of the rules for implicit permissions is discussed in the *System Administration Guide*.
- If a column in the table is encrypted, you must have decrypt permission to select from the view. If the view and its objects are not owned by the same user, you must have decrypt permission on the encrypted column in the table to select from the view. If the view and its objects are owned by the same user, it is sufficient to grant decrypt permission to the user who must select from the view on the view column that corresponds to the encrypted column in the table.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
16	create	create view	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Documentation "Identifiers" in Chapter 4, "Expressions, Identifiers, and Wildcard Characters," of *Reference Manual: Building Blocks*

Commands create schema, drop view, select, update

System procedures sp_depends, sp_help, sp_helptext, sp_rename

dbcc

Description

Database consistency checker (dbcc) checks the logical and physical consistency of a database and provides statistics, planning, and repair functionality.

Certain dbbc commands apply only to shared-disk clusters. See the separately listed dbbc syntax for clusters.

Syntax

dbcc addtempdb (*dbid* |*database_name*)

dbcc checkalloc [(*database_name*[, fix | nofix])]

dbcc checkcatalog [(*database_name*[, fix])

dbcc checkdb [(*database_name*[, skip_ncindex])]

dbcc checkindex ({*table_name* | *table_id*}, *index_id*
    [, bottom_up[, *partition_name* | *partition_id*]])

dbcc checkstorage [(*database_name*)]

dbcc checktable (*table_name* | *table_id*
    [, skip_ncindex | fix_spacebits | "check spacebits" |
    bottom_up | NULL[, *partition_name* | *partition_id*)

dbcc checkverify (*dbname*[, *tblname*[, *ignore_exclusions*]])

dbcc complete_xact (*xid*, {["commit", “1pc”] | "rollback"})

dbcc dbrepair (*database_name*, dropdb)

dbcc engine ({offline, [*enginenum*] | "online"})

dbcc fix_text ({*table_name* | *table_id*})

dbcc forget_xact (*xid*)

dbcc indexalloc (*table_name* | *table_id*, *index_id*
    [, optimized | fast | NULL [, fix | nofix | NULL
    [, *partition_name* | *partition_id*]]])

dbcc monitor (increment, <*group name*>)

dbcc monitor (decrement, <*group name*>)

dbcc monitor (reset, <*group name*>)

dbcc pravailabletempdbs

dbcc rebuild_text (*table_name* | *table_id* | "all"[, column[, *text_page*
    [, *data_partition_name* | *data_partition_id*]]])

dbcc reindex ({*table_name* | *table_id*})

dbcc serverlimits

dbcc stackused

dbcc tablealloc (*table_name* | *table_id* [, full | optimized | fast | NULL
    [, fix | nofix | NULL [, *data_partition_name* | *data_partition_id*]]])

dbcc textalloc (*table_name* | *table_id* [, full | optimized | fast | NULL
    [, fix | nofix | NULL [, *data_partition_name* | *data_partition_id*]]])

dbcc {traceon | traceoff} (*flag* [, flag ...])

dbcc tune ({ascinserts, {0 | 1} , *table_name* |
    cleanup, {0 | 1} |
    cpuaffinity, *start_cpu* {, on| off} |
    des_greedyalloc, *dbid*, *object_name*,
        " {on | off}" | deviochar vdevno, "*batch_size*" |
    doneinproc {0 | 1}})

dbcc upgrade_object [(*dbid* | *dbname*
    [,[*database*.[*owner*].]*compiled_object_name*' |
        'check' | 'default' | 'procedure' | 'rule' |
        'trigger' | 'view'
        [, 'force']])

dbcc syntax for clusters only:

dbcc nodetraceon(*trace_flag_number*)
dbcc nodetraceoff(*trace_flag_number*)

dbcc set_scope_in_cluster("cluster"|"instance"|"scope")

dbcc quorum

Parameters

addtempdb

adds a temporary database to the global list of available temporary databases. If the database does not exist or is not a temporary database, an error is generated. If the database is already a member of the list, an informational message prints.

dbid

is the database ID.

database_name

is the name of the database to check. If no database name is given, dbcc uses the current database.

checkalloc

checks the specified database to see that all pages are correctly allocated and that no page that is allocated is not used. If no database name is given, checkalloc checks the current database. It always uses the optimized report option (see tablealloc).

checkalloc reports on the amount of space allocated and used.

fix | nofix

determines whether dbcc fixes the allocation errors found. The default mode for checkalloc is nofix. You must put the database into single-user mode to use the fix option. For details on page allocation in Adaptive Server, see the *System Administration Guide*.

checkcatalog

checks for consistency in and between system tables. For example, checkcatalog makes sure that every type in syscolumns has a matching entry in systypes, that every table and view in sysobjects has at least one column in syscolumns, and that the last checkpoint in syslogs is valid. See "Checking performed by dbcc checkcatalog" on page 302. You can use checkcatalog in an archive database, but not the fix version of checkcatalog.

checkcatalog also reports on any segments that have been defined. If no database name is given, checkcatalog checks the current database.

fix

determines whether dbcc fixes the sysindexes errors it finds. The default mode for checkcatalog is to not fix the errors. You must put the database into singleuser mode to use the fix option. The new sysindexes checks may result in new errors, not raised by dbcc checkcatalog, in Adaptive Servers earlier than version 12.5.2.

checkdb

runs the same checks as checktable, but on each table, including syslogs, in the specified database. If no database name is given, checkdb checks the current database. You can use checkdb in an archive database.

skip_ncindex

causes dbcc checktable or dbcc checkdb to skip checking the nonclustered indexes on user tables. The default is to check all indexes.

checkindex

runs the same checks as checktable, but only on the specified index. You can use checkindex in an archive database.

bottom_up

(Data-only-locked tables only) Checks indexes in a bottom-up order when specifying this option with checkindex. The bottom_up check involves verifying whether each data row has a corresponding index row.

partition_name | partition_id

is the name or ID of the data partition to check. If you specify a partition, dbcc skips global indexes.

checkstorage

checks the specified database for allocation, object allocation map (OAM) page entries, page consistency, text valued columns, allocation of text valued columns, and text column chains. The results of each dbcc checkstorage operation are stored in the dbccdb database. For details on using dbcc checkstorage, and on creating, maintaining, and generating reports from dbccdb, see the *System Administration Guide*.

dbcc checkstorage reports a soft fault if any data page that is not the first data page is empty for nonhashed tables, when creating virtually-hashed tables. However, dbcc checkstorage does not report this soft fault for the hashed region of a virtually-hashed table. Any data page in the hashed region of a virtually-hashed table can be empty.

checktable

checks the specified table to see that index and data pages are correctly linked, that indexes are in properly sorted order, that all pointers are consistent, that the data information on each page is reasonable, and that page offsets are reasonable. You can use checktable in an archive database.

Certain changes to dbcc checktable refer to virtually-hashed tables:

- In addition to the regular checks it performs, checktable verifies that the layout of data and OAM pages in the hash region is correct:
    - Data pages are not allocated in an extent reserved for OAM pages as per the layout.
    - The OAM pages are allocated only in the first extent of an allocation unit.

table_name | *table_id*

is the name or object ID of the table to check.

fix_spacebits

is for tables that use datapages or datarows locking, and checks for the validity of space bits and fixes any invalid space bits. Space bits are stored per page and indicate the room available in a page for new inserts.

check spacebits

checks space bits for tables that use datapages or datarows locking tables. If you specify check spacebits, dbcc does not check nonclustered indexes.

checkverify

verifies the results of the most recent run of dbcc checkstorage for the specified database. For details on using dbcc checkverify, see the *System Administration Guide*.

ignore_exclusions

enables or disables the exclusion list. Value is either 0, the default (enables the exclusion list), or 1 (disables the exclusion list).

complete_xact

heuristically completes a transaction by either committing or rolling back its work. Adaptive Server retains information about all heuristically completed transactions in the master.dbo.systransactions table, so that the external transaction coordinator may have some knowledge of how the transaction was completed.

Warning! Heuristically completing a transaction in the prepared state can cause inconsistent results for an entire distributed transaction. The system administrator's decision to heuristically commit or roll back a transaction may contradict the decision made by the coordinating Adaptive Server or protocol.

---

xid

is a transaction name from the systransactions.xactname column. You can also determine valid xid values using sp_transactions.

1pc

heuristically completes a transaction that was subject to a one-phase commit protocol optimization—instead of the regular two-phase commit protocol—by the external transaction manager that was coordinating its completion. This option allows the heuristic commit of a transaction that was not in the prepared state.

forget_xact

removes the completion status of a heuristically completed transaction from master.dbo.systransactions. forget_xact can be used when the system administrator does not want the coordinating service to have knowledge that a transaction was heuristically completed, or when an external coordinator is not available to clear commit status in systransactions.

Warning! Do not use dbcc forget_xact in a normal DTP environment, since the external transaction coordinator should be permitted to detect heuristically-completed transactions. X/Open XA-compliant transaction managers and Adaptive Server transaction coordination services automatically clear the commit status in systransactions.

---

dbrepair (*database_name*, dropdb)

drops a damaged database. drop database does not work on a damaged database.

No one can use the database being dropped when this dbcc statement is issued (including the user issuing the statement).

engine

takes Adaptive Server engines offline or brings them online. If *enginenum* is not specified, dbcc engine (offline) takes the highest-numbered engine offline. See Chapter 8, "Managing Multiprocessor Servers," in the *System Administration Guide*.

fix_text

upgrades text values after an Adaptive Server character set has been changed from any character set to a new multibyte character set.

Changing to a multibyte character set makes the internal management of text data more complicated. Since a text value can be large enough to cover several pages, Adaptive Server must be able to handle characters that span page boundaries. To do so, the server requires additional information on each of the text pages. The system administrator or table owner must run dbcc fix_text on each table that has text data to calculate the new values needed. See the *System Administration Guide*.

indexalloc

checks the specified index to see that all pages are correctly allocated and that no page that is allocated is not used. This is a smaller version of checkalloc, providing the same integrity checks on an individual index. You can use indexalloc in an archive database.

indexalloc produces the same three types of reports as tablealloc: full, optimized, and fast. If no type is indicated, or if you use null, Adaptive Server uses optimized. The fix | nofix option functions the same with indexalloc as with tablealloc.

Note You can specify fix or nofix only if you include a value for the type of report (full, optimized, fast, or null).

---

table_name | *table_id*

is the table's name or the table's object ID.

indid

is the ID of the index that is checked during dbcc indexalloc.

fix_spacebits
: is for tables of type datapages or datarows lockscheme, and checks for the validity of space bits and fixes any invalid space bits. Space bits are stored per page and indicate the room available in a page for new inserts.

check spacebits
: checks space bits for datapages or datarows locked tables. If you specify check spacebits, dbcc does not check nonclustered indexes.

full
: reports all types of allocation errors.

optimized
: produces a report based on the allocation pages listed in the object allocation map (OAM) pages for the index. It does not report and cannot fix unreferenced extents on allocation pages that are not listed in the OAM pages. The optimized option is the default.

fast
: does not produce an allocation report, but produces an exception report of pages that are referenced but not allocated in the extent (2521-level errors).

fix | nofix
: determines whether indexalloc fixes the allocation errors found in the table. The default is fix for all indexes except indexes on system tables, for which the default is nofix. To use the fix option with system tables, you must first put the database in single-user mode.

You can specify fix or nofix only if you include a value for the type of report (full, optimized, fast, or null).

partition_name | *partition_id*
: if you specify a partition ID, allocation checks are performed on the partition identified by (indid, partition id).

pravailabletempdbs
: prints the global list of available temporary databases.

rebuild_text
: rebuilds or creates an internal Adaptive Server 12.0 or later data structure for text, or unitext, image data. This data structure enables Adaptive Server to perform random access and asynchronous prefetch during data queries.You can run rebuild_text on all tables in a database, a single table, or a data partition.

table_name | *table_id* | "all"
: is the table's name or the table's object ID, or all the objects in the database.

column

is the ID or name of the column of the text column. dbcc rebuild_text rebuilds the internal data structure of each text value of this column.

text_page

is the logical page number of the first text page. dbcc rebuild_text rebuilds the internal data structure of this text page.

data_partition_name | *data_partition_id*

is name or ID of the data partition. If you specify *text_page*, *data_partition_name* (or *data_partition_id*) is ignored.

monitor increment, *group name*

The increment and decrement commands increase and decrease, by 1, the usage counts for the monitor counters in the specified group. The reset command sets the usage count for the monitor counters in the specified group to zero. This turns off collection of monitoring data for this group.

group name can be one of the following:

- 'all' – determine usage count for the all group, which comprises most of the monitor counters, by selecting the *@@monitors_active* global variable.
- spinlock_s – usage counts for spinlock_s reported by the dbcc resource command.
- appl – usage counts for appl reported by the dbcc resource command.

reindex

checks the integrity of indexes on user tables by running a fast version of dbcc checktable. It can be used with the table name or the table's object ID (the id column from sysobjects). reindex prints a message when it discovers the first index-related error, then drops and re-creates the suspect indexes. The system administrator or table owner must run dbcc reindex after the Adaptive Server sort order has been changed and indexes have been marked "suspect" by Adaptive Server.

When dbcc finds corrupt indexes, it drops and re-creates the appropriate indexes. If the indexes for a table are already correct, or if the table has no indexes, dbcc reindex does not rebuild the index, but prints an informational message instead.

dbcc reindex aborts if a table is suspected of containing corrupt data. When that happens, an error message instructs the user to run dbcc checktable. dbcc reindex does not allow reindexing of system tables. System indexes are checked and rebuilt, if necessary, as an automatic part of recovery after Adaptive Server is restarted following a sort order change.

stackused

reports the maximum amount of stack memory used since the server first started.

serverlimits

displays the limits Adaptive Server enforces on various entities, including the lengths of identifiers and the maximum number of different objects such as number of columns in a table, number of indexes on a table, page sizes, row-overheads, and so on. Use the information to determine the various sizing characteristics of the Adaptive Server process.

tablealloc

checks the specified table or data partition to see that all pages are correctly allocated, and that no page that is allocated is not used. This is a smaller version of checkalloc, providing the same integrity checks on an individual table. It can be used with the table name or the table's object ID (the id column from sysobjects). You can use tablealloc in an archive database. For an example of tablealloc output, see the *System Administration Guide*.

Three types of reports can be generated with tablealloc: full, optimized, and fast. If no type is indicated, or if you use null, Adaptive Server uses optimized.

textalloc

checks the allocation integrity of text or image pages in a database. You can use dbcc textalloc with an archive database.

full
: is equivalent to checkalloc at a table level; it reports all types of allocation errors.

optimized
: produces a report based on the allocation pages listed in the object allocation map (OAM) pages for the table. It does not report and cannot fix unreferenced extents on allocation pages that are not listed in the OAM pages. The optimized option is the default.

fast
: does not produce an allocation report, but produces an exception report of pages that are referenced but not allocated in the extent (2521-level errors).

fix | nofix
: determines whether or not tablealloc fixes the allocation errors found in the table. The default is fix for all tables except system tables, for which the default is nofix. To use the fix option with system tables, you must first put the database in single-user mode.

  You can specify fix or nofix only if you include a value for the type of report (full, optimized, fast, or null).

data_partition_name | *data_partition_id*
: is name or ID of the data partition to check. If you specify a partition, dbcc tablealloc skips global indexes.

traceon | traceoff
: toggles the printing of diagnostics during query optimization. Values 3604 and 3605 toggle, sending trace output to the user session and to the error log, respectively.

tune
: enables or disables tuning flags for special performance situations. You must reissue dbcc tune each time you restart Adaptive Server. For more information on the individual options, see *Performance and Tuning Guide: Basics*.

upgrade_object

upgrades a compiled object from the text stored in the syscomments table. The upgrade_object parameters are:

- *dbid* – specifies the database ID. If you do not specify *dbid*, all compiled objects in the current database are upgraded.
- *dbname* – specifies the database name. If you do not specify *dbname*, all compiled objects in the current database are upgraded.
- *compiled_object_name* – is the name of a specific compiled object you want to upgrade. If you use the fully qualified name, *dbname* and *database* must match, and you must enclose the fully qualified name in quotes. If the database contains more than one compiled object of the same name, use the fully qualified name. Otherwise, all objects with the same name are parsed, and if no errors are found, upgraded.
- check – upgrades all check constraints and rules. Referential constraints are not compiled objects and do not require upgrading.
- default – upgrades all declarative defaults and the defaults created with the create default command.
- procedure – upgrades all stored procedures.
- rule – upgrades all rules and check constraints.
- trigger – upgrades all triggers.
- view – upgrades all views.

  The keywords check, default, procedure, rule, trigger, and view specify the classes of compiled objects to be upgraded. When you specify a class, all objects in that class, in the specified database, are upgraded, provided that dbcc upgrade_object finds no errors or potential problem areas.

- force specifies that you want to upgrade the specified object even if it contains a select * clause. Do not use force unless you have confirmed that the select * statement will not return unexpected results. The force option does not upgrade objects that contain reserved words, contain truncated or missing source text, refer to nonexistent temporary tables, or do not match the quoted identifier setting. You must fix these objects before they can be upgraded.

check
: checks syntax for the specified compiled object in syscomments in the specified database. Does not raise errors on occurrences of select.

  For upgrade_object, upgrades all check constraints and rules. Referential constraints are not compiled objects and do not require upgrading.

force
: forces an upgrade of the object from syscomments even if an upgrade is not required.

object_name
: is the name of the compiled object.

object_type
: is one of the following object types that Adaptive Server compiles: procedure, function, view, trigger, default, rule, condition.

compiled_object_name
: is the name of a specific compiled object you want to upgrade. If you use the fully qualified name, *database_name* and *database* must match, and you must enclose the fully qualified name in quotes. If the database contains more than one compiled object of the same name, use the fully qualified name. Otherwise, all objects with the same name are parsed, and if no errors are found, upgraded.

default
: upgrades all declarative defaults and the defaults created with the create default command.

procedure
: upgrades all stored procedures.

rule
: upgrades all rules and check constraints.

trigger
: upgrades all triggers.

view
: upgrades all views.

The keywords check, default, procedure, rule, trigger, and view specify the classes of compiled objects to be upgraded. When you specify a class, all objects in that class, in the specified database, are upgraded, provided that dbcc upgrade_object finds no errors or potential problem areas.

force
specifies that you want to upgrade the specified object even if it contains a select * clause. Do not use force unless you have confirmed that the select * statement will not return unexpected results. The force option does not upgrade objects that contain reserved words, contain truncated or missing source text, refer to nonexistent temporary tables, or do not match the quoted identifier setting. You must fix these objects before they can be upgraded.

trace_flag_number
is the number of the trace flag you are enabling or disabling.

cluster
sets the dbcc command scope to the cluster. Subsequent dbcc commands have a cluster-wide effect.

instance
sets the dbcc command scope to the current instance. Subsequent dbcc commands affect only the local instance.

scope
displays the current scope of the dbcc command, either cluster or instance.

Examples

Example 1 Checks pubs2 for page allocation errors:

```
dbcc checkalloc (pubs2)
```

Example 2 Checks database consistency for pubs2 and places the information in the dbccdb database:

```
dbcc checkstorage (pubs2)
```

Example 3 Checks the salesdetail table:

```
dbcc checktable (salesdetail)
```

```
Checking salesdetail
The total number of pages in partition 1 is 3.
The total number of pages in partition 2 is 1.
The total number of pages in partition 3 is 1.
The total number of pages in partition 4 is 1.
The total number of data pages in this table is 10.
Table has 116 data rows.
DBCC execution completed. If DBCC printed error
messages, contact a user with system administrator (SA)
role.
```

Example 4 Heuristically aborts the transaction “distributedxact1:”

```
dbcc complete_xact (distributedxact1, "rollback")
```

Example 5 Upgrades text values for blurbs after a character set change:

```
dbcc fix_text (blurbs)
```

Example 6 Removes information for the transaction "distributedxact1" from master.dbo.systransactions:

```
dbcc forget_xact (distributedxact1)
```

Example 7 Returns a full report of allocation for the index with an indid of 2 on the titleauthor table and fixes any allocation errors:

```
dbcc indexalloc ("pubs..titleauthor", 2, full)
```

Example 8 Prints the global list of available temporary databases:

```
dbcc pravailabletempdbs
```

```
Available temporary databases are:
Dbid: 2
Dbid: 4
Dbid: 5
Dbid: 6
Dbid: 7
DBCC execution completed. If DBCC printed error
messages, contact a user with system administrator (SA)
role.
```

Example 9 Rebuilds or creates an internal Adaptive Server data structure for all text and image columns in the blurbs table:

```
dbcc rebuild_text (blurbs)
```

Example 10 Checks part of the titles table that resides on the smallsales partition (which contains all booksales less than 5000)

```
dbcc checktable (titles, NULL, "smallsales")
```

Example 11 dbcc reindex has discovered one or more corrupt indexes in the titles table:

```
dbcc reindex (titles)
```

```
One or more indexes are corrupt. They will be rebuilt.
```

Example 12 Checks the maximum amount of stack memory used since Adaptive Server started:

```
dbcc stackused
```

Example 13 Upgrades all stored procedures in the listdb database:

```
dbcc upgrade_object(listdb, 'procedure')
```

Example 14 Upgrades all rules and check constraints in the listdb database. Double quotes are used around rule because set quoted identifiers is off.

```
dbcc upgrade_object(listdb, list_proc)
```

Example 15 Displays an abridged output showing various forms of limits in your Adaptive Server:

```
dbcc serverlimits

Limits independent of page size:
================================

Server-wide, Database-specific limits and sizes

Max engines per server                                               : 128
Max number of logins per server                                      : 2147516416
Max number of users per database                                     : 2146484223
Max number of groups per database                                    : 1032193
Max number of user-defined roles per server                          : 1024
Max number of user-defined roles per (user) session                  : 127
Min database page size                                               : 2048
Max database page size                                               : 16384
...

Database page-specific limits

APL page header size                                                 : 32
DOL page header size                                                 : 44
Max reserved page gap                                                : 255
Max fill factor                                                      : 100

Table, Index related limits

Max number of columns in a table/view                                : 1024
Max number of indexes on a table                                     : 250
Max number of user-keys in a single index on an unpartitioned table   : 31
Max number of user-keys in a single local index on a partitioned table : 31
...
General SQL related

Max size of character literals, sproc parameters                     : 16384
Max size of local @variables in T-SQL                                : 16384
Max number of arguments to stored procedures                         : 2048
Max number of arguments to dynamic SQL                               : 2048
Max number of aggregates in a COMPUTE clause                         : 254
...

Maximum lengths of different Identifiers

Max length of server name                                            : 30
```

```
Max length of host name                                                    : 30
Max length of login name                                                   : 30
Max length of user name                                                    : 30
...

Limits as a function of the page size:
======================================

Item dependent on page size                : 2048    4096    8192    16384
---------------------------------------------------------------------------

Server-wide, Database-specific limits and sizes

Min number of virtual pages in master device     : 11780 22532 45060 90116
Default number of virtual pages in master device : 23556 45060 90116 180228
Min number of logical pages in master device     : 11776 11264 11264 11264
Min number of logical pages in tempdb                : 2048 1536 1536 1536

Table-specific row-size limits

Max possible size of a log-record row on APL log page : 2014 4062 8158 16350

Physical Max size of an APL data row, incl row-overheads : 1962 4010 8106
16298
Physical Max size of a DOL data row, incl row-overheads : 1964 4012 8108
16300

Max user-visible size of an APL data row : 1960 4008 8104 16296
Max user-visible size of a DOL data row : 1958 4006 8102 16294
Max user-visible size of a fixed-length column in an APL table : 1960 4008
8104 16296
Max user-visible size of a fixed-length column in a DOL table : 1958 4006
8102 16294
...
```

Note To show a complete listing of limits in the server, execute dbcc traceon (3604) to get the output to the client session.

Example 16 Returns an optimized report of allocation for this table, but does not fix any allocation errors:

```
dbcc tablealloc (publishers, null, nofix)
```

Example 17 Performs allocation checks on the smallsales partition. All the local indexes on smallsales are included in the check, while the global indexes are excluded:

```
dbcc tablealloc (titles, null, null, smallsales)
```

Example 18 Uses sp_transactions to determine the name of a one-phase commit transaction that did not heuristically commit because it was not in a "prepared" state. The example then explains how to use the 1pc parameter to successfully commit the transaction:

```
sp_transactions

xactkey                         type    coordinator starttime
    state         connection dbid spid loid failover    srvname namelen
    xactname
------------------------------  ------- ---------- ---------
    ------------- ---------- ---- ---- ---- --------    --------- --------
    -------------
0xbc0500000b00000030c316480100 External XA          Feb 2 2004 1:07PM
    Done-Detached Detached       1   0 2099 Resident Tx NULL     88
    28_u7dAc31Wc380000000000000000000000000000000001HFpfSxkDM000FU_00003M00
        00Y_:SYBBEV0A_LRM
(1 row affected)

 (return status = 0)
```

If you try to commit this transaction, Adaptive Server issues an error message:

```
dbcc complete_xact
("28_u7dAc31Wc380000000000000000000000000000000001HFpfSxkDM000FU_00003M000
0Y_:SYBBEV0A_LRM", "commit"))
```

The error message Adaptive Server issues:

```
Msg 3947, Level 16, State 1:
Server 'PISSARRO_1251_P', Line 1:
A heuristic completion related operation failed. Please
see errorlog for more details.
DBCC execution completed. If DBCC printed error
messages, contact a user with system administrator (SA)
role.
```

Because the transaction is in a "done" state, you can use a one-phase commit protocol optimization to heuristically complete the transaction after verifying the transaction was committed. You can commit this transaction using the dbcc complete_xact ("1pc") parameter:

```
dbcc complete_xact
("28_u7dAc31Wc380000000000000000000000000000000001HFpfSxkDM000FU_00003M000
0Y_:SYBBEV0A_LRM", "commit", "1pc")
DBCC execution completed. If DBCC printed error messages, contact a user
with system administrator (SA) role.
```

You can remove the transaction from systransactions with the dbcc forget_xact command:

```
dbcc forget_xact
("28_u7dAc31Wc380000000000000000000000000000001HFpfSxkDM0
00FU_00003M0000Y_:SYBBEV0A_LRM")
DBCC execution completed. If DBCC printed error messages, contact a user
with system administrator (SA) role.
```

If you run sp_transactions again, the previous transaction does not appear:

```
sp_transactions
xactkey  type  coordinator  starttime  state  connection  dbid  spid
      loid   failover  srvnname  namelen  xactname
-------- ----- ------------ ---------- ------ ----------- ----- -----
      ------ --------- --------- -------- --------
 (0 row affected)
```

Example 19 Enables trace flag 3604:

```
dbcc nodetraceoff(3604)
DBCC execution completed. If DBCC printed error
messages, contact a user with system administrator (SA)
role.
```

Example 20 Sets the dbcc scope to the cluster:

```
dbcc set_scope_in_cluster('cluster')
```

Example 21 Sets the dbcc scope to the instance:

```
dbcc set_scope_in_cluster('instance')
```

Example 22 Displays the current scope for dbcc commands:

```
dbcc set_scope_in_cluster('scope')
```

Usage

- dbcc checkstorage reports a soft fault if any data page that is not the first data page is empty for nonhashed tables. However, dbcc checkstorage does not report this soft fault for the hashed region of a virtually-hashed table. Any data page in the hashed region of a virtually-hashed table can be empty.
- You can run dbcc while the database is active, except for the dbrepair (*database_name*, dropdb) option and dbcc checkalloc with the fix option.
- dbcc locks database objects as it checks them. For information on minimizing performance problems while using dbcc, see the dbcc discussion in the *System Administration Guide*.

- When dbcc commands are executing, users cannot access an archive database. If you attempt to access an archive database while dbcc commands are being performed, you receive a message saying that the database is in single-user mode.
- Most dbcc commands work with in-memory and relaxed durability databases.
- You can use variants of the dbcc commands on an archive database that is online or offline. However, you can use dbcc with a fix option only on an online archive database.
- To qualify a table or an index name with a user name or database name, enclose the qualified name in single or double quotation marks. For example:

  ```
  dbcc tablealloc ("pubs2.pogo.testtable")
  ```

- You cannot run dbcc reindex within a user-defined transaction.
- dbcc fix_text can generate a large number of log records, which may fill up the transaction log. dbcc fix_text is designed so that updates are performed in a series of small transactions: in case of a log space failure, only a small amount of work is lost. If you run out of log space, clear your log and restart dbcc fix_text using the same table that was being upgraded when the original dbcc fix_text failed.
- If you are using a replicated database and need to load a dump from an earlierversion of Adaptive Server to the current version, use dbcc dbrepair. For example:
  - Load a dump from a production system of the earlier version of Adaptive Server into a test system of the current version Adaptive Server, or
  - In a warm standby application, initialize a standby database of the current version of Adaptive Server with a database dump from an active database of the earlier version of Adaptive Server.
- If you attempt to use select, readtext, or writetext on text values after changing to a multibyte character set, and you have not run dbcc fix_text, the command fails, and an error message instructs you to run dbcc fix_text on the table. However, you can delete text rows after changing character sets without running dbcc fix_text.
- dbcc output is sent as messages or errors, rather than as result rows. Client programs and scripts should check the appropriate error handlers.

- If a table is partitioned, dbcc checktable returns information about each partition.
- text and image data that has been upgraded to Adaptive Server version 12.x or later is not automatically upgraded from its original storage format. To improve query performance and enable prefetch for this data, use the rebuild_text keyword against the upgraded text and image columns.
- The amount of stack memory used in the past is only an indication of possible future needs. Adaptive Server may require more stack memory than it used in the past. Periodically run dbcc stackused to find your current stack memory usage.
- dbcc upgrade_object check is used to detect syscomments text corruption caused by Adaptive Server defects that occurred before you upgraded Adaptive Server. This syscomments text corruption is serious because it causes the upgrade process to fail.
- If any error is reported by dbcc upgrade_object check, you must drop and re-create the *compiled_object*.

dbcc complete_xact

dbcc complete_xact enables a system administrator to commit or roll back a distributed transaction in circumstances where the external transaction coordinator cannot. In versions of Adaptive Server earlier than 15.0, a transaction could not heuristically committed unless it was in the “prepare” state, and the transaction coordinator used a two-phase commit protocol to commit the transaction. However, in some cases, a transaction coordinator may want to use a one-phase commit protocol as an optimization to commit the transaction.

1pc heuristically completes a transaction that was subject to a one-phase commit protocol optimization—instead of the regular two-phase commit protocol—by the external transaction manager that was coordinating its completion. Heuristically committing such a transaction requires that the transaction be in a “done” state (as reported by sp_transactions).

Note Before heuristically completing the transaction, the system administrator should make every effort to determine whether the coordinating transaction manager committed or rolled back the distributed transaction.

Checking performed by *dbcc checkcatalog*

dbcc checkcatalog checks that:

- For each row in sysindexes that maps to a range-, hash-, or list-partitioned table, there exists one row in sysobjects where sysindexes.conditionid equals sysobjects.id. dbcc checkcatalog also performs this check for each row in sysindexes that maps to a round-robin-partitioned table that has a partition condition.
- For each row in sysindexes that maps to a range-, hash-, or list-partitioned table, there exists one or more rows in sysprocedures where sysindexes.conditionid equals sysprocedures.id. dbcc checkcatalog also performs this check for each row in sysindexes that maps to a round-robin-partitioned table that has a partition condition.
- For each row in sysindexes that maps to a range-, hash-, or list-partitioned table, there exists one row in syspartitionkeys where the following conditions are true: sysindexes.id equals syspartitionkeys.id and sysindexes.indid equals syspartitionkeys.indid. dbcc checkcatalog also performs this check for each row in sysindexes that maps to a round-robin-partitioned table that has a partition condition.
- For each row in sysindexes, there exists one or more rows in syspartitions where both of the following conditions are true: sysindexes.id equals syspartitions.id and sysindexes.indid equals syspartitions.indid.
- For each row in sysobjects where type is N, there exists one row in sysindexes where sysindexes.conditionid equals sysobjects.id.
- For each row in syspartitions, there exists a row in sysindexes where the following conditions are true: syspartitions.id equals sysindexes.id and syspartitions.indid equals sysindexes.indid.
- For each row in syspartitionkeys, there exists a row in sysindexes where the following conditions are true: syspartitionkeys.id equals sysindexes.id and syspartitionkeys.indid equals sysindexes.indid.
- For each row in syspartitions, there exists one row in syssegments where the following condition is true: syspartitions.segments equals syssegments.segment.
- For each row in systabstats, there exists a row in syspartitions where the following conditions are true: syspartitions.id equals systabstats.id, syspartitions.indid equals systabstats.indid and syspartitions.partitionid equals systabstats.partitionid.

  Text indexes (indid=255) do not have entries in systabstats.
- For each row in sysstatistics, there exists a row in sysobjects where the following condition is true: sysstatistics.id equals sysobjects.id.

- For each encryption key row in sysobjects, Adaptive Server checks sysencryptkeys for a row defining that key.
- For each column in syscolumns marked for encryption, Adaptive Server verifies that a key-in sysobjects and sysencryptkeys.
- dbcc checkcatalog ensures that:
  - The corresponding base key is present in sysencryptkeys for every key copy in sysencryptkeys. If the base key is not present, Adaptive Server issues an error.
  - For every key copy, the corresponding uid is present in sysusers. If the uid is not present, Adaptive Server issues an error.
  - For every decrypt default defined on a column, that the corresponding decrypt default is present in sysobjects and sysattributes. If the corresponding decrypt default is not present, Adaptive Server issues an error.

Using dbcc checktable

If the log segment is on its own device, running dbcc checktable on the syslogs table reports the logs used and free space. For example:

```
Checking syslogs
The total number of data pages in this table is 1.
*** NOTICE: Space used on the log segment is 0.20 Mbytes, 0.13%.
*** NOTICE: Space free on the log segment is 153.4 Mbytes, 99.87%.

DBCC execution completed.  If dbcc printed error messages, see your system
administrator.
```

If the log segment is not on its own device, the following message appears:

```
*** NOTICE:  Notification of log space used/free cannot be reported because the
log segment is not on its own device.
```

In addition to the regular checks it performs, checktable verifies that the preallocation performed during table creation is correct:

- The number of pages preallocated matches the total number of data pages that must be allocated for the specified *max hash key* value.
- The data pages are not preallocated in an extent where the preallocation scheme specifies that only object allocation map (OAM) pages are allowed.
- The OAM pages are allocated only in the first extent of an allocation unit.

Using dbcc nodetraceoff and dbcc nodetraceon (clusters only)

dbcc traceon and dbcc traceoff apply trace flags for the entire cluster, while dbcc nodetraceoff and dbcc nodetraceon apply trace flags locally.

Using dbcc quorum (clusters only)

- dbcc quorum output goes to:
  - By default, terminal that started Adaptive Server
  - The client session if trace flag 3604 or 3605 is on
- dbcc quorum accepts an integer parameter for the number of view records to print. For example, to print the 20 most recently view records, use:

  ```
  dbcc quorum(20)
  ```
- If you do not include a parameter dbcc quorum prints the 10 most recent view records.
- Issue dbcc quorum (-1) to view all records.

Restrictions on dbcc checkstorage for shared-disk clusters:

- You cannot include instance-only named caches with dbcc checkstorage. dbcc checkstorage issues this error message if you do so:

  ```
  The cache %1! cannot be used because it is an
  instance only cache
  ```
- To run dbcc checkstorage against a local temporary database, you must run the command from the same instance that owns the local temporary database.
- For performance reasons, dbcc checkstorage in the Cluster Edition may not query the latest version of a page in the cluster. This may cause the Cluster Edition to report more soft faults than other versions.

  For well-partitioned applications where a single instance updates a database, dbcc checkstorage behaves as earlier non-Cluster Edition Adaptive Server versions.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Table owner Only the table owner can execute dbcc with checktable, fix_text, rebuild_text, or reindex.

Database owner Only the database owner can use checkstorage, checkdb, checkcatalog, checkalloc, indexalloc, and tablealloc.

system administrator Only a system administrator can use dbrepair, complete_xact, engine, and forget_xact, stackused, traceoff, traceon, and quorum.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
81	dbcc	dbcc	• *Roles* – current active roles • *Keywords or options* – Any of the dbcc keywords such as checkstorage and the options for that keyword • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands drop database

System procedures sp_configure, sp_helpdb

deallocate cursor

Description
Makes a cursor inaccessible and releases all memory resources committed to that cursor.

Syntax
deallocate [cursor] *cursor_name*

Parameters
cursor_name
is the name of the cursor to deallocate.

Examples
Example 1 Deallocates the cursor named "authors_crsr":

```
deallocate cursor authors_crsr
```

Example 2 Also deallocates the cursor named "authors_crsr," but omits cursor from the syntax:

```
deallocate authors_crsr
```

Usage
- You can use deallocate cursor with an archive database.
- Adaptive Server returns an error message if the cursor does not exist.
- You must deallocate a cursor before you can use its cursor name as part of another declare cursor statement.
- deallocate cursor has no effect on memory resource usage when specified in a stored procedure or trigger.
- You can deallocate a cursor whether it is open or closed.

Standards
ANSI SQL – Compliance level: Transact-SQL extension.

Permissions
deallocate cursor permission defaults to all users. No permission is required to use it.

See also
Commands close, declare cursor

deallocate locator

Description

Deletes a large object (LOB) stored in memory and invalidates its LOB locator.

Syntax

deallocate locator *locator_descriptor*

Parameters

locator_descriptor
is a valid representation of a LOB locator: a host variable, a local variable, or the literal binary value of a locator.

Examples

Deallocates the LOB referenced by *@v*:

```
deallocate locator @v
```

Usage

- Use deallocate locator within a transaction. Adaptive Server automatically deallocates each locator at the end of a transaction.
- deallocate locator can conserve memory. When many LOB locators are created within a transaction, use deallocate locator to remove individual LOBs and locators when they are no longer needed.

Permissions

Any user can execute deallocate locator.

See also

Commands: truncate lob

Transact-SQL functions: locator_literal, locator_valid, return_lob, create_locator

declare

Description

Declares the name and type of local variables for a batch or procedure.

Syntax

Variable declaration:

declare @*variable_name datatype*
    [, @*variable_name datatype*]...

Variable assignment:

select @*variable* = {*expression* | *select_statement*}
    [, @*variable* = {*expression* | *select_statement*} ...]
    [from *table_list*]
    [where *search_conditions*]
    [group by *group_by_list*]
    [having *search_conditions*]
    [order by *order_by_list*]
    [compute *function_list* [by *by_list*]]

Parameters

@variable_name
must begin with @ and must conform to the rules for identifiers.

datatype
can be either a system datatype or a user-defined datatype.

Examples

Example 1 Declares two variables and prints strings according to the values in the variables:

```
declare @one varchar (18), @two varchar (18)
select @one = "this is one", @two = "this is two"
if @one = "this is one"
    print "you got one"
if @two = "this is two"
    print "you got two"
else print "nope"
```

```
you got one
you got two
```

Example 2 Prints "Ouch!" if the maximum book price in the titles table is more than $20.00:

```
declare @veryhigh money
select @veryhigh = max (price)
    from titles
if @veryhigh > $20
    print "Ouch!"
```

Usage

- Assign values to local variables with a select statement.

- The maximum number of parameters in a procedure is 2048. The number of local or global variables is limited only by available memory. The @ sign denotes a variable name.
- Local variables are often used as counters for while loops or if...else blocks. In stored procedures, they are declared for automatic, noninteractive use by the procedure when it executes. Local variables must be used in the batch or procedure in which they are declared.
- The select statement that assigns a value to the local variable usually returns a single value. If there is more than one value to return, the variable is assigned the last one. The select statement that assigns values to variables cannot be used to retrieve data in the same statement.
- The print and raiserror commands can take local variables as arguments.
- Users cannot create global variables and cannot update the value of global variables directly in a select statement.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

declare permission defaults to all users. No permission is required to use it.

See also

Commands print, raiserror, select, while

declare cursor

Description

Defines a cursor, by associating a select statement with a cursor name. You can use declare cursor with an archive database.

Syntax

declare *cursor_name*
[semi_sensitive | insensitive] [scroll | no scroll] [release_locks_on_close]
    cursor for *select_statement*
    [for {read only | update [of *column_name_list*]}]

Parameters

cursor_name
is the name of the cursor being defined.

select_statement
is the query that defines the cursor result set. See select for more information.

semi_sensitive
specifies that the data changes made independently of the cursor may be visible to the cursor result set. The visibility of the dependent data changes depends on the query plan chosen by the optimizer. If there is no worktable created in the plan, the data changes are visible to the result set. The default is semi_sensitive.

insensitive
specifies that the data changes made independently of the cursor are not visible to the cursor result set. If you do not specify this argument, the default is semi_sensitive. You cannot update an insensitive cursor.

scroll | no scroll
specifies whether the declared cursor is scrollable. Scrollable cursors allowing you fetch the cursor result set nonsequentially, allowing you to scan the cursor back and forth. You cannot update a scrollable cursor.

release_locks_on_close
allows you to configure the lock-releasing behavior of each cursor so that the shared locks can be released when the cursor is closed, even if the transaction is active. This option applies to cursors of all types.

for read only
specifies that the cursor result set cannot be updated.

for update
specifies that the cursor result set is updatable.

of *column_name_list*

is the list of columns from the cursor result set (specified by the *select_statement*) defined as updatable. Adaptive Server also allows you to include columns that are not specified in the list of columns of the cursor's *select_statement* (and excluded from the result set), but that are part of the tables specified in the *select_statement*.

Examples

Example 1 Defines a result set for the authors_crsr cursor that contains all authors from the authors table who do not reside in California:

```
declare authors_crsr cursor
for select au_id, au_lname, au_fname
from authors
where state != 'CA'
```

Example 2 Defines a read-only result set for the titles_crsr cursor that contains the business-type books from the titles table:

```
declare titles_crsr cursor
for select title, title_id from titles
where title_id like "BU%"
for read only
```

Example 3 Defines an updatable result set for the pubs_crsr cursor that contains all of the rows from the publishers table. It defines the address of each publisher (city and state columns) for update:

```
declare pubs_crsr cursor
for select pub_name, city, state
from publishers
for update of city, state
```

Example 4 Defines an insensitive scrollable result set for the stores_scrollcrsr that contains the book stores in California:

```
declare stores_scrollcrsr insensitive scroll cursor
for select stor_id, stor_name
from stores where state = 'CA'
```

Example 5 Defines an insensitive nonscrollable result set for the stores_scrollcrsr that contains the book stores in California:

```
declare stores_scrollcrsr insensitive no scroll cursor
for select stor_id, stor_name
from stores where state = 'CA'
```

Usage

Restrictions on cursors

- A declare cursor statement must precede any open statement for that cursor.

- You cannot include other statements with declare cursor in the same Transact-SQL batch.
- You can include up to 1024 columns in an update clause of a client's declare cursor statement.
- *cursor_name* must be a valid Adaptive Server identifier containing no more than 30 characters.
- You cannot update a scrollable cursor.
- You cannot update an insensitive cursor.

Cursor *select* statements

- *select_statement* can use the full syntax and semantics of a Transact-SQL select statement, with these restrictions:
    - Must contain a from clause
    - Cannot contain a compute, for browse, or into clause
    - Can contain the holdlock keyword
- The *select_statement* can contain references to Transact-SQL parameter names or Transact-SQL local variables (for all cursor types except language). The names must reference the Transact-SQL parameters and local variables defined in the procedure, trigger, or statement batch that contains the declare cursor statement.

  The parameters and local variables referenced in the declare cursor statement do not have to contain valid values until the cursor is opened.
- The *select_statement* can contain references to the inserted and deleted temporary tables that are used in triggers.

Cursor scope

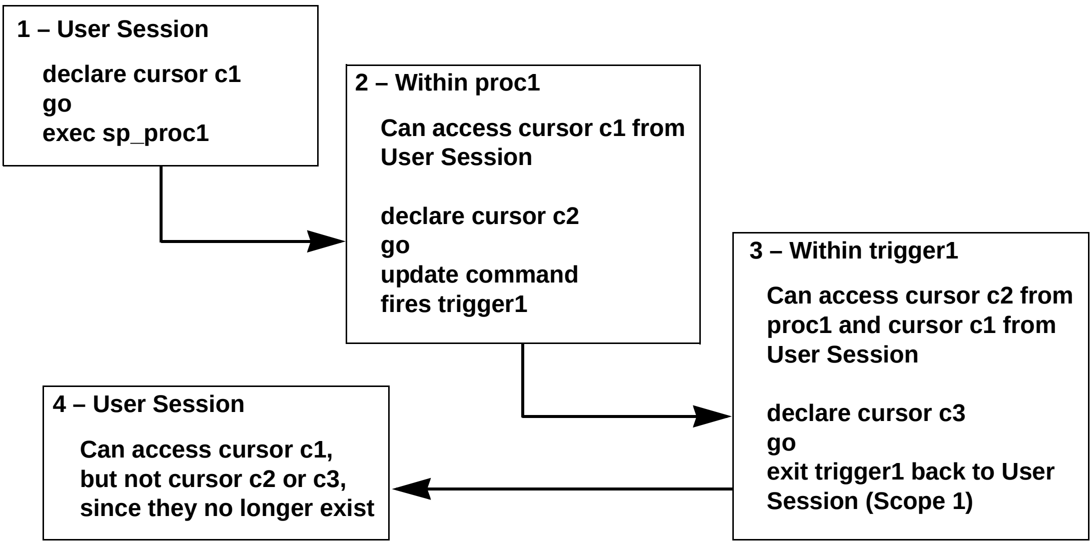
- A cursor's existence depends on its scope. The scope refers to the context in which the cursor is used, that is, within a user session, within a stored procedure, or within a trigger.

  Within a user session, the cursor exists only until the user ends the session. The cursor does not exist for any additional sessions started by other users. After the user logs off, Adaptive Server deallocates the cursors created in that session.

If a declare cursor statement is part of a stored procedure or trigger, the cursor created within it applies to stored procedure or trigger scope and to the scope that launched the stored procedure or trigger. Cursors declared inside a trigger on an inserted or a deleted table are not accessible to any nested stored procedures or triggers. However, cursors declared inside a trigger on an inserted or a deleted table are accessible within the scope of the trigger. Once the stored procedure or trigger completes, Adaptive Server deallocates the cursors created within it.

Figure 1-3 illustrates how cursors operate between scopes.

Figure 1-3: How cursors operate within scopes



- A cursor name must be unique within a given scope. Adaptive Server detects name conflicts within a particular scope only during runtime. A stored procedure or trigger can define two cursors with the same name if only one is executed. For example, the following stored procedure works because only one names_crsr cursor is defined in its scope:

```
create procedure proc2 @flag int
as
if @flag > 0
    declare names_crsr cursor
    for select au_fname from authors
else
    declare names_crsr cursor
    for select au_lname from authors
```

```
return
```

Result set

- Cursor result set rows may not reflect the values in the actual base table rows. For example, a cursor declared with an order by clause usually requires the creation of an internal table to order the rows for the cursor result set. Adaptive Server does not lock the rows in the base table that correspond to the rows in the internal table, which permits other clients to update these base table rows. In this case, the rows returned to the client from the cursor result set are not in sync with the base table rows.
- A cursor result set is generated as the rows are returned through a fetch of that cursor. This means that a cursor select query is processed like a normal select query. This process, known as a **cursor scan**, provides a faster turnaround time and eliminates the need to read rows that are not required by the application.

  A restriction of cursor scans is that they can only use the unique indexes of a table. However, if none of the base tables referenced by the cursor result set are updated by another process in the same lock space as the cursor, the restriction is unnecessary. Adaptive Server allows the declaration of cursors on tables without unique indexes, but any attempt to update those tables in the same lock space closes all cursors on the tables.

Updatable cursors

- After defining a cursor using declare cursor, Adaptive Server determines whether the cursor is updatable or read-only. If:
  - A cursor is updatable – you can update or delete rows through the cursor; that is, use *cursor_name* to do a position update or delete.
  - A cursor is read-only – you cannot use *cursor_name* to perform a position update or delete.
- Use he for update or for read only clause to explicitly define a cursor as updatable or read-only. You cannot define an updatable cursor if its *select_statement* contains one of the following constructs:
  - distinct option
  - group by clause
  - Aggregate function
  - Subquery
  - union operator
  - at isolation read uncommitted clause

If you do not specify either the for update or the read only clause, Adaptive Server checks to see whether the cursor is updatable.

Adaptive Server also defines a cursor as read-only if you declare a language- or server-type cursor that includes an order by clause as part of its *select_statement*. Adaptive Server handles updates differently for client- and execute-type cursors, thereby eliminating this restriction.

Releasing locks at cursor close

release_locks_on_close has no effect if the cursor scan occurs at isolation level 1.

The default behavior at isolation levels 2 and 3 if the transaction is committed or rolled back before the cursor is closed is for Adaptive Server to release the shared locks acquired by the cursor until that point, with the exception of the lock on the last fetched row. If you use release_on_locks_close, the shared locks acquired by the cursor exist until the cursor is closed.

Use sp_cursorinfo to determine if a cursor was declared with the release_on_locks_close parameter:

```
1) sp_cursorinfo
2> go
Cursor name 'c' is declared at nesting level '0'.
The cursor is declared as NON-SCROLLABLE
RELEASE_LOCKS_ON_CLOSE cursor.
The cursor id is 917505.
The cursor has been successfully opened 0 times.
The cursor will remain open when a transaction is
committed or rolled back.
```

Updatable cursors and allpages locking

- If you do not specify a *column_name_list* with the for update clause, all the specified columns in the query are updatable. Adaptive Server attempts to use unique indexes for updatable cursors when scanning the base table. For cursors, Adaptive Server considers an index containing an IDENTITY column to be unique, even if it is not so declared.
- If you do not specify the for update clause, Adaptive Server chooses any unique index, although it can also use other indexes or table scans if no unique index exists for the specified table columns. However, when you specify the for update clause, Adaptive Server must use a unique index defined for one or more of the columns to scan the base table. If none exists, it returns an error.

- In most cases, include only columns to be updated in the *column_name_list* of the for update clause. If the table has only one unique index, you do not need to include its column in the for update *column_name_list*; Adaptive Server finds it when it performs the cursor scan. If the table has more than one unique index, do not include any of them in the for update *column_name_list*.

  This allows Adaptive Server to use that unique index for its cursor scan, which helps prevent an update anomaly called the **Halloween problem**. Another way to prevent the Halloween problem is to create tables with the unique auto_identity index database option. See the *System Administration Guide*.

  The Halloween problem occurs when a client updates a column of a cursor result set row that defines the order in which the rows are returned from the base tables. For example, if Adaptive Server accesses a base table using an index, and the index key is updated by the client, the updated index row can move within the index and be read again by the cursor. This is a result of an updatable cursor only logically creating a cursor result set. The cursor result set is actually the base tables that derive the cursor.

If you specify the read only option, you cannot update the cursor result set using the cursor name to perform update or delete.

Using scrollable cursors

- If you do specify insensitive or semi_sensitive when you execute declare cursor, the default sensitivity is implicit, so that the cursor's sensitivity depends on the query plan chosen by the optimizer. If the query plan has any worktable created, the cursor becomes insensitive.
- If you specify the cursor's sensitivity to be semisensitive, sensitivity also depends on the query plan.
- If you specify insensitive, the cursor is *read_only*. You cannot use a for update clause in a cursor declaration.
- If you do not specify the cursor's scrollability, no scroll is implied.
- All scrollable cursors are read-only. You cannot use a for update clause in a cursor declaration.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

Permissions

declare cursor permission defaults to all users. No permission is required to use it.

See also

Commands open

delete

Description

Removes rows from a table.

Syntax

```
delete
     [top unsigned_integer]
     [from] [[database.]owner.]{view_name|table_name}
     [where search_conditions]
     [plan "abstract plan"]

delete [[database.]owner.]{table_name | view_name}
     [from [[database.]owner.]{view_name [readpast]|
          table_name
               [(index {index_name | table_name}
                    [prefetch size][lru|mru])]}
               [readpast]
     [, [[database.]owner.]{view_name [readpast]|
          table_name
               [(index {index_name | table_name}
                    [prefetch size][lru|mru])]
               [readpast]} ...]
     [where search_conditions]]
     [plan "abstract plan"]

delete [from] [[database.]owner.]{table_name|view_name}
     where current of cursor_name
```

Parameters

from (after delete)
: is an optional keyword used for compatibility with other versions of SQL.

view_name | *table_name*
: is the name of the view or table from which to remove rows. Specify the database name if the view or table is in another database, and specify the owner's name if more than one view or table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

where
: is a standard where clause. See where clause for more information.

from (after *table_name* or *view_name*)
: lets you name more than one table or view to use with a where clause when specifying which rows to delete. This from clause allows you to delete rows from one table based on data stored in other tables, giving you much of the power of an embedded select statement.

top *unsigned_integer*
: is used to limit the number of rows to the number of rows specified by *unsigned_integer*.

readpast

specifies that the delete command skip all pages or rows on which incompatible locks are held, without waiting for locks or timing out. For datapages-locked tables, *readpast* skips all rows on pages on which incompatible locks are held; for datarows-locked tables, it skips all rows on which incompatible locks are held.

index *index_name*

specifies an index to use for accessing *table_name*. You cannot use this option when you delete from a view.

prefetch *size*

specifies the I/O size, in kilobytes, for tables that are bound to caches with large I/Os configured. You cannot use prefetch when you delete from a view. sp_helpcache shows the valid sizes for the cache an object is bound to, or for the default cache.

When using prefetch and designating the prefetch size (*size*), the minimum is 2K and any power of two on the logical page size up to 16K. prefetch size options, in kilobytes, are:

Logical page size	**Prefetch size options**
2	2, 4, 8 16
4	4, 8, 16, 32
8	8, 16, 32, 64
16	16, 32, 64, 128

The prefetch size specified in the query is only a suggestion. To allow the size specification, configure the data cache at that size. If you do not configure the data cache to a specific size, the default prefetch size is used.

To configure the data cache size, use sp_cacheconfigure.

Note You cannot use prefetch for remote servers if you enable CIS.

lru | mru

specifies the buffer replacement strategy to use for the table. Use lru to force the optimizer to read the table into the cache on the MRU/LRU (most recently used/least recently used) chain. Use mru to discard the buffer from cache, and replace it with the next buffer for the table. You cannot use this option when you delete from a view.

plan "*abstract plan*"

specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. See Chapter 16, "Creating and Using Abstract Plans," in the *Performance and Tuning Guide: Optimizer and Abstract Plans*.

where current of *cursor_name*

causes Adaptive Server to delete the row of the table or view indicated by the current cursor position for *cursor_name*.

Examples

Example 1 Deletes all rows from the authors table:

```
delete authors
```

Example 2 Deletes a row or rows from the authors table:

```
delete from authors where au_lname = "McBadden"
```

Example 3 Deletes rows for books written by Bennet from the titles table.

```
delete titles
from titles, authors, titleauthor
where authors.au_lname = 'Bennet'
  and authors.au_id = titleauthor.au_id
  and titleauthor.title_id = titles.title_id
```

The pubs2 database includes a trigger (deltitle) that prevents the deletion of the titles recorded in the sales table; drop this trigger for this example to work.

Example 4 Deletes a row from the titles table currently indicated by the cursor title_crsr:

```
delete titles where current of title_crsr
```

Example 5 Determines which row has a value of 4 for the IDENTITY column and deletes it from the authors table. Note the use of the syb_identity keyword instead of the actual name of the IDENTITY column:

```
delete authors where syb_identity = 4
```

Example 6 Deletes rows from authors, skipping any locked rows:

```
delete from authors from authors readpast
where state = "CA"
```

Example 7 Deletes rows from stores, skipping any locked rows. If any rows in authors are locked, the query blocks on these rows, waiting for the locks to be released:

```
delete stores from stores readpast, authors
where stores.city = authors.city
```

Usage

- You can refer to as many as 15 tables in a delete statement.
- In pre-12.5.2 versions of Adaptive Server, queries that used update and delete on views with a union all clause were sometimes resolved without using worktables, which occasionally lead to incorrect results. In Adaptive Server 12.5.2 and later, queries that use update and delete on views with a union all clause are always resolved using worktables in tempdb.

Restrictions

- You cannot use delete with a multitable view (one whose from clause names more than one table), even though you may be able to use update or insert on that same view. Deleting a row through a multitable view changes multiple tables, which is not permitted. insert and update statements that affect only one base table of the view are permitted.
- Adaptive Server treats two different designations for the same table in a delete as two tables. For example, the following delete issued in pubs2 specifies discounts as two tables (discounts and pubs2..discounts):

```
delete discounts
from pubs2..discounts, pubs2..stores
where pubs2..discounts.stor_id =
    pubs2..stores.stor_id
```

  In this case, the join does not include discounts, so the where condition remains true for every row; Adaptive Server deletes all rows in discounts (which is not the desired result). To avoid this problem, use the same designation for a table throughout the statement.
- If you are deleting a row from a table that is referenced from other tables via referential constraints, Adaptive Server checks all the referencing tables before permitting the delete. If the row you are attempting to delete contains a primary key that is being used as a foreign key by one of the referencing tables, the delete is not allowed.

Deleting all rows from a table

- If you do not use a where clause, all rows in the table named after delete [from] are removed. The table, though empty of data, continues to exist until you issue a drop table command.
- truncate table and delete without a row specification are functionally equivalent, but truncate table is faster. delete removes rows one at a time and logs these transactions. truncate table removes entire data pages, and the rows are not logged.

  Both delete and truncate table reclaim the space occupied by the data and its associated indexes.

- You cannot use the truncate table command on a partitioned table. To remove all rows from a partitioned table, either use the delete command without a where clause, or unpartition the table before issuing truncate table.

delete and transactions

In chained transaction mode, each delete statement implicitly begins a new transaction if no transaction is currently active. Use commit to complete any deletes, or use rollback to undo the changes. For example:

```
delete from sales where date < '01/01/06'
if exists (select stor_id
   from stores
   where stor_id not in
    (select stor_id from sales))
      rollback transaction
else
      commit transaction
```

This batch begins a transaction (using the chained transaction mode) and deletes rows with dates earlier than Jan. 1, 2006 from the sales table. If it deletes all sales entries associated with a store, it rolls back all the changes to sales and ends the transaction. Otherwise, it commits the deletions and ends the transaction. For more information about the chained mode, see the *Transact-SQL Users Guide*.

delete triggers

You can define a trigger to take a specified action when a delete command is issued on a specified table.

Using *delete where current of*

- Use the clause where current of with cursors. Before deleting rows using the clause where current of, first define the cursor with declare cursor and open it using the open statement. Use one or more fetch statements to position the cursor on the row to delete. The cursor name cannot be a Transact-SQL parameter or local variable. The cursor must be an updatable cursor, or Adaptive Server returns an error. Any deletion to the cursor result set also affects the base table row from which the cursor row is derived. You can delete only one row at a time using the cursor.

- You cannot delete rows in a cursor result set if the cursor's select statement contains a join clause, even though the cursor is considered updatable. The *table_name* or *view_name* specified with a delete...where current of must be the table or view specified in the first from clause of the select statement that defines the cursor.

- After the deletion of a row from the cursor's result set, the cursor is positioned before the next row in the cursor's result set. You must issue a fetch to access the next row. If the deleted row is the last row of the cursor result set, the cursor is positioned after the last row of the result set. The following describes the position and behavior of open cursors affected by a delete:
  - If a client deletes a row (using another cursor or a regular delete) and that row represents the current cursor position of other opened cursors owned by the same client, the position of each affected cursor is implicitly set to precede the next available row. However, one client cannot delete a row representing the current cursor position of another client's cursor.
  - If a client deletes a row that represents the current cursor position of another cursor defined by a join operation and owned by the same client, Adaptive Server accepts the delete statement. However, it implicitly closes the cursor defined by the join.

Using *readpast*

- readpast allows delete commands on data-only-locked tables to proceed without being blocked by incompatible locks held by other tasks.
  - On datarows-locked tables, readpast skips all rows on which shared, update, or exclusive locks are held by another task.
  - On datapages-locked tables, readpast skips all pages on which shared, update, or exclusive locks are held by another task.
- Commands specifying readpast block if there is an exclusive table lock.
- If he teadpast option is specified for an allpages-locked table, it is ignored. The command blocks as soon as it finds an incompatible lock.
- If the session-wide isolation level is 3, the readpast option is silently ignored. The command executes at level 3. The command blocks on any rows or pages with incompatible locks.
- If the transaction isolation level for a session is 0, a delete command using readpast does not issue warning messages. For datapages-locked tables, delete with readpast modifies all rows on all pages that are not locked with incompatible locks. For datarows-locked tables, it affects all rows that are not locked with incompatible locks.
- If he delete command applies to a row with two or more text columns, and any text column has an incompatible lock on it, readpast locking skips the row.

Using *index*, *prefetch*, or *lru* | *mru*

The index, prefetch, and lru | mru options override the choices made by the Adaptive Server optimizer. Use these options with caution, and always check the performance impact with set statistics io on. See Chapter 4, "Using the set statistics command," in *Performance and Tuning Guide: Monitoring and Analyzing*.

Standards

ANSI SQL – Compliance level: Entry-level compliant. The use of more than one table in the from clause and qualification of table name with database name are Transact-SQL extensions.

readpast is a Transact-SQL extension.

Permissions

delete permission defaults to the table or view owner, who can transfer it to other users.

If set ansi_permissions is on, you must have select permission on all columns appearing in the where clause, in addition to the regular permissions required for delete statements. By default, ansi_permissions is off.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
18	delete	delete from a table	• *Roles* – current active roles • *Keywords or options* – delete • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect
19	delete	delete from a view	• *Roles* – current active roles • *Keywords or options* – delete • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands create trigger, drop table, drop trigger, truncate table, where clause

delete statistics

Description

Removes statistics from the sysstatistics system table.

Syntax

```
delete [shared] statistics table_name
    [partition data_partition_name]
    [(column_name[, column_name] ...)]
```

Parameters

shared
: removes simulated statistics information from sysstatistics in the master database.

table_name
: removes statistics for all columns in the table.

data_partition_name
: deletes all statistics for the data partition. Global statistics are not deleted.

column_name
: removes statistics for the specified column.

Examples

Example 1 Deletes the densities, selectivities, and histograms for all columns in the titles table:

```
delete statistics titles
```

Example 2 Deletes densities, selectivities, and histograms for the pub_id column in the titles table:

```
delete statistics titles (pub_id)
```

Example 3 Deletes densities, selectivities, and histograms for the smallsales partition of the titles table:

```
delete statistics titles partition smallsales
```

Example 4 Deletes densities, selectivities, and histograms for pub_id, pubdate, without affecting statistics on the single-column pub_id or the single-column pubdate:

```
delete statistics titles (pub_id, pubdate)
```

Example 5 Deletes densities, selectivities, and histograms for the column pub_id and for the data partition smallsales:

```
delete statistics titles partition smallsales (pub_id)
```

Usage

- delete statistics does not affect statistics in the systabstats table.
- delete statistics on a data partition does not delete global statistics.

- When you issue the drop table command, the corresponding rows in sysstatistics are dropped. When you use drop index, the rows in sysstatistics are not deleted. This allows the query optimizer to continue to use index statistics without incurring the overhead of maintaining the index on the table.

Warning! Densities, selectivities, and histograms are essential to good query optimization. The delete statistics command is provided as a tool to remove statistics not used by the optimizer. If you inadvertently delete statistics needed for query optimization, run update statistics on the table, index, or column.

- Loading simulated statistics with the optdiag utility command adds a small number of rows to master..sysstatistics table. If the simulated statistics are no longer in use, use the delete shared statistic command to drop the information in master..sysstatistics.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Permission to use delete statistics can be granted or transferred to anyone by table owner or system administrator.

See also

Commands create index, grant, revoke, update

Utilities optdiag

disk init

Description

Makes a physical device or file usable by Adaptive Server.

Syntax

```
disk init
        name = "device_name",
        physname = { 'physical_name' | 'cache_name'}
        skip_alloc={true | false},
        [vdevno = virtual_device_number,]
        size = number_of_blocks
        [, type = 'inmemory' ]
        [, vstart = virtual_address
            , cntrltype = controller_number]
            [, dsync = {true | false}]
        [, directio = {true | false}]
        [, instance = "instance_name"]
```

Parameters

device_name
is the name of the database device or file. The name must conform to the rules for identifiers and must be enclosed in single or double quotes. This name is used in the create database and alter database commands.

physical_name
is the full specification of the database device or cache. This name must be enclosed in single or double quotes. When the physical device path is relative, disk init returns a warning.

cache_name
name of the cache on which you are creating the disk.

inmemory
indicates you are creating an in-memory device.

skip_alloc
is a Boolean parameter for the disk init command. It is supported for devices created on non-Windows file systems and on Windows raw systems. When skip_alloc is set to true, users can avoid initialization of pages with zeros. The default of skip_alloc is false.

vdevno
is the virtual device number, which must be unique among the database devices associated with Adaptive Server. The device number 0 is reserved for the master device. Otherwise, valid device numbers must be between 1 and 2,147,483,647.

To determine the virtual device number, look at the device_number column of the sp_helpdevice report, and use the next unused integer.

size

is the amount of space to allocate to the new device. The following are example unit specifiers, using uppercase, lowercase, and single and double quotes interchangeably: ‘k’ or “K” (kilobytes), “m” or‘M’ (megabytes), “g” or “G” (gigabytes), and ‘t’ or ‘T’ (terabytes). Sybase recommends that you always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier. Acceptable values are:

- `5120` = 10MB
- `"5120"` = 10MB
- `"10M"` = 10MB

vstart

is the starting virtual address, or the offset, for Adaptive Server to begin using the database device. The following are example unit specifiers, using uppercase, lowercase, and single and double quotes interchangeably: ‘k’ or “K” (kilobytes), “m” or ‘M’ (megabytes), “g” or “G” (gigabytes), and ‘t’ or ‘T’ (terabytes). Sybase recommends that you always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier.

The size of the offset depends on how you enter the value for vstart.

- If you do not specify a unit size, vstart uses 2K pages for its starting address. For example, if you specify `vstart = 13`, Adaptive Server uses 13 * 2K pages as the offset for the starting address.
- If you specify a unit value, vstart uses the unit value as the starting address. For example, if you specify `vstart = "13M"`, Adaptive Server sets the starting address offset at 13MB.

The default value (and usually the preferred value) of vstart is 0. If the specified device does not have the sum of vstart + size blocks available, the disk init command fails. If you are running the Logical Volume Manager on an AIX operating system, vstart should be 2. Specify vstart only if instructed to do so by Sybase Technical Support.

cntrltype

specifies the disk controller. Its default value is 0. Reset cntrltype only if instructed to do so by Sybase Technical Support.

dsync

specifies whether writes to the database device take place directly to the storage media, or are buffered when using operating system files. This option is meaningful only when you are initializing an operating system file; it has no effect when initializing devices on a raw partition. By default, all operating system files are initialized with dsync set to true.

directio

allows you to configure Adaptive Server to transfer data directly to disk, bypassing the operating system buffer cache. directio is a static parameter that requires a restart of Adaptive Server to take effect.

By default, directio is set to false for nonclustered Adaptive Servers, and to true for clustered Adaptive Servers.

The directio parameter is ignored for raw devices.

instance = "*instance_name*"

(clusters only) specifies the device as private and sets its owning instance to *instance_name*.

Examples

Example 1 Does not initialize pages with zeros:

```
disk init name="d2",
physname="/usr/sybase/devices/d3.dat",
skip_alloc="true",
size="10G"
```

Adaptive Server does not allocate space during disk initialization if skip_alloc is set to true.

Example 2 Initializes 10MB of a disk on a UNIX system:

```
disk init
name = "user_disk",
physname = "/dev/rxy1a",
vdevno = 2, size = 5120
```

Example 3 Initializes 10MB of a disk on a UNIX operating system file. Adaptive Server opens the device file with the dsync setting, and writes to the file are guaranteed to take place directly on the storage media:

```
disk init
name = "user_file",
physname = "/usr/u/sybase/data/userfile1.dat",
vdevno = 2, size = 5120, dsync = true
```

Example 4 Creates a device named "user_disk" that uses directio to write data directly to disk:

```
disk init
name = "user_disk",
physname = "/usr/u/sybase/data/userfile1.dat",
size = 5120,
directio= true
```

Example 5 creates a device named inmemory_dev:

```
disk init name = inmemory_dev,
physname = 'imdb_cache',
size = '3G',
type = 'inmemory'
```

Usage

- Sybase recommends that you use block devices as a database device only on the HP-UX, Windows, and Linux platforms. disk init and disk reinit display a warning message if you attempt to create a block device on a platform Sybase does not recommend.
- Use skip_alloc to expedite crash recovery on non-NT file systems and on NT raw systems. Also, using skip_alloc with the directio feature creates devices faster and improves durability of updates. Regardless of space availability, skip_alloc always prints a warning message about making sure Adaptive Server has the required space for future use.
- The master device is initialized by the installation program; you need not initialize this device with disk init.
- To successfully complete disk initialization, the "sybase" user must have the appropriate operating system permissions on the device that is being initialized.
- You can specify the size as a float, but the size is rounded down to the nearest multiple of 2K.
- If you do not use a unit specifier for size, disk init uses the virtual page size of 2K.
- The minimum size of a disk piece that you can initialize using disk init is the larger of:
  - One megabyte
  - One allocation unit of the server's logical page size
- directio and dsync are mutually exclusive. If a device has dsync set to true, you cannot set directio to true for this device. To enable directio for a device, you must first reset dsync to false.

- directio is not available on all platforms. If you issue disk init with the directio parameter on a platform on which it is not supported, Adaptive Server issues the message `No such parameter: 'directio'`.
- Use disk init for each new database device. Each time disk init is issued, a row is added to master..sysdevices. A new database device does not automatically become part of the pool of default database storage. Use sp_diskdefault to assign default status to a database device.
- Back up the master database with the dump database or dump transaction command after each use of disk init. This makes recovery easier and safer in case master is damaged. If you add a device with disk init and fail to back up master, you may be able to recover the changes by using disk reinit, then stopping and restarting Adaptive Server.
- Assign user databases to database devices using the on clause of the create database or alter database command.
- The preferred method for placing a database's transaction log (the system table syslogs) on a different device than the one on which the rest of the database is stored is to use the log on extension to create database. Alternatively, you can name at least two devices when you create the database, then execute sp_logdevice. You can also use alter database to extend the database onto a second device, then run sp_logdevice. The log on extension immediately moves the entire log to a separate device. The sp_logdevice method retains part of the system log on the original database device until transaction activity causes the migration to become complete.
- For a report on all Adaptive Server devices on your system (both database and dump devices), execute sp_helpdevice.
- Use sp_dropdevice to remove a database device. You must first drop all existing databases on that device.

Using *dsync*

Note Do not set dsync to false for any device that stores critical data. The only exception is tempdb, which can safely be stored on devices for which dsync is set to false.

- When dsync is on, writes to the database device are guaranteed to take place on the physical storage media, and Adaptive Server can recover data on the device in the event of a system failure.

- When dsync is off, writes to the database device may be buffered by the UNIX file system. The UNIX file system may mark an update as being completed, even though the physical media has not yet been modified. In the event of a system failure, there is no guarantee that data updates have ever taken place on the physical media, and Adaptive Server may be unable to recover the database.
- dsync is always on for the master device file.
- Turn off the dsync value only when databases on the device need not be recovered after a system failure. For example, you may consider turning dsync off for a device that stores only the tempdb database.
- Adaptive Server ignores the dsync setting for devices stored on raw partitions—writes to those device are guaranteed to take place on the physical storage media, regardless of the dsync setting.
- disk reinit ensures that master..sysdevices is correct if the master database has been damaged or if devices have been added since the last dump of master.

Creating devices for in-memory and relaxed durability databases

- The logical name of the in-memory device cannot be the same as the name of the cache on which a device is created.
- In-memory devices are reserved for the first in-memory database you assign to it.
- You must use the physical device name as the logical name of the in-memory device.
- The logical name of the in-memory device must be unique across all devices.
- You cannot:
  - Use these parameters when you create an in-memory device: vstart, cntrltype, dsync, directio, and skip_alloc.
  - Create an in-memory device that is larger than the cache on which it is created.
  - Create an in-memory device from a regular named cache, including the default data cache.
  - Increase the size of an in-memory device once it is created. However, you can use sp_cacheconfig to increase the size of the in-memory cache, and use disk init to create new in-memory devices.

- Use these commands against in-memory devices: disk resize, disk mirror, disk remirror, disk unmirror, disk refit, and disk reinit.
- Use the sp_deviceattr and sp_diskdefault system procedures on disk devices.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

disk init permission defaults to system administrators and is not transferable. You must be using the master database to use disk init.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
20	disk	disk init	• *Roles* – current active roles • *Keywords or options* – disk init • *Previous value* – NULL • *Current value* – NULL • *Other information* – name of the disk • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter database, create database, disk refit, disk reinit, dump database, dump transaction, load database, load transaction

System procedures sp_diskdefault, sp_dropdevice, sp_helpdevice, sp_logdevice

disk mirror

Description

Creates a software mirror that immediately takes over when the primary device fails.

Syntax

disk mirror
    name = "*device_name*",
    mirror = "*physicalname*"
    [, writes = {serial | noserial}]
    [clear = {TRUE | FALSE}]

Parameters

name

is the name of the database device to mirror. This is recorded in the name column of the sysdevices table. The name must be enclosed in single or double quotes.

mirror

is the full path name of the database mirror device that is to be your secondary device. It must be enclosed in single or double quotes. If the secondary device is a file, *physicalname* should be a path specification that clearly identifies the file, which Adaptive Server creates. The value of *physicalname* cannot be an existing file.

writes

allows you to choose whether to enforce serial writes to the devices. In the default case (serial), the write to the primary database device is guaranteed to finish before the write to the secondary device begins. If the primary and secondary devices are on different physical devices, serial writes can ensure that at least one of the disks is unaffected in the event of a power failure. serial writes are generally slower than noserial writes.

clear

initializes the mirror device with zeros to guarantee that the underlying filesystem has reserved space for the mirror device. The default value, FALSE, does not clear the mirror, and executing a write to the device might fail through lack of space on the file system. If you specify TRUE, the mirror is cleared, forcing the file system to reserve space for the device.

Examples

Example 1 tranlog is the logical device name for a raw device. The tranlog device was initialized with disk init and is being used as a transaction log device (as in create database...log on *tranlog*). The following command mirrors the transaction log device:

```
disk mirror
  name = "tranlog",
  mirror = "/dev/rxy1e"
```

Example 2 Creates a software mirror for the database device user_disk on the file *mirror.dat*:

```
disk mirror
    name = "user_disk",
    mirror = "/server/data/mirror.dat"
```

Usage

- Disk mirroring creates a software mirror of a user database device, the master database device, or a database device used for user database transaction logs. If a database device fails, its mirror immediately takes over.

  Disk mirroring does not interfere with ongoing activities in the database. You can mirror or unmirror database devices without shutting down Adaptive Server.

- Use dump database to back up the master database after each use of disk mirror. This makes recovery easier and safer in case master is damaged.
- When a read or write to a mirrored device is unsuccessful, Adaptive Server unmirrors the bad device and prints error messages. Adaptive Server continues to run, unmirrored. The system administrator must use the disk remirror command to restart mirroring.
- The clear option in this command has no effect when used on the NT platform.
- You can mirror the master device, devices that store data, and devices that store transaction logs. However, you cannot mirror dump devices.
- Devices are mirrored; databases are not.
- A device and its mirror constitute one logical device. Adaptive Server stores the physical name of the mirror device in the mirrorname column of the sysdevices table. It does not require a separate entry in sysdevices and should not be initialized with disk init.
- To retain use of asynchronous I/O, always mirror devices that are capable of asynchronous I/O to other devices capable of asynchronous I/O. In most cases, this means mirroring raw devices to raw devices and operating system files to operating system files.

  If the operating system cannot perform asynchronous I/O on files, mirroring a raw device to a regular file produces an error message. Mirroring a regular file to a raw device works, but does not use asynchronous I/O.

- On systems that support asynchronous I/O, the writes option allows you to specify whether writes to the first device must finish before writes to the second device begin (serial) or whether both I/O requests are to be queued immediately, one to each side of the mirror (noserial). In either case, if a write cannot be completed, the I/O error causes the bad device to become unmirrored
- Mirror all default database devices so that you are still protected if a create database or alter database command affects a database device in the default list.
- For greater protection, mirror the database device used for transaction logs.
- Always put user database transaction logs on a separate database device. To put a database's transaction log (that is, the system table syslogs) on a device other than the one on which the rest of the database is stored, name the database device and the log device when you create the database. Alternatively, use alter database to extend the database onto a second device, then run sp_logdevice.
- If you mirror the database device for the master database, you can use the -r option and the name of the mirror for UNIX, when you restart Adaptive Server with the dataserver utility program. Add this to the *RUN_servername* file for that server so that the startserver utility program knows about it. Forexample, to start a master device named master.dat and its mirror, mirror.dat enter:

  ```
  dataserver -dmaster.dat -rmirror.dat
  ```

  See dataserver and startserver in the *Utility Guide*.
- If you mirror a database device that has unallocated space (room for additional create database and alter database statements to allocate part of the device), disk mirror begins mirroring these allocations when they are made, not when the disk mirror command is issued.
- For a report on all Adaptive Server devices on your system (user database devices and their mirrors, as well as dump devices), execute sp_helpdevice.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

disk mirror permission defaults to the system administrator and is not transferable. You must be using the master database to use disk mirror.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
23	disk	disk mirror	• *Roles* – current active roles • *Keywords or options* – disk mirror • *Previous value* – NULL • *Current value* – NULL • *Other information* – name of the disk • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter database, create database, disk init, disk refit, disk reinit, disk remirror, disk unmirror, dump database, dump transaction, load database, load transaction

System procedures sp_diskdefault, sp_helpdevice, sp_logdevice

Utilities dataserver, startserver

disk refit

Description
: Rebuilds the master database's sysusages and sysdatabases system tables from information contained in sysdevices.

Syntax
: disk refit

Usage

- Adaptive Server automatically shuts down after disk refit rebuilds the system tables.
- Use disk refit after disk reinit as part of the procedure to restore the master database.

Note You must start Adaptive Server with trace flag 3608 before you run disk refit. However, make sure you read the information in the *Troubleshooting and Error Messages Guide* before you start Adaptive Server with any trace flag.

Standards
: ANSI SQL – Compliance level: Transact-SQL extension.

Permissions
: disk refit permission defaults to system administrators and is not transferable. You must be in the master database to use disk refit.

Auditing
: Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
21	disk	disk refit	• *Roles* – current active roles • *Keywords or options* – disk refit • *Previous value* – NULL • *Current value* – NULL • *Other information* – Name of the disk • *Proxy information* – original login name, if set proxy is in effect

See also

Documents *System Administration Guide*.

Commands disk init, disk reinit

System procedures sp_addumpdevice, sp_helpdevice

disk reinit

Description

Rebuilds the master database's sysdevices system table. Use disk reinit as part of the procedure to restore the master database.

Syntax

```
disk reinit
        name = "device_name",
        physname = "physicalname" ,
        [vdevno = virtual_device_number ,]
        size = number_of_blocks
        [, vstart = virtual_address
            , cntrltype = controller_number]
            [, dsync = {true | false}]
        [, directio = {true | false}]
        [, instance = "instance_name"]
```

Parameters

name

is the name of the database device, which must conform to the rules for identifiers, and must be enclosed in single or double quotes. This name is used in the create database and alter database commands.

physname

is the name of the database device. The physical name must be enclosed in single or double quotes.

vdevno

is the virtual device number, which must be unique among the database devices associated with Adaptive Server. The device number 0 is reserved for the master device. Otherwise, valid device numbers are between 1 and 2,147,483,647.

To determine the virtual device number, look at the device_number column of the sp_helpdevice report, and use the next unused integer.

size

is the current size of the device being reinitialized. The following are example unit specifiers, using uppercase, lowercase, and single and double quotes interchangeably: 'k' or "K" (kilobytes), "m" or 'M' (megabytes), "g" or "G" (gigabytes), and 't' or 'T' (terabytes). Sybase recommends that you always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier.

vstart

is the starting virtual address, or the offset, for Adaptive Server to begin using the database device. The following are example unit specifiers, using uppercase, lowercase, and single and double quotes interchangeably: ‘k’ or “K” (kilobytes), “m” or ‘M’ (megabytes), “g” or “G” (gigabytes), and ‘t’ or ‘T’ (terabytes). Sybase recommends that you always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier. If you do not provide a unit specifier, the value provided is presumed to be in megabytes. The size of the offset depends on how you enter the value for vstart.

- If you do not specify a unit size, vstart uses 2K pages for its starting address. For example, if you specify `vstart = 13`, Adaptive Server uses 13 * 2K pages as the offset for the starting address.
- If you specify a unit value, vstart uses it as the starting address. For example, if you specify `vstart = "13M"`, Adaptive Server sets the starting address offset at 13MB.

The default value (and usually the preferred value) of vstart is 0. If the specified device does not have the sum of vstart + size blocks available, disk reinit fails.

Note If you are running the Logical Volume Manager on an AIX operating system, vstart should be 2.

Specify vstart only if instructed to do so by Sybase Technical Support.

cntrltype

specifies the disk controller. Its default value is 0. Reset it only if instructed to do so by Sybase Technical Support.

dsync

specifies whether writes to the database device take place directly to the storage media, or are buffered when using operating system files. This option is meaningful only when you are initializing an operating system file; it has no effect when initializing devices on a raw partition. By default, all operating system files are initialized with dsync set to true.

directio

allows you to configure Adaptive Server to transfer data directly to disk, bypassing the operating system buffer cache. directio is a static parameter that requires a restart of Adaptive Server to take effect.

By default, directio is set to false for nonclustered Adaptive Servers, and to true for clustered Adaptive Servers.

The directio parameter is ignored for raw devices.

instance = "*instance_name*"

(clusters only) specifies the device as private and sets its owning instance to *instance_name*.

Examples

Example 1 Adds a new row to the sysdevices table. This new row contains the characteristics of the existing device currently being reinitialized:

```
disk reinit
name = "user_file",
physname = "/usr/u/sybase/data/userfile1.dat",
vdevno = 2, size = 5120, dsync = true
```

Example 2 Adds a new row to the sysdevices table, with the data transferred directly to disk. This new row contains the characteristics of the existing device currently being reinitialized:

```
disk reinit
name = "user_disk",
physname = "/usr/u/sybase/data/userfile1.dat",
size = 5120, directio= true
```

Usage

- Sybase recommends that you use block devices as a database device only on the HP-UX, Windows, and Linux platforms. disk init and disk reinit display a warning message if you attempt to create a block device on a platform Sybase does not recommend.
- disk reinit ensures that master..sysdevices is correct if the master database has been damaged or if devices have been added since the last dump of master.
- disk reinit is similar to disk init, but does not initialize the database device.
- You can specify the *size* as a float, but the size is rounded down to the nearest multiple of 2K.
- If you do not use a unit specifier for *size*, disk reinit uses the virtual page size of 2K.
- By default, the directio option is set to false (off) for all platforms.

- For complete information on restoring the master database, see the *System Administration Guide*.

Using *dsync*

Note Do not set dsync to false for any device that stores critical data. The only exception is tempdb, which can safely be stored on devices for which dsync is set to false.

- When dsync is on, writes to the database device are guaranteed to take place on the physical storage media, and Adaptive Server can recover data on the device in the event of a system failure.
- directio and dsync are mutually exclusive. If a device has dsync set to “true,” you cannot set directio to “true” for this device. To enable directio for a device, you must first reset dsync to “false.”
- When dsync is off, writes to the database device may be buffered by the UNIX file system. The UNIX file system may mark an update as being completed, even though the physical media has not yet been modified. In the event of a system failure, there is no guarantee that data updates have ever taken place on the physical media, and Adaptive Server may be unable to recover the database.
- dsync is always on for the master device file.
- Turn off the dsync value only when databases on the device need not be recovered after a system failure. For example, you may consider turning dsync off for a device that stores only the tempdb database.
- Adaptive Server ignores the dsync setting for devices stored on raw partitions—writes to those device are guaranteed to take place on the physical storage media, regardless of the dsync setting.
- The dsync setting is not used on the Windows NT platform.
- disk reinit ensures that master..sysdevices is correct if the master database has been damaged or if devices have been added since the last dump of master.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

disk reinit permission defaults to system administrators and is not transferable. You must be in the master database to use disk reinit.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
22	disk	disk reinit	• *Roles* – current active roles • *Keywords or options* – disk reinit • *Previous value* – NULL • *Current value* – NULL • *Other information* – name of the disk • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter database, create database, dbcc, disk init, disk refit

System procedures sp_addumpdevice, sp_helpdevice

disk remirror

Description

Restarts disk mirroring after it is stopped by failure of a mirrored device, or temporarily disabled by the disk unmirror command.

Syntax

```
disk remirror
        name = "device_name"
```

Parameters

name
: is the name of the database device that you want to remirror, which is recorded in the name column of the sysdevices table, and must be enclosed in single or double quotes.

Examples

Resumes software mirroring on the database device user_disk:

```
disk remirror
  name = "user_disk"
```

Usage

- Disk mirroring creates a software mirror of a user database device, the master database device, or a database device used for user database transaction logs. If a database device fails, its mirror immediately takes over.

  Use the disk remirror command to reestablish mirroring after it has been temporarily stopped by failure of a mirrored device, or temporarily disabled with the mode = retain option of the disk unmirror command. The disk remirror command copies data on the retained disk to the mirror.

- Back up the master database with the dump database command after each use of disk remirror. This makes recovery easier and safer in case master is damaged.
- If mirroring was permanently disabled with the mode = remove option, you must remove the operating system file that contains the mirror before using disk remirror.
- Database devices, not databases, are mirrored.
- You can mirror, remirror, or unmirror database devices without shutting down Adaptive Server. Disk mirroring does not interfere with ongoing activities in the database.
- When a read or write to a mirrored device is unsuccessful, Adaptive Server unmirrors the bad device and prints error messages. Adaptive Server continues to run, unmirrored. The system administrator must use disk remirror to restart mirroring.

- In addition to mirroring user database devices, always put user database transaction logs on a separate database device. The database device used for transaction logs can also be mirrored for even greater protection. To put a database's transaction log (that is, the system table syslogs) on a different device than the one on which the rest of the database is stored, name the database device and the log device when you create the database. Alternatively, use alter database to point to a second device, then run sp_logdevice.
- If you mirror the database device for the master database, you can use the -r option and the name of the mirror for UNIX, when you restart Adaptive Server with the dataserver utility program. Add this option to the *RUN_servername* file for that server so that the startserver utility program knows about it. For example, the following command starts a master device named master.dat and its mirror, mirror.dat:

  ```
  dataserver -dmaster.dat -rmirror.dat
  ```

  See dataserver and startserver in the *Utility Guide*.
- For a report on all Adaptive Server devices on your system (user database devices and their mirrors, as well as dump devices), execute sp_helpdevice.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

disk remirror permission defaults to the system administrator and is not transferable. You must be using the master database to use disk remirror.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
25	disk	disk remirror	• *Roles* – current active roles • *Keywords or options* – disk remirror • *Previous value* – NULL • *Current value* – NULL • *Other information* – name of the disk • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter database, create database, disk init, disk mirror, disk refit, disk reinit, disk unmirror, dump database, dump transaction, load database, load transaction

System procedures sp_diskdefault, sp_helpdevice, sp_logdevice

Utilities dataserver, startserver

disk resize

Description

Dynamically increases the size of the device used by Adaptive Server.

Syntax

disk resize
    name = "*device_name*",
    size = *additional_space*

Parameters

name
Is the name of the device for which you are increasing the size.

additional_space
Is the amount of additional space you are adding to the device.

Examples

To increase the size of testdev by 4MB, enter:

```
disk resize
name = "test_dev",
size = "4M"
```

Usage

- The disk resize command allows you to dynamically increase the size of your disks.
- After you resize a device, dump the master device, which maintains the size of the device in the sysdevices table. If you attempt a recovery from an old dump of the master device, the information stored in sysdevices will not be current.
- Any properties that are set on the device continue to be set after you increase its size.
- During the physical initialization of the disk, if any error occurs due to insufficient disk space, disk resize extends the database device to the point before the error occurs.

  For example, on a server that uses 4K logical pages, if you try to increase the size of the device by 40MB, but only 39.5MB is available, then the device is extended only by 39.5MB. From the extended size (39.5MB), only 39MB is used by Adaptive Server. The last 0.5MB is allocated but not used, as 4K servers configure devices in one MB minimums.

  To utilize the last 0.5MB, make sure that there is at least another 1.5MB available for the device, then re-run disk resize, specifying 1.5MB as the incremental size.
- You cannot use disk resize to decrease the size of the device.
- *device_name* must have a valid identifier. The device is initialized using the disk init command and, it must refer to a valid Adaptive Server device, not a dump or load device.

- The following are example unit specifiers, using uppercase, lowercase, and single and double quotes interchangeably: 'k' or "K" (kilobytes), "m" or 'M' (megabytes), "g" or "G" (gigabytes), and 't' or 'T' (terabytes). Sybase recommends that you always include a unit specifier. Although it is optional, Sybase recommends that you always include the unit specifier with the disk resize command to avoid confusion in the actual number of pages allocated.

  You must enclose the unit specifier in single or double quotes. If you do not use a unit specifier, the size defaults to the number of disk pages.

- Permanently disable mirroring while the resize operation is in progress. You can reestablish mirroring when the resize operation is completed.

Standards

ANSI SQL – compliance level: Transact-SQL extension.

Permissions

Only a user with the sa_role can execute the disk resize command.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
100	disk	disk resize	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – index name • *Proxy information* – original login name, if a set proxy is in effect

See also

Commands create database, disk init, drop database, load database

System procedures sp_addsegment, sp_dropsegment, sp_helpdb, sp_helpsegment, sp_logdevice, sp_renamedb, sp_spaceused

disk unmirror

Description

Suspends disk mirroring initiated with the disk mirror command to allow hardware maintenance or the changing of a hardware device.

Syntax

```
disk unmirror
        name = "device_name"
        [, side = {"primary" | secondary}]
        [, mode = {retain | remove}]
```

Parameters

name

is the name of the database device to unmirror. The name must be enclosed in single or double quotes.

side

specifies whether to disable the primary device or the secondary device (the mirror). By default, the secondary device is unmirrored.

mode

determines whether the unmirroring is temporary (retain) or permanent (remove). By default, unmirroring is temporary.

Specify retain when you plan to remirror the database device later in the same configuration. This option mimics what happens when the primary device fails:

- I/O is directed only at the device *not* being unmirrored.
- The status column of sysdevices indicates that mirroring is deactivated. remove eliminates all sysdevices references to a mirror device.
- The status column indicates that the mirroring feature is ignored.
- The phyname column is replaced by the name of the secondary device in the mirrorname column if the primary device is the one being deactivated.
- The mirrorname column is set to NULL.

Examples

Example 1 Suspends software mirroring for the database device user_disk:

```
disk unmirror
name = "user_disk"
```

Example 2 Suspends software mirroring for the database device user_disk on the secondary side:

```
disk unmirror name = "user_disk", side = secondary
```

Example 3 Suspends software mirroring for the database device user_disk and removes all device references to the mirror device:

```
disk unmirror name = "user_disk", mode = remove
```

Usage

- Disk mirroring creates a software mirror of a user database device, the master database device, or a database device used for user database transaction logs. If a database device fails, its mirror immediately takes over.

  disk unmirror disables either the original database device or the mirror, either permanently or temporarily, so that the device is no longer available to Adaptive Server for reads or writes. It does not remove the associated file from the operating system.

- Disk unmirroring alters the sysdevices table in the master database. Back up the master database with the dump database command after each use of disk unmirror. This makes recovery easier and safer in case master is damaged.
- You can unmirror a database device while it is in use.
- You cannot unmirror any of a database's devices while a dump database, load database, or load transaction is in progress. Adaptive Server displays a message asking whether to abort the dump or load or to defer the disk unmirror until after the dump or load completes.
- You cannot unmirror a database's log device while a dump transaction is in progress. Adaptive Server displays a message asking whether to abort the dump or defer the disk unmirror until after the dump completes.

Note dump transaction with truncate_only and dump transaction with no_log are not affected when a log device is unmirrored.

- Mirror all the default database devices so that you are still protected if a create or alter database command affects a database device in the default list.
- When a read or write to a mirrored device is unsuccessful, Adaptive Server automatically unmirrors the bad device and prints error messages. Adaptive Server continues to run, unmirrored. A system administrator must restart mirroring with the disk remirror command.
- For a report on all Adaptive Server devices on your system (user database devices and their mirrors, as well as dump devices), execute sp_helpdevice.

- Use disk remirror to reestablish mirroring after it is temporarily stopped with the mode = retain option of the disk unmirror command. If mirroring is permanently disabled with the mode = remove option, you must remove the operating system file that contains the mirror before using disk remirror.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

disk unmirror permission defaults to the system administrator, and is not transferable. You must be using the master database to use disk unmirror.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
24	disk	disk unmirror	• *Roles* – current active roles • *Keywords or options* – disk unmirror • *Previous value* – NULL • *Current value* – NULL • *Other information* – name of the disk • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter database, create database, disk init, disk mirror, disk refit, disk reinit, disk remirror, dump database, dump transaction, load database, load transaction

System procedures sp_diskdefault, sp_helpdevice, sp_logdevice

Utilities dataserver, startserver

drop database

Description

Removes one or more databases from Adaptive Server, including archive databases.

Syntax

drop database *database_name* [, *database_name*] ...

Parameters

database_name
is the name of a database to remove. Use sp_helpdb to get a list of databases.

Examples

Example 1 Removes the publishing database and all its contents:

```
drop database publishing
```

Example 2 key_db is the database where the encryption key resides and col_db is the database containing the encrypted columns. Adaptive Server raises an error and fails to drop key_db. The drop of col_db succeeds. To drop both databases, drop col_db first:

```
drop database col_db, key_db
```

Usage

- When dropping an archive database, all the rows for that database are deleted from the sysaltusages table in the scratch database. This requires log space in the scratch database.
- Removing a database deletes the database and all its objects, frees its storage allocation, and erases its entries from the sysdatabases and sysusages system tables in the master database.
- drop database clears the suspect page entries pertaining to the dropped database from master..sysattributes.

Encrypted columns and *drop database*

To prevent accidental loss of keys, drop database fails if the database contains keys currently used to encrypt columns in other databases. To drop a database:

- Use alter table to decrypt the columns, or modify the columns for encryption using a different key.
- Drop the table or database containing the encrypted columns.

Restrictions

- You must be using the master database to drop a database.
- You cannot drop a database that is in use (open for reading or writing by any user).

- You cannot use drop database to remove a database that is referenced by a table in another database. Determine which tables and external databases have foreign-key constraints on primary key tables in the current database, execute:

```
select object_name (tableid), frgndbname
    from sysreferences
    where frgndbname is not null
```

  Use alter table to drop these cross-database constraints, then reissue the drop database command.

- You can use drop database to remove a damaged database. If drop database does not run because the database is damaged, use dbcc dbrepair to fix the database:

```
dbcc dbrepair (database_name, dropdb)
```

- You cannot drop the sybsecurity database if auditing is enabled. When auditing is disabled, only the system security officer can drop sybsecurity.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only the database owner can execute drop database, except for the sybsecurity database, which can be dropped only by the system security officer.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
26	drop	drop database	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter database, create database, dbcc, use

Procedures sp_changedbowner, sp_helpdb, sp_renamedb, sp_spaceused

drop default

Description

Removes a user-defined default.

Syntax

drop default [*owner*.]*default_name*
[, [*owner*.]*default_name*] ...

Parameters

default_name
is the name of an existing default. Execute sp_help to display a list of existing defaults. Specify the owner's name to drop a default of the same name owned by a different user in the current database. The default value for *owner* is the current user.

Examples

Removes the user-defined default datedefault from the database:

```
drop default datedefault
```

Usage

- You cannot drop a default that is currently bound to a column or to a user-defined datatype. Use sp_unbindefault to unbind the default before you drop it.
- You can bind a new default to a column or user-defined datatype without unbinding its current default. The new default overrides the old one.
- When you drop a default for a NULL column, NULL becomes the column's default value. When you drop a default for a NOT NULL column, an error message appears if users do not explicitly enter a value for that column when inserting data.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

drop default permission defaults to the owner of the default and is not transferable.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
31	drop	drop default	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands create default

System procedures sp_help, sp_helptext, sp_unbindefault

drop encryption key

Description

Allows key owners to drop the named encryption key.

Syntax

drop encryption key [[*database*.][*owner*].]*keyname*

The syntax for explicitly dropping an external login password service key is

```
drop encryption key syb_extpasswdkey
    with password encryption downgrade
```

The syntax for explicitly dropping a hidden text service key is:

```
drop encryption key syb_syscommkey_dddddd
```

Or:

```
drop encryption key syb_syscommkey with text encryption downgrade
```

Parameters

database
is the name of the database.

owner
is the owner.

keyname
is the name of the key.

syb_extpasswdkey
name of the service key

When you specify with password encryption downgrade, Adaptive Server resets external login passwords with the algorithm used in versions earlier than 15.7, and the Replication Agent password, and the CIS and RTMS external login passwords are reset to an invalid value.

After the key is dropped, the administrator must reenter the passwords manually to resume using the corresponding services.

syb_syscommkey_ddddddd
is the explicit name of an individual syscomments service key to be dropped.

syb_syscommkey with text encryption downgrade
Adaptive Server reencrypts all the hidden text in syscomments with the algorithm used in versions earlier than 15.7.

Examples

Drops the encryption key `cc_key`:

```
drop encryption key cust.dbo.cc_key
```

Usage

- If the key has key copies, the copies are dropped along with the base key.

- The command fails if any column in any database is encrypted using the key.
- drop encryption key cannot check databases that are archived, suspect, offline, unrecovered, or currently being loaded for columns encrypted by the key. The command issues a warning message naming the unavailable database, but does not fail. When the database is brought online, any tables with columns that were encrypted with the dropped key are not usable. To restore the key, the system administrator must load a dump of the dropped key's database from a time that precedes when the key was dropped.

Permissions

The key owner and the system security officer can drop encryption keys.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
109		drop encryption key	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

create encryption key, alter encryption key, sp_encryption, sp_help

drop function

Description

Removes one or more user-defined functions from the current database.

Syntax

drop function{ [*owner_name* .] *function_name* } [,...n]

Parameters

owner_name
is the name of the user ID that owns the user-defined function. Must be an existing user ID.

function_name
is name of the user-defined function to be removed. Specifying the owner name is optional; the server name and database name cannot be specified.

Examples

Drops the bonus function:

```
drop function bonus
```

Usage

drop function drops scalar SQL user-defined functions from your current database.

Permissions

Permissions default to the function owner, and are not transferable. Users with the sa and the dbo roles can drop any object by specifying the owner.

drop function (SQLJ)

Description

Removes a SQLJ function.

Syntax

drop func[tion] [*owner*.]*function_name*
[, [*owner*.]*function_name*] ...

Parameters

[*owner*.]*function_name*
is the SQL name of a SQLJ function.

Examples

Removes the SQLJ function square_root:

```
drop function square_root
```

Usage

drop function removes only user-created functions from the current database. It does not remove system functions.

Permissions

Only the database owner or user with the sa_role can execute drop function.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
98	drop	drop function	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a set proxy is in effect

See also

Documents See *Java in Adaptive Server Enterprise* for more information about SQLJ functions.

Commands create function (SQLJ)

drop index

Description

Removes an index from a table in the current database.

Syntax

drop index *table_name.index_name*
    [, *table_name.index_name*] ...

Parameters

table_name
is the table in which the indexed column is located. The table must be in the current database.

index_name
is the index to drop. In Transact-SQL, index names need not be unique in a database, though they must be unique within a table.

Examples

Removes au_id_ind from the authors table:

```
drop index authors.au_id_ind
```

Usage

- Once the drop index command is issued, you regain all the space that was previously occupied by the index. This space can be used for any database objects.
- You cannot use drop index on system tables.
- drop index cannot remove indexes that support unique constraints. To drop such indexes, drop the constraints through alter table or drop the table. See create table for more information about unique constraint indexes.
- You cannot drop indexes that are currently used by any open cursor. For information about which cursors are open and what indexes they use, use sp_cursorinfo.
- To get information about what indexes exist on a table, use the following, where objname is the name of the table:

```
sp_helpindex objname
```

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

drop index permission defaults to the index owner and is not transferable. However, database owners can drop the index using setuser.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
105		drop index	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a set proxy is in effect

See also

Commands create index, setuser

System procedures sp_cursorinfo, sp_helpindex, sp_spaceused

drop login

Description — Drops a login account or list of accounts.

Syntax — drop login *login_name* [, *login_name_list*] [with override]

Parameters

login_name
: specifies the name of login account to be dropped.

login_name_list
: specifies a list of login accounts to be dropped.

with override
: drops the login even if there are non-available databases that cannot be checked for login references.

Examples — Drops the login accounts ravi and vinod.

```
drop login ravi, vinod
```

Usage

- Executing drop login removes a user login from Adaptive Server, deleting the user's entry from master.dbo.syslogins.
- Adaptive Server reuses a dropped login's server user ID, which compromises accountability. You can avoid dropping accounts entirely and, instead, use sp_locklogin to lock any accounts that will no longer be used.
- If you need to drop logins, be sure to audit these events (using sp_audit) so that you have a record of them.
- drop login deletes all resource limits associated with the dropped login.
- drop login fails if the login to be dropped is a user in any database on the server. Use sp_dropuser to drop the user from a database. You cannot drop a user from a database if that user owns any objects in the database.
- If the login to be dropped is a System Security Officer, drop login verifies that at least one other unlocked System Security Officer's account exists. If not, drop login fails. Similarly, drop login ensures that there is always at least one unlocked system administrator account.

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — You must have sso_role privileges to drop login accounts.

Auditing — Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
139	login_admin	drop login	Keywords contain: *loginname1[, ... [, loginnameN*]]

See also

Commands create login profile, create login, drop login profile, alter login, alter login profile,

Documents For more information about dropping login accounts, see the *Security Administration Guide*.

Functions lprofile_id, lprofile_name

System procedures sp_passwordpolicy, sp_displaylogin, sp_displayroles, sp_locklogin

drop login profile

Description

Drops a login profile or list of login profiles.

Syntax

drop login profile *login_profile_name* [, *login_profile_name_list*]
[with override]

Parameters

login_profile_name
specifies the name of the login profile to be dropped.

login_profile_name_list
specifies a list of login profiles to be dropped.

with override
forcefully drops login profiles that are bound to login accounts. The login accounts associated with the dropped login profile will be associated with the default login profile.

Examples

Example 1 Drops the login profile group1_login_profile if it is not bound to one or more login accounts.

```
drop login profile group1_login_profile
```

Example 2 An error is generated because the sa_login_profile being bound to one or more login accounts.

```
drop login profile sa_login_profile

Msg 11193, Level 16, State 1:
Line 1:
The specified login profile is the default login profile
and/or associated with one or more login accounts.
Remove the default property and/or associations or use
the WITH OVERRIDE clause to drop the login profile.
```

Example 3 The sa_login_profile is dropped even though it is bound to one or more login accounts.

```
drop login profile sa_login_profile with override
```

Usage

- The command drop login profile removes the login profile if it is not bound to a login account.
- Use drop login profile with override to forcefully remove a login profile that is bound to a login account. If the login profile is bound with to a login account, the login account will be bound to the default login account, if one exist. If the default login profile is also not present, precedence rules prior to Adaptive Server version 15.7 are observed for the login account.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — You must have sso_role privileges to drop login profiles.

Auditing — Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
141	security_profile	drop login profile	Keywords contain: *login_profile_name* [WITH OVERRIDE]

See also

Commands create login profile, create login, alter login profile, alter login , drop login

Documents For more information about dropping login profiles, see the *Security Administration Guide*.

Functions lprofile_id, lprofile_name

System procedure sp_passwordpolicy, sp_displaylogin, sp_displayroles, sp_locklogin

drop procedure

Description

Removes a procedure.

Syntax

```
drop proc[edure] [owner.]procedure_name
      [, [owner.]procedure_name] ...
```

Parameters

procedure_name
is the name of the Transact-SQL or SQLJ procedure to drop. Specify the owner's name to drop a procedure of the same name owned by a different user in the current database. The default value for *owner* is the current user.

Examples

Example 1 Deletes the stored procedure showind:

```
drop procedure showind
```

Example 2 Unregisters the extended stored procedure xp_echo:

```
drop procedure xp_echo
```

Usage

- drop procedure drops user-defined stored procedures, system procedures, and extended stored procedures (ESPs).
- Adaptive Server checks the existence of a procedure each time a user or a program executes that procedure.
- A procedure group (more than one procedure with the same name but with different number suffixes) can be dropped with a single drop procedure statement. For example, if the procedures used with the application named orders were named orderproc;1, orderproc;2, and so on, the following statement drops the entire group:

  ```
  drop proc orderproc
  ```

  Once procedures have been grouped, individual procedures within the group cannot be dropped. For example, the following statement is not allowed:

  ```
  drop procedure orderproc;2
  ```

  You cannot drop extended stored procedures as a procedure group.
- sp_helptext displays the procedure's text, which is stored in syscomments.
- sp_helpextendedproc displays ESPs and their corresponding DLLs.
- Dropping an ESP unregisters the procedure by removing it from the system tables. It has no effect on the underlying DLL.
- drop procedure drops only user-created stored procedures from your current database.

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — drop procedure permission defaults to the procedure owner and is not transferable.

Auditing — Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
28	drop	drop procedure	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also — **Commands** create procedure, create procedure (SQLJ)

System procedures sp_depends, sp_dropextendedproc, sp_helpextendedproc, sp_helptext, sp_rename

drop role

Description

Drops a user-defined role.

Syntax

drop role *role_name* [with override]

Parameters

role_name
is the name of the role you want to drop.

with override
overrides any restrictions on dropping a role. When you use the with override option, you can drop any role without having to check whether the role permissions have been dropped in each database.

Examples

Example 1 Drops the named role only if all permissions in all databases have been revoked. The system administrator or object owner must revoke permissions granted in each database before dropping a role, or the command fails:

```
drop role doctor_role
```

Example 2 Drops the named role and removes permission information and any other reference to the role from all databases:

```
drop role doctor_role with override
```

Usage

- You need not drop memberships before dropping a role. Dropping a role automatically removes any user's membership in that role, regardless of whether you use the with override option.
- Use drop role from the master database.

Restrictions

- You cannot use drop role to drop system roles.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must be a system security officer to use drop role.

drop role permission is not included in the grant all command.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
85	roles	create role, drop role, alter role, grant role, or revoke role	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter role, create role, grant, revoke, set

System procedures sp_activeroles, sp_displaylogin, sp_displayroles, sp_helprotect,

drop rule

Description

Removes a user-defined rule.

Syntax

drop rule [*owner*.]*rule_name*[, [*owner*.]*rule_name*] ...

Parameters

rule_name

is the name of the rule to drop. Specify the owner's name to drop a rule of the same name owned by a different user in the current database. The default value for *owner* is the current user.

Examples

Removes the rule pubid_rule from the current database:

```
drop rule pubid_rule
```

Usage

- Before dropping a rule, you must unbind it using sp_unbindrule. If the rule has not been unbound, an error message appears, and the drop rule command fails.
- You can bind a new rule to a column or user-defined datatype without unbinding its current rule. The new rule overrides the old one.
- After you drop a rule, Adaptive Server enters new data into the columns that were previously governed by the rule without constraints. Existing data is not affected in any way.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

drop rule permission defaults to the rule owner and is not transferable.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
30	drop	drop rule	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands create rule

System procedures sp_bindrule, sp_help, sp_helptext, sp_unbindrule

drop service

Description

The drop service command removes a user-defined Web service from the current database. Both the metadata and the corresponding stored procedure are removed.

Syntax

drop service *service-name*

Parameters

service-name

is the name for the user-defined Web service. This name can be any name that is valid for a stored procedure. If you specify the name of a service that does not exist, an exception results. Also, you cannot drop a service that is currently in use by another session.

Examples

This example drops the user-defined Web service named sp_who_service:

```
drop service sp_who_service
```

Usage

You must undeploy a user-defined Web service before you can drop it.

See also

Commands create service

Stored procedures sp_webservices

Documentaiton *Web Services Users Guide*

drop thread pool

Description
Drops a user-defined pool.

Considerations for process mode
drop thread pool is not supported in process mode.

Syntax
drop thread pool *pool_name*

Parameters
pool_name
name of the pool you are dropping.

Examples
Drops a pool named sales_pool:

```
drop thread pool sales_pool
```

Usage

- Adaptive Server reassigns tasks associated with the dropped thread pool to syb_default_pool.
- You cannot drop thread pools that are currently using an execution class definition. Use sp_dropexeclass to remove the execution class.
- You cannot drop system-created thread pools (those beginning with syb_).
- Thread pools must wait for currently running tasks to yield before they can be dropped, which may cause a slight delay in Adaptive Server dropping the pool.
- Tasks running in a thread pool that you drop migrate to syb_default_pool.
- You cannot use Transact-SQL variables as parameters to drop thread pool.
- You can issue drop thread pool with execute immediate.

Standards
ANSI SQL-Compliance level: Transact-SQL extension

Permissions
drop thread pool permission defaults to the system administrator. drop thread pool permission is not included in the grant all command.

Auditing

Event	Audit option	Command or access audited	Information in extrainfo
144			Pool name

drop table

Description

Removes a table definition and all of its data, indexes, partition properties, triggers, encryption properties, and permissions from the database.

Syntax

```
drop table [[database.]owner.]table_name
    [, [[database.]owner.]table_name] ...
```

Parameters

table_name
is the name of the table to drop. Specify the database name if the table is in another database, and specify the owner's name if more than one table by the same name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

Examples

Removes the table roysched and its data and indexes from the current database:

```
drop table roysched
```

Usage

- When you use drop table, any rules or defaults on the table lose their binding, and any triggers associated with it are automatically dropped. If you re-create a table, you must rebind the appropriate rules and defaults and re-create any triggers.
- When you drop a table, any partition condition associated with the table is also dropped.
- Dropping a table drops any decrypt default associated with the table's columns, and drops the columns' encryption properties.
- The system tables affected when a table is dropped are sysobjects, syscolumns, sysindexes, sysprotects, syscomments, syspartitions, syspartitionkeys, and sysprocedures.
- If CIS is enabled, and if the table being dropped was created with create existing table, the table is not dropped from the remote server. Instead, Adaptive Server removes references to the table from the system tables.

Restrictions

- You cannot use the drop table command on system tables.
- You can drop a table in any database, as long as you are the table owner. For example, use either of the following to drop a table called newtable in the database otherdb:

```
drop table otherdb..newtable
drop table otherdb.yourname.newtable
```

- If you delete all the rows in a table or use the truncate table command, the table still exists until you drop it.

Dropping tables with cross-database referential integrity constraints

- When you create a cross-database constraint, Adaptive Server stores the following information in the sysreferences system table of each database:

Table 1-17: Information stored about referential integrity constraints

Information stored in sysreferences	Columns with information about referenced table	Columns with information about referencing table
Key column IDs	refkey1 through refkey16	fokey1 through fokey16
Table ID	reftabid	tableid
Database name	pmrydbname	frgndbname

- Because the referencing table depends on information from the referenced table, Adaptive Server does not allow you to:
  - Drop the referenced table,
  - Drop the external database that contains it, or
  - Use sp_renamedb to rename either database.

  Use sp_helpconstraint to determine which tables reference the table you want to drop. Use alter table to drop the constraints before reissuing drop table.
- You can drop a referencing table or its database. Adaptive Server automatically removes the foreign-key information from the referenced database.
- Each time you add or remove a cross-database constraint or drop a table that contains a cross-database constraint, dump both of the affected databases.

Warning! Loading earlier dumps of these databases can cause database corruption. For more information about loading databases with cross-database referential integrity constraints, see the *System Administration Guide*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

drop table permission defaults to the table owner and is not transferable.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
27	drop	drop table	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter table, create table, delete, truncate table

System procedures sp_depends, sp_help, sp_spaceused

drop trigger

Description

Removes a trigger.

Syntax

```
drop trigger [owner.]trigger_name
    [, [owner.]trigger_name] ...
```

Parameters

trigger_name
is the name of the trigger to drop. Specify the owner's name to drop a trigger of the same name owned by a different user in the current database. The default value for *owner* is the current user.

Examples

Removes trigger1 from the current database:

```
drop trigger trigger1
```

Usage

- drop trigger drops a trigger in the current database.
- You need not explicitly drop a trigger from a table to create a new trigger for the same operation (insert, update, or delete). In a table or column, each new trigger for the same operation overwrites the previous one.
- When a table is dropped, Adaptive Server automatically drops any triggers associated with it.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

drop trigger permission defaults to the trigger owner and is not transferable.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
29	drop	drop trigger	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands create trigger

System procedures sp_depends, sp_help, sp_helptext

drop view

Description

Removes one or more views from the current database.

Syntax

drop view [*owner*.]*view_name* [, [*owner*.]*view_name*] ...

Parameters

view_name
is the name of the view to drop. Specify the owner's name to drop a view of the same name owned by a different user in the current database. The default value for *owner* is the current user.

Examples

Removes the view new_price from the current database:

```
drop view new_price
```

Usage

- When you use drop view, the definition of the view and other information about it, including privileges, is deleted from the system tables sysobjects, syscolumns, syscomments, sysdepends, sysprocedures, and sysprotects.
- Existence of a view is checked each time the view is referenced, for example, by another view or by a stored procedure.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

drop view permission defaults to the view owner and is not transferable.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
33	drop	drop view	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL

See also

Commands create view

System procedures sp_depends, sp_help, sp_helptext

dump database

Description

Makes a backup copy of the entire database, including the transaction log, in a form that can be read in with load database. Dumps and loads are performed through Backup Server.

If you are not dumping compressed data, the target platform of a load database operation need not be the same platform as the source platform where the dump database operation occurred. Dumps and loads of compressed data must occur on the same platform. However, dump database and load database are performed from either a big-endian platform to a little-endian platform, or from a little-endian platform to a big-endian platform.

See *Using Backup Server with IBM Tivoli Storage Manager* for dump database syntax when the Tivoli Storage Manager is licensed at your site.

Syntax

```
dump database database_name
        to [compress::[compression_level::]]stripe_device
            [at backup_server_name]
            [density = density_value,
            blocksize = number_bytes,
            capacity = number_kilobytes,
            dumpvolume = volume_name,
            file = file_name]
            [with shrink_log]
            with verify[= header | full]
        [stripe on [compress::[compression_level::]]stripe_device
            [at backup_server_name]
            [density = density_value,
            blocksize = number_bytes,
            capacity = number_kilobytes,
            dumpvolume = volume_name,
            file = file_name]]
        [[stripe on [compress::[compression_level::]]stripe_device
            [at backup_server_name]
            [density = density_value,
            blocksize = number_bytes,
            capacity = number_kilobytes,
            dumpvolume = volume_name,
            file = file_name]]...]
        [with {
            density = density_value,
            blocksize = number_bytes,
            capacity = number_kilobytes,
            compression = compress_level
            dumpvolume = volume_name,
            file = file_name,
            [dismount | nodismount],
            [nounload | unload],
            passwd = password,
```

```
retaindays = number_days,
[noinit | init],
notify = {client | operator_console}
}]
```

(Tivoli Storage Manager) Use this syntax for copying the database when the Tivoli Storage Manager provides backup services.

```
dump database database_name
    to "syb_tsm::object_name"
        [blocksize = number_bytes]
    [stripe on "[syb_tsm::]object_name"
        [blocksize = number_bytes]]...]
    [with {
        blocksize = number_bytes,
        compression = compress_level,
        passwd = password,
        [noinit | init],
        notify = {client | operator_console},
        verify[ = header | full]
        } ]
```

Parameters

database_name
is the name of the database from which you are copying data. The database name can be specified as a literal, a local variable, or a stored procedure parameter.

compress::*compression_level*
is no longer used, and is included for compatibility with older applications. Use "compression = *compress_level*" for compression instead.

to *stripe_device*
is the device to which to copy the data. See “Specifying dump devices” on page 386 for information about what form to use when specifying a dump device.

at *backup_server_name*
is the name of the Backup Server. Do not specify this parameter when dumping to the default Backup Server. Specify this parameter only when dumping over the network to a remote Backup Server. You can specify as many as 32 remote Backup Servers with this option. When dumping across the network, specify the *network name* of a remote Backup Server running on the machine to which the dump device is attached. For platforms that use interfaces files, the *backup_server_name* must appear in the interfaces file.

density = *density_value*
overrides the default density for a tape device. Valid densities are 800, 1600, 6250, 6666, 10000, and 38000. Not all values are valid for every tape drive; use the correct density for your tape drive.

blocksize = *number_bytes*

overrides the default block size for a dump device. The block size must be at least one database page (2048 bytes for most systems) and must be an exact multiple of the database page size. For optimal performance, specify the blocksize as a power of 2, for example, 65536, 131072, or 262144.

capacity = *number_kilobytes*

is the maximum amount of data that the device can write to a single tape volume. The capacity must be at least five database pages and should be less than the recommended capacity for your device.

A general rule for calculating capacity is to use 70 percent of the manufacturer's maximum capacity for the device, allowing 30 percent for overhead such as record gaps and tape marks. The maximum capacity is the capacity of the device on the drive, not the drive itself. This rule works in most cases, but may not work in all cases, due to differences in overhead across vendors and across devices.

On UNIX platforms that cannot reliably detect the end-of-tape marker, indicate how many kilobytes can be dumped to the tape. You must supply a capacity for dump devices specified as a physical path name. If a dump device is specified as a logical device name, the Backup Server uses the *size* parameter stored in the sysdevices system table unless you specify a capacity.

compression = *compress_level*

is a number between 0 and 9, 100, or 101. For single-digit compression levels, 0 indicates no compression, and 9 provides the highest level of compression. Compression levels of 100 and 101 provide a faster, more efficient compression mode, with 100 providing faster compression and 101 providing better compression. If you do not specify *compress_level*, Adaptive Server does not compress the dump.

Note Sybase recommends the native "compression = *compress_level*" option as preferred over the older "compress::*compression_level*" option, which is retained only for compatibility with older applications.

---

dumpvolume = *volume_name*

establishes the name that is assigned to the volume. The maximum length of *volume_name* is 6 characters. Backup Server writes the *volume_name* in the ANSI tape label when overwriting an existing dump, dumping to a new tape, or dumping to a tape whose contents are not recognizable. The load database command checks the label and generates an error message if the wrong volume is loaded.

Warning! Label each tape volume as you create it so that the operator can load the correct tape.

---

with shrink_log

is used when a hole in the database might be created when the alter database log off command is used to shrink space from the log. This command automatically removes holes at the end of the database if the database is not in a dump sequence. Likewise, dump database will automatically remove any hole at the end of the database if the database is not in a dump sequence (that is, when youa re forced to run dump database because dump transaction is not allowed, when, for example, any minimally logged command is performed). The with shrink_log option of dump database removes holes at the end of the database, regardless of whether the database is in a dump sequence or not..

with verify[= header | full]

allows the Backup Server to perform a minimal header or structural row check on the data pages as they are being copied to the archives. There are no structural checks done at this time togam, oam, allocation pages, indexes, text, or log pages. The only other check is done on pages where the page number matches to the page header.

stripe on *stripe_device*

is an additional dump device. You can use as many as 32 devices, including the device named in the to *stripe_device* clause. The Backup Server splits the database into approximately equal portions, and sends each portion to a different device. Dumps are made concurrently on all devices, reducing the time required to make a dump, and requiring fewer volume changes during the dump. See “Specifying dump devices” on page 386.

dismount | nodismount

on platforms that support logical dismount, determines whether tapes remain mounted. By default, all tapes used for a dump are dismounted when the dump completes. Use nodismount to keep tapes available for additional dumps or loads.

nounload | unload

determines whether tapes rewind after the dump completes. By default, tapes do not rewind, allowing you to make additional dumps to the same tape volume. Specify unload for the last dump file to be added to a multidump volume. This rewinds and unloads the tape when the dump completes.

passwd = *password*

is the password you provide to protect the dump file from unauthorized users. The password must be between 6 and 30 characters long. You cannot use variables for passwords. See Chapter 14, "Managing Adaptive Server Logins, Database Users, and Client Connections," in the *System Administration Guide, Volume 1*.

retaindays = *number_days*

(UNIX systems) when dumping to disk, specifies the number of days that Backup Server protects you from overwriting the dump. If you try to overwrite the dump before it expires, Backup Server requests confirmation before overwriting the unexpired volume.

Note This option applies only when dumping to a disk; it does not apply to tape dumps.

The *number_days* must be a positive integer or 0, for dumps that you can overwrite immediately. If you do not specify a retaindays value, Backup Server uses the tape retention in days value set by sp_configure.

noinit | init

determines whether to append the dump to existing dump files or reinitialize (overwrite) the tape volume. By default, Adaptive Server appends dumps following the last end-of-tape mark, allowing you to dump additional databases to the same volume. New dumps can be appended only to the last volume of a multivolume dump. Use init for the first database you dump to a tape to overwrite its contents.

Use init when you want Backup Server to store or update tape device characteristics in the tape configuration file. See the *System Administration Guide*.

file = *file_name*

is the name of the dump file. The name cannot exceed 17 characters and must conform to operating system conventions for file names. See "Dump files" on page 388.

notify = {client | operator_console}

overrides the default message destination.

On operating systems that offer an operator terminal feature, volume change messages are always sent to the operator terminal on the machine on which Backup Server is running. Use client to route other Backup Server messages to the terminal session that initiated the dump database.

On operating systems that do not offer an operator terminal feature, such as UNIX, messages are sent to the client that initiated the dump database. Use operator_console to route messages to the terminal on which Backup Server is running.

syb_tsm::*obj_name*

is the keyword that invokes the libsyb_tsm.so module that enables communication between Backup Server and Tivoli Storage Manager.

object_name

is the name of the backup object on TSM server.

Examples

Example 1 Dumps the database pubs2 to a tape device. If the tape has an ANSI tape label, this command appends this dump to the files already on the tape, since the init option is not specified:

```
dump database pubs2
    to "/dev/nrmt0"
```

Example 2 (UNIX only) dumps the pubs2 database, using the REMOTE_BKP_SERVER Backup Server. The command names three dump devices, so the Backup Server dumps approximately one-third of the database to each device. This command appends the dump to existing files on the tapes. The retaindays option specifies that the tapes cannot be overwritten for 14 days:

```
dump database pubs2
    to "/dev/rmt4" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt5" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt0" at REMOTE_BKP_SERVER
with retaindays = 14
```

Example 3 The init option initializes the tape volume, overwriting any existing files:

```
dump database pubs2
    to "/dev/nrmt0"
    with init
```

Example 4 Rewinds the dump volumes upon completion of the dump:

```
dump database pubs2
    to "/dev/nrmt0"
```

```
with unload
```

Example 5 (UNIX only) the notify clause sends Backup Server messages requesting volume changes to the client which initiated the dump request, rather than sending them to the default location, the console of the Backup Server machine:

```
dump database pubs2
    to "/dev/nrmt0"
    with notify = client
```

Example 6 Creates a compressed dump of the pubs2 database into a local file called *dmp090100.dmp* using a compression level of 4:

```
dump database pubs2 to
    "compress::4::/opt/bin/Sybase/dumps/dmp090100.dmp"
```

Alternatively, you can create a compressed dump of the pubs2 database into a local file called *dmp090100.dmp* using a compression level of 100 using compression = *compression_level* syntax:

```
dump database pubs2 to "/opt/bin/Sybase/dumps/dmp090100.dmp"
    with compression = 100
```

Example 7 Dumps the pubs2 database to the remote machine called “remotemachine” and uses a compression level of 4:

```
dump database pubs2 to "/Syb_backup/mydb.db" at remotemachine
    with compression = "4"
```

Example 8 Dumps the pubs2 database to the TSM backup object “obj1.1”:

```
dump database pubs2 to "syb_tsm::obj1.1"
```

Example 9 Dumps the pubs2 database to the TSM backup object “obj1.2” using multiple stripes:

```
dump database pubs2 to "syb_tsm::obj1.2"
    stripe on "syb_tsm::obj1.2"
    stripe on "syb_tsm::obj1.2"
    stripe on "syb_tsm::obj1.2"
    stripe on "syb_tsm::obj1.2"
```

Example 10 Removes the last fragment in sales_db1, which is a database hole at the end of the database.

select * indicates there is a hole at the end of the database:

```
select * from sysusages where dbid=db_id("sales_db1")
go

 dbid segmap lstart  size vstart location unreservedpgs  crdate            vdevno
```

```
 ---- ------ ------- ---- ------ -------- -------------- ----------------- ------
    5      3       0  1536   1536        0            598  May 5 2011 2:59PM      3
    5      4    1536  1536   1536        0           1530  May 5 2011 2:59PM      4
    5      0    3072  1536   3072        4           1526  May 5 2011 2:59PM     -5

dump database sales_db1 to "/tmp/sales_db1.dmp" with shrink_log
go

Backup Server session id is: 42. Use this value when executing the 'sp_volchanged'
system
stored procedure after fulfilling any volume change request from the Backup Server.
Backup Server: 4.41.1.1: Creating new disk file /tmp/sales_db1.dmp.
Backup Server: 6.28.1.1: Dumpfile name 'sales_db1111250D8E6  ' section number 1
mounted
on disk file '/tmp/sales_db1.dmp'
Backup Server: 4.188.1.1: Database sales_db1: 892 kilobytes (55%) DUMPED.
Backup Server: 4.188.1.1: Database sales_db1: 934 kilobytes (100%) DUMPED.
Backup Server: 3.43.1.1: Dump phase number 1 completed.
Backup Server: 3.43.1.1: Dump phase number 2 completed.
Backup Server: 3.43.1.1: Dump phase number 3 completed.
Backup Server: 4.188.1.1: Database sales_db1: 942 kilobytes (100%) DUMPED.
Backup Server: 3.42.1.1: DUMP is complete (database sales_db1).
```

Run select * to confirm that the fragment is successfully removed:

```
select * from sysusages where dbid=db_id("sales_db1")
go
 dbid segmap lstart  size vstart location unreservedpgs  crdate            vdevno
 ---- ------ ------- ---- ------ -------- -------------- ----------------- ------
    5      3       0  1536   1536        0            598  May 5 2011 2:59PM      3
    5      4    1536  1536   1536        0           1530  May 5 2011 2:59PM      4
```

Usage

- If you use sp_hidetext followed by a cross-platform dump and load, you must manually drop and re-create all hidden objects.
- dump database executes in three phases. A progress message informs you when each phase completes. When the dump is finished, it reflects all changes that were made during its execution, except for those initiated during phase 3.
- Table 1-18 describes the commands and system procedures used to back up databases:

Table 1-18: Commands used to back up databases and logs

To do this	Use this command
Make routine dumps of the entire database, including the transaction log.	dump database
Make routine dumps of the transaction log, then truncate the inactive portion.	dump transaction

To do this	Use this command
Dump the transaction log after failure of a database device.	dump transaction with no_truncate
Truncate the log without making a backup, then copy the entire database.	dump transaction with truncate_only dump database
Truncate the log after your usual method fails due to insufficient log space, then copy the entire database.	dump transaction with no_log dump database
Respond to the Backup Server volume change messages.	sp_volchanged

Restrictions

- The maximum file path/name size for a physical device is 127 characters.
- If a database has proxy tables, the proxy tables are a part of the database save set. The content data of proxy tables is not included in the save; only the pointer is saved and restored.
- You cannot remove holes that are not at the end of the database using the with shrink_log option.
- You cannot mix Sybase dumps and non-Sybase data (for example, UNIX archives) on the same tape.
- If a database has cross-database referential integrity constraints, the sysreferences system table stores the name—not the ID number—of the external database. Adaptive Server cannot guarantee referential integrity if you use load database to change the database name or to load it onto a different server.

Warning! Before dumping a database to load it with a different name or move it to another Adaptive Server, use alter table to drop all external referential integrity constraints.

- You cannot use dump database in a user-defined transaction.
- If you issue dump database on a database where a dump transaction is already in progress, dump database sleeps until the transaction dump completes.
- When using 1/4-inch cartridge tape, you can dump only one database or transaction log per tape.
- You cannot dump a database if it has offline pages. To force offline pages online, use sp_forceonline_db or sp_forceonline_page.
- Before you run dump database, for a cross platform dump and load, move the database to a transactional quiescent status:

a. Verify the database runs cleanly by executing dbcc checkdb and dbcc checkalloc.

b. To prevent concurrent updates from open transactions by other processes during dump database, use sp_dboption to place the database in a single-user mode.

c. Flush statistics to systabstats using sp_flushstats.

d. Wait for 10 to 30 seconds, depending on the database size and activity.

e. Run checkpoint against the database to flush updated pages.

f. Run dump database.

- dump transaction and load transaction are not allowed across platforms.
- dump database and load database to or from a remote backupserver are not supported across platforms.
- You cannot load a password-protected dump file across platforms.
- If you perform dump database and load database for a parsed XML object, you must parse the text again after the load database is completed.
- Adaptive Server cannot translate embedded data structures stored as binary, varbinary, or image columns.
- load database is not allowed on the master database across platforms.
- Stored procedures and other compiled objects are recompiled from the SQL text in syscomments at the first execution after the load database.

  If you do not have permission to recompile from text, then the person who does must recompile from text using dbcc upgrade_object to upgrade objects.

Note If you migrate login records in the syslogins system table in the master database from Solaris to Linux, you can perform a bcp -c character format bulk copy, and the login password from Solaris is compatible on Linux. For all other combinations and platforms, login records must be re-created because the passwords are not compatible.

Scheduling dumps

- Adaptive Server database dumps are dynamic—they can take place while the database is active. However, they may slow the system down slightly, so you may want to run dump database when the database is not being heavily updated.

- Back up the master database regularly and frequently. In addition to your regular backups, dump master after each create database, alter database, and disk init command is issued.
- Back up the model database each time you make a change to the database.
- Use dump database immediately after creating a database, to make a copy of the entire database. You cannot run dump transaction on a new database until you have run dump database.
- Each time you add or remove a cross-database constraint or drop a table that contains a cross-database constraint, dump both of the affected databases.

> **Warning!** Loading earlier dumps of these databases can cause database corruption.

- Develop a regular schedule for backing up user databases and their transaction logs.
- Use thresholds to automate backup procedures. To take advantage of Adaptive Server last-chance threshold, create user databases with log segments on a device that is separate from data segments. For more information about thresholds, see the *System Administration Guide*.

Dumping the system databases

- The master, model, and sybsystemprocs databases do not have separate segments for their transaction logs. Use dump transaction with truncate_only to purge the log, then use dump database to back up the database.
- Backups of the master database are needed for recovery procedures in case of a failure that affects the master database. See the *System Administration Guide* for step-by-step instructions for backing up and restoring the master database.
- If you are using removable media for backups, the entire master database must fit on a single volume, unless you have another Adaptive Server that can respond to volume change messages.

Specifying dump devices

- You can specify the dump device as a literal, a local variable, or a parameter to a stored procedure.
- You cannot dump to the null device (on UNIX, */dev/null*).

- Dumping to multiple stripes is supported for tape and disk devices. Placing multiple dumps on a device is supported only for tape devices.
- You can specify a local dump device as:
  - A logical device name from the sysdevices system table
  - An absolute path name
  - A relative path name

  Backup Server resolves relative path names using the current working directory in Adaptive Server.
- When dumping across the network, you must specify the absolute path name of the dump device. The path name must be valid on the machine on which Backup Server is running. If the name includes any characters except letters, numbers, or the underscore (_), you must enclose it in quotes.
- Ownership and permissions problems on the dump device may interfere with the use of dump commands. sp_addumpdevice adds the device to the system tables, but does not guarantee that you can dump to that device or create a file as a dump device.
- You can run more than one dump (or load) at the same time, as long as each uses different dump devices.
- If the device file already exists, Backup Server overwrites it; it does not truncate it. For example, suppose you dump a database to a device file and the device file becomes 10MB. If the next dump of the database to that device is smaller, the device file is still 10MB.

Dumping compressed data

- You cannot create a dump of a compressed table on one platform and load this dump on a different platform.
- Compressed data is dumped directly to an archived location.
- create index commands on compressed tables that contain any form of compressed or uncompressed rows are fully recovered during a load transaction.

Determining tape device characteristics

- If you issue a dump command without the init qualifier and Backup Server cannot determine the device type, the dump command fails. See the *System Administration Guide*.

Backup servers

- You must have a Backup Server running on the same machine as Adaptive Server. The Backup Server must be listed in the master..sysservers table. This entry is created during installation or upgrade; do not delete it.
- If your backup devices are located on another machine so that you dump across a network, you must also have a Backup Server installed on the remote machine.

Dump files

- Dumping a database with the init option overwrites any existing files on the tape or disk.
- If you perform two or more dumps to a tape device and use the same file name for both dumps (specified with the FILENAME parameter), Adaptive Server appends the second dump to the archive device. You cannot restore the second dump, because Adaptive Server locates the first instance of the dump image with the specified file name and restores this image instead. Adaptive Server does not search for subsequent dump images with the same file name.
- Backup Server sends the dump file name to the location specified by the with notify clause. Before storing a backup tape, the operator should label it with the database name, file name, date, and other pertinent information. When loading a tape without an identifying label, use the with headeronly and with listonly options to determine the contents.

File names and archive names

- The name of a dump file identifies the database that was dumped and when the dump was made. However, in the syntax, *file_name* has different meanings depending on whether you are dumping to disk or to a UNIX tape:

  ```
  file = file_name
  ```

  In a dump to disk, the path name of a disk file is also its file name.

  In a dump to a UNIX tape, the path name is not the file name. The ANSI Standard Format for File Interchange contains a file name field in the HDR1 label. For tapes conforming to the ANSI specification, this field in the label identifies the file name. The ANSI specification applies these labels only to tape; it does not apply to disk files.

  This creates two problems:

- UNIX does not follow the ANSI convention for tape file names. UNIX considers the tape's data to be unlabeled. Although the data can be divided into files, those files have no name.
- In Backup Server, the ANSI tape labels are used to store information about the archive, negating the ANSI meanings. Therefore, disk files also have ANSI labels, because the archive name is stored there.

The meaning of *filename* changes, depending on the kind of dump you are performing. For example, in this syntax:

```
dump database database_name to 'filename' with file='filename'
```

- The irstf*filename* refers to the path name you enter to display the file.
- The second *filename* is actually the archive name, the name stored in the HDR1 label in the archive, which the user can specify with the file=*filename* parameter of the dump or load command.

When the archive name is specified, the server uses that name during a database load to locate the selected archive.

If the archive name is not specified, the server loads the first archive it encounters.

In both cases, file='*archivename*' establishes the name that is stored in the HDR1 label, and which the subsequent load uses to validate that it is looking at the correct data.

If the archive name is not specified, a dump creates one; a load uses the first name it encounters.

The meaning of *filename* in the to '*filename*' clause changes, according to whether you are performing a disk or tape dump:

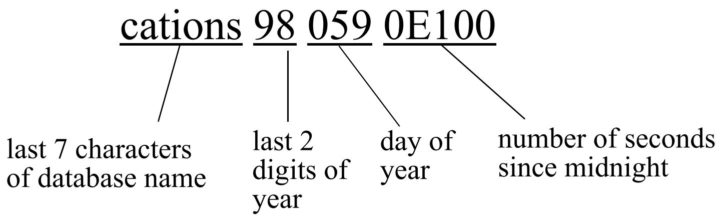
- If the dump is to tape, '*filename*' is the name of the tape device.
- If the dump is to disk, it is the name of a disk file.

If this is a disk dump and '*filename*' is not a complete path, the server's current working directory is prepended to the file name.

- If you are dumping to tape and you do not specify a file name, Backup Server creates a default file name by concatenating:
  - Last seven characters of the database name
  - Two-digit year number
  - Three-digit day of the year (1 – 366)
  - Hexadecimal-encoded time at which the dump file was created

For example, the file *cations980590E100* contains a copy of the publications database made on the 59th day of 1998:

Figure 1-4: File naming convention for database dumps to tape



Volume names

- Dump volumes are labeled according to the ANSI tape-labeling standard. The label includes the logical volume number and the position of the device within the stripe set.
- During loads, Backup Server uses the tape label to verify that volumes are mounted in the correct order. This allows you to load from a smaller number of devices than you used at dump time.

Note When dumping and loading across the network, you must specify the same number of stripe devices for each operation.

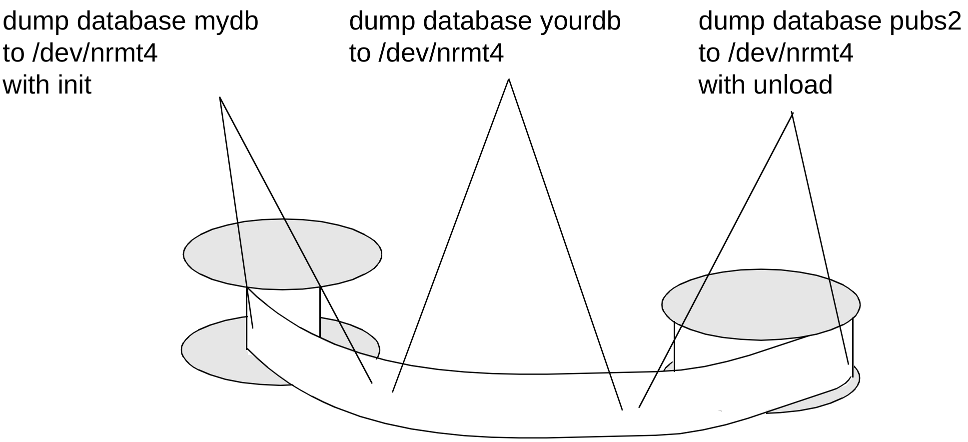
Changing dump volumes

- (UNIX systems) Backup Server requests a volume change when the tape capacity has been reached. After mounting another volume, the operator notifies Backup Server by executing sp_volchanged on any Adaptive Server that can communicate with Backup Server.
- If Backup Server detects a problem with the currently mounted volume, it requests a volume change by sending messages to either the client or its operator console. The operator can use the sp_volchanged system procedure to respond to these messages.

Appending to or overwriting a volume

- By default (noinit), Backup Server writes successive dumps to the same tape volume, making efficient use of high-capacity tape media. Data is added following the last end-of-tape mark. New dumps can be appended only to the last volume of a multivolume dump. Before writing to the tape, Backup Server verifies that the first file has not yet expired. If the tape contains non-Sybase data, Backup Server rejects it to avoid destroying potentially valuable information.
- Use the init option to reinitialize a volume. If you specify init, Backup Server overwrites any existing contents, even if the tape contains non-Sybase data, the first file has not yet expired, or the tape has ANSI access restrictions.
- Figure 1-5 illustrates how to dump three databases to a single volume using:
    - init to initialize the tape for the first dump
    - noinit (the default) to append subsequent dumps
    - unload to rewind and unload the tape after the last dump

Figure 1-5: Dumping several databases to the same volume



Dumping from a 32-bit OS to a 64-bit OS

Database dumps from a 32-bit version of Adaptive Server are fully compatible with a 64-bit version of Adaptive Server of the same platform, and vice-versa.

Dumping databases whose devices are mirrored

- At the beginning of a dump database, Adaptive Server passes Backup Server the primary device name of all database and log devices. If the primary device has been unmirrored, Adaptive Server instead passes the name of the secondary device. If any named device fails before the Backup Server completes its data transfer, Adaptive Server aborts the dump.
- If a user attempts to unmirror any of the named database devices while a dump database is in progress, Adaptive Server displays a message. The user executing the disk unmirror command can abort the dump or defer the disk unmirror until after the dump is complete.

Performance notes

Due to the design of indexes within a dataserver that provides an optimum search path, index rows are ordered for fast access to the table's data row. Index rows that contain row identifiers (RIDs), are treated as binary to achieve fast access to the user table.

Within the same architecture platform, the order of index rows remains valid, and search order for a selection criteria takes its normal path. However, when index rows are translated across different architectures, the order by which optimization was performed is invalidated, leading to an invalid index on user tables in a cross-platform dump and load.

When a database dump from a different architecture, such as big endian to little endian, is loaded, certain indexes are marked as suspect:

- Nonclustered index on APL tables.
- Clustered index on DOL tables.
- Nonclustered index on DOL tables.

To fix indexes on the target system, after loading from a different architecture dump, either:

- Drop and re-create all of the indexes, or,
- Use sp_post_xpload. See Chapter 1, "System Procedures," in *Reference Manual: Procedures*.

Re-creating indexes on large tables can be a lengthy process. sp_post_xpload validates indexes, drops invalid indexes, and re-creates dropped indexes, in a single command.

Using sp_post_xpload may take longer than dropping and re-creating indexes individually. Sybase recommends that you use the drop and re-create indexes on those databases larger than 10GB.

Compressed dumps for an archive database

To use a compressed dump for an archive database:

- Create the compressed dump using the with compression = <*compression level*> option of the dump database or dump tran command.
- Create a memory pool for accessing the archive database.

Note Dumps generated with "compress::" cannot be loaded into an archive database. Therefore, any references to compression in this chapter refer to dumps generated using the with compression = <compression level> option.

There are no compatibility issues with dumps using this compression option on traditional databases.

Compatibility issues for a compressed dump

The format of a compressed dump generated with the with compression = *compression_level* option has changed. Backup Server versions 15.0 ESD #2 and later generate a different format of compressed dump than earlier versions. Therefore:

- You can load compressed dump made using a Backup Server version 15.0 ESD #2 and later only into a pre-15.0 ESD #2 installation using a Backup Server version 15.0 ESD #2 or later.
- If you are using a pre-15.0 ESD #2 installation and want to use your dumps for an archive database, use Backup Server version 15.0 ESD #2 or later to create compressed database dumps.

Note You can use a 15.0 ESD #2 Backup Server for both dump and loads.

Encrypted columns and *dump database*

dump and load work on the ciphertext of encrypted columns, ensuring that the data for encrypted columns remains encrypted while on disk.

dump and load pertain to the whole database. Default keys and keys created in the same database are dumped and loaded along with the data to which they pertain.

If your keys are in a separate database from the columns they encrypt, Sybase recommends that:

- When you dump the database containing encrypted columns, you also dump the database where the key was created. This is necessary if new keys have been added since the last dump.

- When you dump the database containing an encryption key, dump all databases containing columns encrypted with that key. This keeps the encrypted data in sync with the available keys.
- After loading the database containing the encryption keys and the database containing the encrypted columns, bring both databases online at the same time.

Because of metadata dependencies of encrypted columns on the key's database, follow the steps below if you intend to load the key database into a database with a different name (if your data is stored in the same database as your keys, you need not follow these steps):

1. Before dumping the database containing the encrypted columns, use alter table to decrypt the data.
2. Dump the databases containing keys and encrypted columns.
3. After loading the databases, use alter table to reencrypt the data with the keys in the newly named database.

The consistency issues between encryption keys and encrypted columns are similar to those for cross-database referential integrity. See "Cross-database constraints and loading databases" in the *System Administration Guide*.

dump database and support for the Tivoli Storage Manager

See user documentation for Tivoli Storage Manager for more information about creating backups when TSM is supported at your site.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only the system administrator, the database owner, and users with the operator role can execute dump database.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
34	dump	dump database	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Documents Chapter 28, "Backing Up and Restoring User Databases" in the *System Administration Guide*.

Commands dump transaction, load database, load transaction

System procedures sp_addthreshold, sp_addumpdevice, sp_dropdevice, sp_dropthreshold, sp_helpdb, sp_helpdevice, sp_helpthreshold, sp_hidetext, sp_logdevice, sp_spaceused, sp_volchanged

dump transaction

Description

Makes a copy of a transaction log and removes the inactive portion.

See the Tivoli Storage Manager (TSM) syntax for dump tranaction syntax when Tivoli is licensed at your site.

Syntax

To make a routine log dump:

```
dump tran[saction] database_name
    to [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]
    [stripe on [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]]
    [[stripe on [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]]...]
    [with {
        density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        compression = compress_level,
        dumpvolume = volume_name,
        file = file_name,
        [dismount | nodismount],
        [nounload | unload],
        retaindays = number_days,
        [noinit | init],
        notify = {client | operator_console},
        standby_access}]
```

To truncate the log without making a backup copy:

```
dump tran[saction] database_name
    with truncate_only
```

To truncate a log that is filled to capacity. *Use only as a last resort, as you will lose the contents of your log*:

```
dump tran[saction] database_name
     with no_log
```

To back up the log after a database device fails:

```
dump tran[saction] database_name
     to [compress::[compression_level::]]stripe_device
          [at backup_server_name]
          [density = density_value,
          blocksize = number_bytes,
          capacity = number_kilobytes,
          dumpvolume = volume_name,
          file = file_name]
     [stripe on [compress::[compression_level::]]stripe_device
          [at backup_server_name]
          [density = density_value,
          blocksize = number_bytes,
          capacity = number_kilobytes,
          dumpvolume = volume_name,
          file = file_name]]
     [[stripe on [compress::[compression_level::]]stripe_device
          [at backup_server_name]
          [density = density_value,
          blocksize = number_bytes,
          capacity = number_kilobytes,
          dumpvolume = volume_name,
          file = file_name]]...]
     [with {
          density = density_value,
          blocksize = number_bytes,
          capacity = number_kilobytes,
          compression = compress_level
          dumpvolume = volume_name,
          file = file_name,
          [dismount | nodismount],
          [nounload | unload],
          retaindays = number_days,
          [noinit | init],
          no_truncate,
          notify = {client | operator_console}}]
```

To copy the transaction log when the Tivoli Storage Manager provides backup services.

```
dump transaction database_name
     to "syb_tsm::object_name"
          [blocksize = number_bytes]
     [stripe on "[syb_tsm::]object_name"
          [blocksize = number_bytes]]...]
     [with {
          blocksize = number_bytes,
          compression = compress_level,
```

```
passwd = password,
[noinit | init],
notify = {client | operator_console},
verify[ = header | full]
} ]
```

Parameters

database_name

is the name of the database from which you are copying data. The name can be given as a literal, a local variable, or a parameter to a stored procedure.

compress::*compression_level*

is a number between 0 and 9, 100, or 101. For single-digit compression levels, 0 indicates no compression, and 9 provides the highest level of compression. Compression levels of 100 and 101 provide a faster, more efficient compression mode, with 100 providing faster compression and 101 providing better compression. If you do not specify *compression_level*, Adaptive Server does not compress the dump.

For more information about the compress option, see Chapter 27, "Backing Up and Restoring User Databases" in the *System Administration Guide*.

Note The compression = *compress_level* option allows you to compress a dump file on both local and remote machines, and differs from the compress::*compression_level* option, which you can use only to compress a dump file on local machine.

Beginning with Adaptive Server version 15.0, Sybase supports—and recommends—the native compression = *compression_level* syntax.

---

truncate_only

removes the inactive part of the log without making a backup copy. Use on databases without log segments on aseparate device from data segments. Do not specify a dump device or Backup Server name.

no_log

removes the inactive part of the log without making a backup copy and without recording the procedure in the transaction log. Use no_log only when you are completely out of log space and cannot run the usual dump transaction command. Use no_log as a last resort and use it only once after dump transaction with truncate_only fails.

to *stripe_device*

is the device to which data is being dumped. See "Specifying dump devices" on page 386 for information about what form to use when specifying a dump device.

at *backup_server_name*

is the name of the Backup Server. Do not specify this parameter if you are dumping to the default Backup Server. Specify this parameter only if you are dumping over the network to a remote Backup Server. You can specify as many as 32 different remote Backup Servers using this option. When dumping across the network, specify the *network name* of a remote Backup Server running on the machine to which the dump device is attached. For platforms that use interfaces files, *backup_server_name* must appear in the interfaces file.

density = *density_value*

overrides the default density for a tape device. Valid densities are 800, 1600, 6250, 6666, 10000, and 38000. Not all values are valid for every tape drive; use the correct density for your tape drive.

blocksize = *number_bytes*

overrides the default block size for a dump device. The block size must be at least one database page (2048 bytes for most systems) and must be an exact multiple of the database page size.

Note Whenever possible, use the default block size; it is the best block size for your system.

---

capacity = *number_kilobytes*

is the maximum amount of data that the device can write to a single tape volume. The capacity must be at least five database pages, and should be slightly less than the recommended capacity for your device.

A general rule for calculating capacity is to use 70 percent of the manufacturer's maximum capacity for the device, leaving 30 percent for overhead, such as record gaps and tape marks. This rule works in most cases, but may not work in all cases because of differences in overhead across vendors and devices.

On UNIX platforms that cannot reliably detect the end-of-tape marker, you must indicate how many kilobytes can be dumped to the tape. You must supply a capacity for dump devices specified as a physical path name. If a dump device is specified as a logical device name, the Backup Server uses the *size* parameter stored in the sysdevices system table, unless you specify a capacity.

compression = *compress_level*

is a number between 0 and 9, 100, or 101. For single-digit compression levels, 0 indicates no compression, and 9 provides the highest level of compression. Compression levels of 100 and 101 provide a faster, more efficient compression mode, with 100 providing faster compression and 101 providing better compression. If you do not specify *compression_level*, Adaptive Server does not compress the dump.

Note Sybase recommends the native "compression = *compress_level*" option as preferred over the older "compress::*compression_level*" option. The native option allows compression of both local and remote dumps, and the dumps that it creates will describe their own compression level during a load. The older option is retained for compatibility with older applications.

---

dumpvolume = *volume_name*

establishes the name that is assigned to the volume. The maximum length of *volume_name* is 6 characters. The Backup Server writes the *volume_name* in the ANSI tape label when overwriting an existing dump, dumping to a brand new tape, or dumping to a tape for which the contents are not recognizable. The load transaction command checks the label and generates an error message if the wrong volume is loaded.

stripe on *stripe_device*

is an additional dump device. You can use up to 32 devices, including the device named in the to *stripe_device* clause. The Backup Server splits the log into approximately equal portions and sends each portion to a different device. Dumps are made concurrently on all devices, reducing the time and the number of volume changes required. See "Specifying dump devices" on page 386.

dismount | nodismount

(on platforms that support logical dismount) determines whether tapes remain mounted. By default, all tapes used for a dump are dismounted when the dump completes. Use nodismount to keep tapes available for additional dumps or loads.

nounload | unload

determines whether tapes rewind after the dump completes. By default, tapes do not rewind, allowing you to make additional dumps to the same tape volume. Specify unload for the last dump file to be added to a multidump volume. This rewinds and unloads the tape when the dump completes.

retaindays = *number_days*

(on UNIX platforms) specifies the number of days that Backup Server protects you from overwriting a dump. If you try to overwrite a dump before it expires, Backup Server requests confirmation before overwriting the unexpired volume.

Note This option is meaningful for disk, 1/4-inch cartridge, and single-file media. On multifile media, this option is meaningful for all volumes except the first.

The *number_days* must be a positive integer or 0, for dumps you can overwrite immediately. If you do not specify a retaindays value, Backup Server uses the server-wide tape retention in days value, set by sp_configure.

noinit | init

determines whether to append the dump to existing dump files or reinitialize (overwrite) the tape volume. By default, Adaptive Server appends dumps following the last end-of-tape mark, allowing you to dump additional databases to the same volume. You can append new dumps only to the last volume of a multivolume dump. Use init for the first database you dump to a tape, to overwrite its contents.

Use init when you want Backup Server to store or update tape device characteristics in the tape configuration file. See the *System Administration Guide*.

file = *file_name*

is the name of the dump file. The name cannot exceed 17 characters and must conform to operating system conventions for file names. If you do not specify a file name, Backup Server creates a default file name. See “Dump files” on page 388.

no_truncate

dumps a transaction log, even if the disk containing the data segments for a database is inaccessible, using a pointer to the transaction log in the master database. The with no_truncate option provides up-to-the-minute log recovery when the transaction log resides on an undamaged device, and the master database and user databases reside on different physical devices.

If you use dump tran with no_truncate you must follow it with dump database, not with another dump tran. If you load a dump generated using the no_truncate option, Adaptive Server prevents you from loading any subsequent dump.

notify = {client | operator_console}
overrides the default message destination.

- On operating systems that offer an operator terminal feature, volume change messages are always sent to the operator terminal on the machine on which the Backup Server is running. Use client to route other Backup Server messages to the terminal session that initiated the dump database.
- On operating systems (such as UNIX) that do not offer an operator terminal feature, messages are sent to the client that initiated the dump database. Use operator_console to route messages to the terminal on which the Backup Server is running.

with standby_access
specifies that only completed transactions are to be dumped. The dump continues to the furthest point it can find at which a transaction has just completed and there are no other active transactions.

syb_tsm
is the keyword that invokes the libsyb_tsm.so module that enables communication between Backup Server and TSM.

object_name
is the name of the backup object on TSM server.

Examples

Example 1 Dumps the transaction log to a tape, appending it to the files on the tape, since the init option is not specified:

```
dump transaction pubs2
    to "/dev/nrmt0"
```

Example 2 Dumps the transaction log for the mydb database, using the Backup Server REMOTE_BKP_SERVER. The Backup Server dumps approximately half the log to each of the two devices. The init option overwrites any existing files on the tape. The retaindays option specifies that the tapes cannot be overwritten for 14 days:

```
dump transaction mydb
    to "/dev/nrmt4" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt5" at REMOTE_BKP_SERVER
with init, retaindays = 14
```

Example 3 Dumps completed transactions from the inventory_db transaction log file to device dev1:

```
dump tran inventory_db to dev1 with standby_access
```

Example 4 Dumps the transaction log for the pubs2 database to the TSM backup object "demo2.2" with 100-level compression.

```
dump transaction pubs2 to "syb_tsm::demo2.2"
    with compression = 100
```

Usage

- If you use sp_hidetext followed by a cross-platform dump and load, you must manually drop and re-create all hidden objects.
- Table 1-19 describes the commands and system procedures used to back up databases and logs.

Table 1-19: Commands used to back up databases and logs

To do this	Use this command
Make routine dumps of the entire database, including the transaction log.	dump database
Make routine dumps of the transaction log, then truncate the inactive portion.	dump transaction
Dump the transaction log after failure of a database device.	dump transaction with no_truncate
Truncate the log without making a backup. Then copy the entire database.	dump transaction with truncate_only dump database
Truncate the log after your usual method fails due to insufficient log space. Then copy the entire database.	dump transaction with no_log dump database
Respond to the Backup Server volume change messages.	sp_volchanged

Restrictions

- The maximum file path/name size for a physical device is 127 characters.
- You cannot dump to the null device (on UNIX, */dev/null*).
- You cannot use the dump transaction command in a transaction.
- When using 1/4-inch cartridge tape, you can dump only one database or transaction log per tape.
- You cannot run dump transaction *database_name* to before fully dumping a newly created database.
- You cannot use dump transaction *database_name* to once an unlogged operation has been performed in the database.

- You cannot issue dump the transaction log while the trunc log on chkpt database option is enabled or after enabling select into/bulk copy/pllsort and making minimally logged changes to the database with select into, fast bulk copy operations, default unlogged writetext operations, or a parallel sort. Use dump database instead.

Warning! Do not modify the log table syslogs with a delete, update, or insert command.

- If a database does not have a log segment on a separate device from data segments, you cannot use dump transaction to copy the log and truncate it.
- If a user or threshold procedure issues a dump transaction command on a database where a dump database or another dump transaction is in progress, the second command sleeps until the first completes.
- To restore a database, use load database to load the most recent database dump; then use load transaction to load each subsequent transaction log dump in the order in which it was made.
- Each time you add or remove a cross-database constraint, or drop a table that contains a cross-database constraint, dump both of the affected databases.

Warning! Loading earlier dumps of these databases can cause database corruption.

- You cannot mix Sybase dumps and non-Sybase data (for example, UNIX archives) on the same tape.
- You cannot dump a transaction with no_log or with truncate_only if the database has offline pages.

Restrictions on using the *with no_truncate* option

Under normal circumstances, Adaptive Server returns an error message when:

- Running dump transaction *database_name* to before fully dumping a newly created databases:

```
This database has not been dumped since it was
created or upgraded or a transaction dump may have
been loaded using the UNTIL_TIME clause. You must
perform a DUMP DATABASE before you can dump its
transaction log.
```

- Using dump transaction *database_name* to once you have performed a minimally logged operation in the database:

  ```
  Dump transaction is not allowed because a
  non-logged operation was performed on the database.
  Dump your database or use dump transaction with
  truncate_only until you can dump your database.
  ```

  See "Fully recoverable DDL and dump transaction" on page 411 for more information.

- Using dump transaction *database_name* to after you have performed dump transaction with truncate_only:

  ```
  DUMP TRANsaction to a dump device is not allowed
  where a truncate-only transaction dump has been
  performed after the last DUMP DATABASE. Use DUMP
  DATABASE instead.
  ```

When you use the with no_truncate option in your dump transaction *database_name* to *dump_file* command, however, Adaptive Server does not perform a check of the database and thus does not return any of these error messages. Adaptive Server assumes that your database has some lost data (for example, from a failed disk) and is therefore inaccessible.

You do, however, get an error message when you then try to load your transaction. Your load transaction process may fail, with this error message:

```
Specified file 'dump device' is out of sequence. Current
timestamp is <X> while dump was from <Y>.
```

Copying the log after device failure

- After device failure, use dump transaction with no_truncate to copy the log without truncating it. You can use this option only if your log is on a separate segment and your master database is accessible.
- The backup created by dump transaction with no_truncate is the most recent dump for your log. When restoring the database, load this dump last.

Dumping databases without separate log segments

- When a database does not have a log segment on a separate device from data segments, use dump transaction with truncate_only to remove committed transactions from the log without making a backup copy.

Warning! dump transaction with truncate_only provides no means to recover your databases. Run dump database at the earliest opportunity to ensure recoverability.

- Use with truncate_only on the master, model, and sybsystemprocs databases, which do not have log segments on a separate device from data segments.
- You can also use with truncate_only on very small databases that store the transaction log and data on the same device.
- Mission-critical user databases should have log segments on a separate device from data segments. Use the log on clause of create database to create a database with a separate log segment, or alter database and sp_logdevice to transfer the log to a separate device.

Dumping only complete transactions

- Use the with standby_access option to dump transaction logs for loading into a server that acts as a warm standby server for the database.
- When you use with standby_access to dump the transaction log, the dump proceeds to the furthest point in the log at which all earlier transactions have completed and there are no records belonging to open transactions.
- You must use dump tran[saction]...with standby_access in all situations where you load two or more transaction logs in sequence and you want the database to be online between loads.
- After loading a dump made with the with standby_access option, use the online database command with the for standby_access option to make the database accessible.

Warning! If a transaction log contains open transactions and you dump it without the with standby_access option, Adaptive Server does not allow you to load the log, bring the database online, then load a subsequent transaction dump. If you are going to load a series of transaction dumps, you can bring the database online only after a load that was originally dumped with standby_access or after loading the entire series.

Dumping without the log

Warning! Use dump transaction with no_log only as a last resort, after your usual method of dumping the transaction log (dump transaction or dump transaction with truncate_only) fails because of insufficient log space. dump transaction with no_log provides no means to recover your databases. Run dump database at the earliest opportunity to ensure recoverability.

- dump transaction...with no_log truncates the log without logging the dump transaction event. Because it copies no data, it requires only the name of the database.
- Every use of dump transaction...with no_log is considered an error and is recorded in the Adaptive Server error log.
- If you have created your databases with log segments on a separate device from data segments, written a last-chance threshold procedure that dumps your transaction log often enough, and allocated enough space to your log and database, you should not have to use with no_log. If you must use with no_log, increase the frequency of your dumps and the amount of log space.

Scheduling dumps

- Transaction log dumps are dynamic—they can take place while the database is active. They may slow the system slightly, so run dumps when the database is not being heavily updated.
- Develop a regular schedule for backing up user databases and their transaction logs.
- dump transaction uses less storage space and takes less time than dump database. Typically, transaction log dumps are made more frequently than database dumps.

Using thresholds to automate *dump transaction*

- Use thresholds to automate backup procedures. To take advantage of the Adaptive Server last-chance threshold, create user databases with log segments on a separate device from data segments.
- When space on the log segment falls below the last-chance threshold, Adaptive Server executes the last-chance threshold procedure. Including a dump transaction command in your last-chance threshold procedure helps protect you from running out of log space. See sp_thresholdaction.
- You can use sp_addthreshold to add a second threshold to monitor log space. For more information about thresholds, see the *System Administration Guide*.

Specifying dump devices

- You can specify the dump device as a literal, a local variable, or a parameter to a stored procedure.
- You can specify a local dump device as:
  - A logical device name from the sysdevices system table
  - An absolute path name

- A relative path name

  The Backup Server resolves relative path names using the current working directory in Adaptive Server.

- Dumping to multiple stripes is supported for tape and disk devices. Placing multiple dumps on a device is supported only for tape devices.
- When dumping across the network, specify the absolute path name of the dump device. The path name must be valid on the machine on which the Backup Server is running. If the name includes any characters except letters, numbers, or underscores (_), enclose it in quotes.
- Ownership and permissions problems on the dump device may interfere with use of dump commands. sp_addumpdevice adds the device to the system tables, but does not guarantee that you can dump to that device or create a file as a dump device.
- You can run more than one dump (or load) at the same time, as long as they use different dump devices.

Determining tape device characteristics

If you issue a dump transaction command without the init qualifier and Backup Server cannot determine the device type, the dump transaction command fails. See the *System Administration Guide*.

Backup servers

- You must have a Backup Server running on the same machine as your Adaptive Server. The Backup Server must be listed in the master..sysservers table. This entry is created during installation or upgrade and should not be deleted.
- If your backup devices are located on another machine so that you dump across a network, you must also have a Backup Server installed on the remote machine.

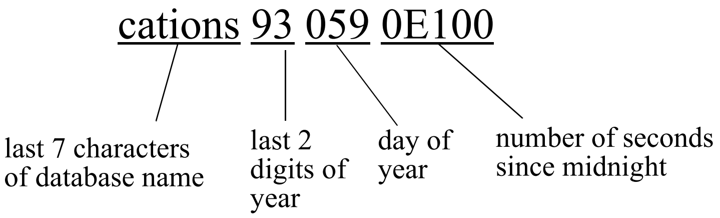
Dump files

- Dumping a log with the init option overwrites any existing files on the tape or disk.
- Dump file names identify which database was dumped and when the dump was made. If you do not specify a file name, Backup Server creates a default file name by concatenating the following:
  - Last seven characters of the database name
  - Two-digit year number

- Three-digit day of the year (1– 366)
- Hexadecimal-encoded time at which the dump file was created

For example, the file *cations930590E100* contains a copy of the publications database made on the 59th day of 1993:

Figure 1-6: File naming convention for transaction log dumps



- The Backup Server sends the dump file name to the location specified by the with notify clause. Before storing a backup tape, the operator should label it with the database name, file name, date, and other pertinent information. When loading a tape without an identifying label, use the with headeronly and with listonly options to determine the contents.

Volume names

- Dump volumes are labeled according to the ANSI tape-labeling standard. The label includes the logical volume number and the position of the device within the stripe set.
- During loads, Backup Server uses the tape label to verify that volumes are mounted in the correct order. This allows you to load from a smaller number of devices than you used at dump time.

Note When dumping and loading across the network, you must specify the same number of stripe devices for each operation.

Changing dump volumes

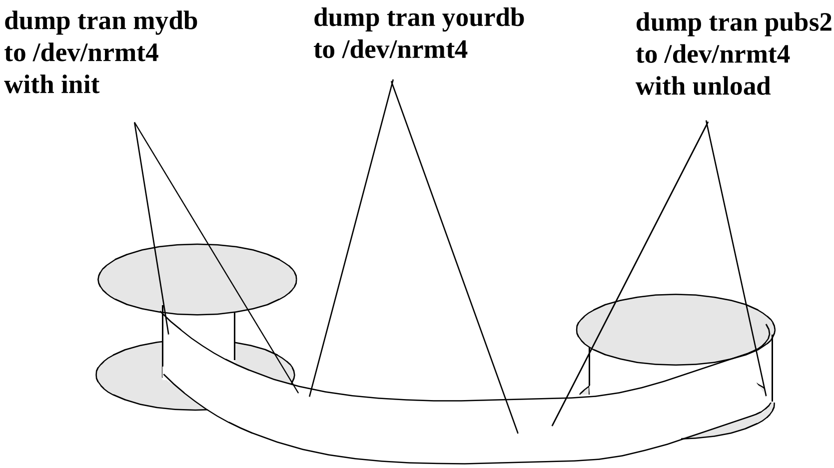
- (On UNIX systems) the Backup Server requests a volume change when the tape capacity has been reached. After mounting another volume, the operator notifies the Backup Server by executing the sp_volchanged system procedure on any Adaptive Server that can communicate with the Backup Server.

- If the Backup Server detects a problem with the currently mounted volume (for example, if the wrong volume is mounted), it requests a volume change by sending messages to either the client or its operator console. The operator responds to these messages with the sp_volchanged system procedure.

Appending to or overwriting a volume

- By default (noinit), Backup Server writes successive dumps to the same tape volume, making efficient use of high-capacity tape media. Data is added following the last end-of-tape mark. New dumps can be appended only to the last volume of a multivolume dump. Before writing to the tape, Backup Server verifies that the first file has not yet expired. If the tape contains non-Sybase data, Backup Server rejects it to avoid destroying potentially valuable information.
- Use he init option to reinitialize a volume. If you specify init, Backup Server overwrites any existing contents, even if the tape contains non-Sybase data, the first file has not yet expired, or the tape has ANSI access restrictions.
- Figure 1-7 illustrates how to dump three transaction logs to a single volume. Use:
  - init to initialize the tape for the first dump
  - noinit (the default) to append subsequent dumps
  - unload to rewind and unload the tape after the last dump

Figure 1-7: Dumping three transaction logs to a single volume



Dumping logs stored on mirrored devices

- At the beginning of a dump transaction, Adaptive Server passes the primary device name of each logical log device to the Backup Server. If the primary device has been unmirrored, Adaptive Server passes the name of the secondary device instead. If the named device fails before Backup Server completes its data transfer, Adaptive Server aborts the dump.
- If you attempt to unmirror a named log device while a dump transaction is in progress, Adaptive Server displays a message. The user executing the disk unmirror command can abort the dump or defer the disk unmirror until after the dump completes.
- dump transaction with truncate_only and dump transaction with no_log do not use the Backup Server. These commands are not affected when a log device is unmirrored, either by a device failure or by a disk unmirror command.
- dump transaction copies only the log segment. It is not affected when a data-only device is unmirrored, either by a device failure or by a disk unmirror command.

Fully recoverable DDL and dump transaction

In versions of Adaptive Server earlier than 15.7, some operations are minimally logged. Since dump transaction is not allowed after a minimally logged operation, this restriction impacts:

- Recoverability and operational scalability for very large database (VLDB) installations, where dump database may be very time consuming.
- Up-to-the-minute recoverability of the database. Even though minimally logged operations are fully recoverable from a server failure, changes after the last successful transaction dump may be lost when data devices are broken, or if the database is corrupted. You cannot, after a minimally logged operation, use dump tran with no_truncate to dump the log, then recover the database using the dumped transaction log.
- You cannot restore the database to a particular time using dump transaction, and then load tran with until_time.

Beginning with Adaptive Server 15.7, you can use dump transaction to fully recover the following operations that in earlier versions of Adaptive Server were minimally logged:

- select into including select into a proxy table
- alter table commands that require data movement
- reorg rebuild

Use sp_dboption in in the master database to fully log commands that are, by default, minimally logged.

dump transaction and the Tivoli Storage Manager

See user documentation for Tivoli Storage Manager for more information about creating back-ups when TSM is supported at your site.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only system administrators, users who have been granted the operator role, and the database owner can execute dump transaction.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
35	dump	dump transaction	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Documents Chapter 28, “Backing Up and Restoring User Databases” in the *System Administration Guide*.

Commands dump database, load database, load transaction, online database

System procedures sp_addumpdevice, sp_dboption, sp_dropdevice, sp_helpdevice, sp_hidetextsp_logdevice, sp_volchanged

execute

Description
Runs a procedure or dynamically executes Transact-SQL commands.

Syntax
```
[exec[ute]] [@return_status =]
          [[[server .]database.]owner.]procedure_name[;number]
               [[@parameter_name =] value |
                    [@parameter_name =] @variable [output]
               [, [@parameter_name =] value |
                    [@parameter_name =] @variable [output]...]]
          [with recompile]
```

or

```
     exec[ute] ("string" | char_variable
          [+ "string" | char_variable]...)
```

Parameters

execute | exec
: is used to execute a stored procedure or an extended stored procedure (ESP). This keyword is necessary if there are multiple statements in the batch.

  execute is also used to execute a string containing Transact-SQL.

@return_status
: is an optional integer variable that stores the return status of a stored procedure. *@return_status* must be declared in the batch or stored procedure before it is used in an execute statement.

server
: is the name of a remote server. You can execute a procedure on another Adaptive Server as long as you have permission to use that server and to execute the procedure in that database. If you specify a server name, but do not specify a database name, Adaptive Server looks for the procedure in your default database.

database
: is the database name. Specify the database name if the procedure is in another database. The default value for *database* is the current database. You can execute a procedure in another database as long as you are its owner or have permission to execute it in that database.

owner
: is the procedure owner's name. Specify the owner's name if more than one procedure of that name exists in the database. The default value for *owner* is the current user. The owner name is optional only if the database owner owns the procedure or if you own it.

procedure_name
: is the name of a procedure defined with create procedure.

number

is an optional integer used to group procedures of the same name so that they can be dropped together with a single drop procedure statement. Procedures used in the same application are often grouped this way. For example, if the procedures used with an application named orders are named *orderproc;1*, *orderproc;2*, and so on, the following statement drops the entire group:

```
drop proc orderproc
```

After procedures have been grouped, individual procedures within the group cannot be dropped. For example, you cannot execute the statement:

```
drop procedure orderproc;2
```

parameter_name

is the name of an argument to the procedure, as defined in create procedure. Parameter names must be preceded by the @ sign.

If the "*@parameter_name* = *value*" form is used, parameter names and constants need not be supplied in the order defined in create procedure. However, if this form is used for any parameter, it must be used for all subsequent parameters.

value

is the value of the parameter or argument to the procedure. If you do not use the "*@parameter_name* = *value*" form, you must supply parameter values in the order defined in create procedure.

@variable

is the name of a variable used to store a return parameter.

output

indicates that the stored procedure is to return a return parameter. The matching parameter in the stored procedure must also have been created with the keyword output.

The output keyword can be abbreviated to out.

with recompile
: forces compilation of a new plan. Use this option if the parameter you are supplying is atypical or if the data has significantly changed. The changed plan is used on subsequent executions. Adaptive Server ignores this option when executing an extended system procedure.

Note Using execute procedure with recompile many times can adversely affect procedure cache performance. Since a new plan is generated every time you use with recompile, a useful performance plan may be pushed out of the cache if there is insufficient space for new plans.

---

string
: is a literal string containing part of a Transact-SQL command to execute. There are no restrictions to the number of characters supplied with the literal string.

char_variable
: is the name of a variable that supplies the text of a Transact-SQL command.

Examples

Example 1 All three statements execute showind with a parameter value titles:

```
execute showind titles
exec showind @tabname = titles
```

If this is the only statement in a batch or file:

```
showind titles
```

Example 2 Executes checkcontract on the remote server GATEWAY. Stores the return status indicating success or failure in *@retstat*:

```
declare @retstat int
execute @retstat = GATEWAY.pubs.dbo.checkcontract
"409-56-4008"
```

Example 3 Executes roy_check, passing three parameters. The third parameter, *@pc*, is an output parameter. After execution of the procedure, the return value is available in the variable *@percent*:

```
declare @percent int
select @percent = 10
execute roy_check "BU1032", 1050, @pc = @percent output
select Percent = @percent
```

Example 4 This procedure displays information about the system tables if you do not supply a parameter:

```
create procedure
```

```
showsysind @table varchar (30) = "sys%"
as
  select sysobjects.name, sysindexes.name, indid
  from sysindexes, sysobjects
  where sysobjects.name like @table
  and sysobjects.id = sysindexes.id
```

Example 5 Executes xp_echo, passing in a value of "Hello World!" The returned value of the extended stored procedure is stored in a variable named *result*:

```
declare @input varchar (12), @in varchar (12),
    @out varchar (255), @result varchar (255)
select @input="Hello World!"
execute xp_echo @in = @input, @out= @result output
```

Example 6 The final execute command concatenates string values and character variables to issue the Transact-SQL command:

```
select name from sysobjects where id=3
```

```
declare @tablename char (20)
declare @columname char (20)
select @tablename="sysobjects”
select @columname="name"
execute ('select ' + @columname + ' from ' + @tablename
+ ' where id=3')
```

Example 7 Executes sp_who:

```
declare @sproc varchar (255)
select @sproc = "sp_who"
execute @sproc
```

Usage

- You can use execute with an archive database as long as any statements that reference the archive database are allowed within the archive database. A transaction inside or outside a stored procedure is not permitted with an execute command.
- Procedure results may vary, depending on the database in which they are executed. For example, the user-defined system procedure sp_foo, which executes the db_name() system function, returns the name of the database from which it is executed. When executed from the pubs2 database, it returns the value "pubs2":

  ```
  exec pubs2..sp_foo
  ------------------------------
  pubs2
   (1 row affected, return status = 0)
  ```

When executed from sybsystemprocs, it returns the value "sybsystemprocs":

```
exec sybsystemprocs..sp_foo
------------------------------
sybsystemprocs
 (1 row affected, return status = 0)
```

- There are two ways to supply parameters—by position, or by using:

  ```
  @parameter_name = value
  ```

  If you use the second form, you need not supply the parameters in the order defined in create procedure.

  If you are using the output keyword and intend to use the return parameters in additional statements in your batch or procedure, the value of the parameter must be passed as a variable. For example:

  ```
  parameter_name = @variable_name
  ```

  When executing an extended stored procedure, pass all parameters by either name or value. You cannot mix parameters by value and parameters by name in a single invocation of the execute command for an ESP.

- The dynamic SQL syntax of exec (@*parameter_name*) is also valid; however, it may take more keystrokes. For example, the dynamic SQL command exec (@sproc ="7") passes the integer value 7 to the procedure, but this can also be accomplished using exec @sproc 7.
- You cannot use text, unitext, and image columns as parameters to stored procedures or as values passed to parameters.
- Executing a procedure specifying output for a parameter that is not defined as a return parameter in create procedure causes an error.
- You cannot pass constants to stored procedures using output; the return parameter requires a variable name. You must declare the variable's datatype and assign it a value before executing the procedure. Return parameters cannot have a datatype of text, unitext, or image.
- You need not use the keyword execute if the statement is the first one in a batch. A batch is a segment of an input file terminated by the word "go" on a line by itself.
- Since the execution plan for a procedure is stored the first time it is run, subsequent run time is much shorter than for the equivalent set of standalone statements.

- Nesting occurs when one stored procedure calls another. The nesting level is incremented when the called procedure begins execution and is decremented when the called procedure completes execution. The nesting level is also incremented by one when a cached statement is created. Exceeding the maximum of 16 levels of nesting causes the transaction to fail. The current nesting level is stored in the *@@nestlevel* global variable.
- Return values 0 and -1 through -14 are currently used by Adaptive Server to indicate the execution status of stored procedures. Values from -15 through -99 are reserved for future use. See return for a list of values.
- Parameters are not part of transactions, so if a parameter is changed in a transaction that is later rolled back, its value does not revert to its previous value. The value that is returned to the caller is always the value at the time the procedure returns.
- If you use select * in a stored procedure, the procedure does not pick up any new columns you might have added to the table using alter table, even if you use the with recompile option. To do so, you must drop and re-create the stored procedure, or else an insert based on a select * can cause erroneous results. Even if the newly added column has a default bound to it, the result of the insert is NULL for the newly added column.

  When you drop and re-create the stored procedure or reload the database, you see an errror message if the column defintions of the target table do not match the select * result.
- Commands executed via remote procedure calls cannot be rolled back.
- The with recompile option is ignored when Adaptive Server executes an extended stored procedure.

Dynamically executing Transact-SQL

- When used with the *string* or *char_variable* options, execute concatenates the supplied strings and variables to execute the resulting Transact-SQL command. This form of the execute command may be used in SQL batches, procedures, and triggers.
- You cannot supply *string* and *char_variable* options to execute the following commands: use, exec(*string*) (not the execute stored procedure), connect, begin transaction, rollback, commit, and dbcc.
- The contents of the *string* or *char_variable* options cannot reference local variables declared in the SQL batch or procedure.

- *string* and *char_variable* options can be concatenated to create new tables. Within the same SQL batch or procedure, however, the table created with execute is visible only to other execute commands. After the SQL batch or procedure has completed, the dynamically created table is persistent and visible to other commands.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

execute permission defaults to the owner of the procedure, who can transfer it to other users.

The permission to execute Transact-SQL commands defined with the *string* or *char_variable* options is checked against the user executing the command, unless the procedure was set up using the execution mode "dynamic ownership chain." See sp_procxmode.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
38	exec_procedure	Execution of a procedure	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – all input parameters • *Proxy information* – original login name, if set proxy is in effect
39	exec_trigger	Execution of a trigger	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands create procedure, drop procedure, return

System procedures sp_addextendedproc, sp_depends, sp_dropextendedproc, sp_helptext, sp_procxmode

fetch

Description

Returns a row or a set of rows from a cursor result set.

Syntax

fetch [next | prior | first | last | absolute
    fetch_offset | relative *fetch_offset*]
    [from] *cursor_name*
    [into *fetch_target_list*]

Parameters

next | prior | first | last | absolute | relative
are keywords that specify the fetch direction. You do not need to specify the fetch direction for nonscrollable cursors. If you specify the fetch direction, you can use any of the other options to access the rows from a scrollable cursor. You must specify the *fetch_offset* when you use absolute or relative.

[from] *cursor_name*
is the name of the cursor. from is optional.

fetch_offset
specifies the offset value from a specific position. *fetch_offset* is required when you specify absolute or relative. *fetch_offset* can be either signed numeral literal with scale of zero, or Transact-SQL variable with a type of integer or numeric with a zero-scale numeral. See "Rules for positioning the scrollable cursor" on page 425.

fetch_target_list
is a comma-separated list of parameters or local variables into which cursor results are placed. The parameters and variables must be declared prior to the fetch.

Examples

Example 1 Returns a row of information from the cursor result set defined by the authors_crsr cursor:

```
fetch authors_crsr
```

Example 2 Returns a row of information from the cursor result set defined by the pubs_crsr cursor into the variables *@name*, *@city*, and *@state*:

```
fetch pubs_crsr into @name, @city, @state
```

Example 3 With scrollable cursors, you can use numeric literal offset with orientation keyword absolute. In this example, the 25th row is specified. Enter:

```
fetch absolute 25 from pubs_crsr
    into @name, @city, @state
```

Example 4 To use a Transact-SQL variable representing the 25th row, enter:

```
declare @offset int
select @offset = 25
```

```
fetch absolute @offset from c1
```

Usage

Restrictions

- Before you can use fetch, you must declare the cursor and open it.
- You can use fetch with an archive database.
- The *cursor_name* cannot be a Transact-SQL parameter or local variable.
- For nonscrollable cursors, you cannot fetch a row that has already been fetched. There is no way to backtrack through the result set, but you can close and reopen the cursor to create the cursor result set again and start from the beginning.
- Adaptive Server expects a one-to-one correspondence between the variables in the *fetch_target_list* and the target list expressions specified by the select statement that defines the cursor. The datatypes of the variables or parameters must be compatible with the datatypes of the columns in the cursor result set.
- When you set chained transaction mode, Adaptive Server implicitly begins a transaction with the fetch statement if no transaction is currently active. However, this situation occurs only when you set the close on endtran option and the cursor remains open after the end of the transaction that initially opened it, since the open statement also automatically begins a transaction.

Cursor position

- For nonscrollable cursors, after you fetch all the rows, the cursor points to the last row of the result set. If you fetch again, Adaptive Server returns a warning through the *@@sqlstatus* and *@@fetch_status* global variables, with value indicating there is no more data, and the cursor position moves beyond the end of the result set. You can no longer update or delete from that current cursor position.
- With fetch into, Adaptive Server does not advance the cursor position when an error occurs, because the number of variables in the *fetch_target_list* does not equal the number of target list expressions specified by the query that defines the cursor. However, it does advance the cursor position, even if a compatibility error occurs between the datatypes of the variables and the datatypes of the columns in the cursor result set.

Determining the number of rows fetched

- You can fetch one or more rows at a time. Use the cursor rows option of the set command to specify the number of rows to fetch.

Getting information about fetches

- The *@@sqlstatus* global variable holds status information (warning exceptions) resulting from the execution of a fetch statement. Its value reflects the last cursor fetched:

Value	Description
0	Indicates successful completion of the fetch statement.
1	Indicates that the fetch statement resulted in an error.
2	Indicates that there is no more data in the result set. This warning can occur if the current cursor position is on the last row in the result set and the client submits a fetch statement for that cursor.

- The *@@fetch_status* global variable provides information about whether fetch is executed successfully in a scrollable cursor:

Value	Description
0	Indicates successful completion of the fetch statement.
-1	Indicates that the fetch operation failed, or the row fetched was beyond the result set.
-2	Reserved for future use.

- Only a fetch statement can set *@@sqlstatus* and *@@fetch_status*. Other statements have no effect on *@@sqlstatus* or *@@fetch_status*.
- The value of *@@rowcount* is affected by whether the specified cursor is forward-only or scrollable. If the cursor is the default, nonscrollable cursor, the value of *@@rowcount* increments one by one, in the forward direction only, until the total number of rows in the result set are fetched.

  Once all the rows have been read from the cursor result set, *@@rowcount* represents the total number of rows in the cursor results set. *@@rowcount* after a fetch to get the number of rows read for the cursor specified in that fetch.

  If the cursor is scrollable, there is no maximum value for *@@rowcount*. For more information on *@@rowcount*, see *Reference Manual: Building Blocks*.

Using scrollable cursors

fetch_direction:

- If not specified, the default value is next.
- If ot **n**ext, the cursor must be declared scrollable.
- *fetch_offset* must be an exact, signed numeric, with a scale of zero.

- Positions the cursor beyond the last row or before the first row, no data is returned and no error is raised.
- Is absolute, when *fetch_offset* >0, the offset is calculated from the position before the first row of the result set. If *fetch_offset* <0, the offset is calculated from the position after the last row of the result set.
- Is relative, when *fetch_offset* n>0, the cursor is placed *n* rows after the current position; if *fetch_offset* n<0, the cursor is placed abs (*n*) rows before the current position.

The row number specified in the result set is counted from 1; the first row is number 1.

Multiple rows per fetch

Each fetch returns one row to the client in default behavior. The returned rows per fetch can be changed to another number by entering:

```
set cursor rows number for cursor_name
```

number specifies the number of rows per fetch the cursor can execute. This number can be a numeric literal with no decimal point, or a local variable of type integer. If *cursor rows* is greater than one, multiple rows return to the client after fetch. In some cases, the rows returned by fetch may be less than the number of rows specified, depending on the cursor's position. The current cursor position is always one row.

Terms used in rules for positioning the scrollable cursor

These terms are used in "Rules for positioning the scrollable cursor" next.

- *curRowsetStart* – the cursor's current position.
- *new_CurRowsetStart* – the new current position of the cursor.
- *total_rows* – the total number of rows in the cursor result set.
- *before_first* – the row position before the first row of the cursor result set. This variable has a value of 0.
- *after_last* – the row position after the last row of the cursor result set. This variable has a value of *total_rows* + 1.
- *first_row* – the position at the first row of the cursor result set. This variable has value of 1.
- *last_row* – the position at the last row of the cursor result set. This variable has the same value as *total_rows*.
- *fetchSize* – the number of rows requested for each fetch operation.

Rules for positioning the scrollable cursor

These rules govern the position of the cursor in fetch_orientation options when you are fetching the cursor rows, where *cursPos* is the cursor position. See the fetch_orientation options syntax:

Fetch first The *new_CurRowsetStart* always moves to *first_row*, regardless of the position of *CurRowsetStart* and the value of *fetchSize*.

Fetch last

- If *total_rows* >= *fetchSize*,
  then *new_CurRowsetStart* = *total_rows* – *fetchSize* + 1.
- If *total_rows* < *fetchSize*,
  then *new_CurRowsetStart* is on *first_row*.

Fetch next

- If *CurRowsetStart* is *before_first*,
  then *new_CurRowsetStart* is on *first_row*.
- Let *curPos* = (*CurRowsetStart* + *fetchSize*),
  - *curPos* <=*total_rows*, then *new_CurRowsetStart* = *curPos*
  - *curPos* > *total_rows*, *new_CurRowsetStart* is *after_last*
- If *CurRowsetStart* is *after_last* row,
  then *new_CurRowsetStart* remains on *after_last*.

Fetch prior

- *new_CurRowsetStart* is *before_first* when one of these conditions is true:
  - (*CurRowsetStart* >= 1) && (*CurRowsetStart* - *fetchSize* <=0)
  - *CurRowsetStart* is *before_first*
- Let *curPos* = *CurRowsetStart* – *fetchSize*; iff 1 <=*curPos* <=*total_rows*,
  then *new_CurRowsetStart* = *curPos*.
- If (*CurRowsetStart* is *after_last*), let *curPos* = *total_rows* – *fetchSize* + 1
  new_CurRowsetStart = *curPos* if *curPos* > 0
  new_CurRowsetStart is *before_first* if *curPos* <= 0

Fetch relative

- If (*CurRowsetStart* is *before_first*) && (*fetch_offset* > 0),
  then *new_CurRowsetStart* = *fetch_offset*.
- *new_CurRowsetStart* is *before_first* if one of these conditions is true:

    - (*CurRowsetStart* is *before_first*) and (*fetch_offset* < 0)
    - (*CurRowsetStart* is on *first_row*) and (*fetch_offset* < 0)
    - (*CurRowsetStart* is *after_last*)
      and ((*CurRowsetStart* + *fetch_offset* + 1) <= 0)

- If (1 < *CurRowsetStart* <= *total_rows*),
  let *curPos* = *CurRowsetStart* + *fetch_offset*, then:
    - *new_CurRowsetStart* is on *first_row* iff
      (*curPos* < 1) and *abs* (*fetch_offset*) <= *fetchSize*
    - *new_CurRowsetStart* is before *first_row* iff
      (*curPos* < 1) && (*abs* (*fetch_offset*) *fetchSize*)
    - *new_CurRowsetStart* = *curPos* iff (0 < *curPos* <=*total_rows*)
    - *new_CurRowsetStart* is *after_last* iff *curPos* > *total_rows*
- If (*CurRowsetStart* is *after_last*),
  let *curPos* = *CurRowsetStart* + *fetch_offset* +1, then:
    - *new_CurRowsetStart* = *curPos* iff 1 <= *curPos* <= *total_rows*
    - *new_CurRowsetStart* is *before_first* iff *curPos* <= 0
    - *new_CurRowsetStart* is *after_last* iff *curPos* > *total_rows*

Fetch absolute

- If *fetch_offset* = 0, *new_CurRowsetStart* is *before_first*
- If *fetch_offset* > *total_rows*, *new_CurRowsetStart* is *after_last*
- If 0 < *fetch_offset* <= *total_rows*, *new_CurRowsetStart* = *fetch_offset*
- If (*fetch_offset* < 0) && (*abs* (*fetch_offset*) > *total_rows*),
  let *abs_offset* = *abs* (*fetch_offset*)
  new_CurRowsetStart is *before_first* iff *abs_offset* > *fetchSize*
  new_CurRowsetStart is on *first_row* iff *abs_offset* <= *fetchSize*
- If (*fetch_offset* < 0) && (*abs* (*fetch_offset*) <= *total_rows*)
  new_CurRowsetStart = *total_rows* + *fetch_offset* + 1

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The fetch of multiple rows is a Transact-SQL extension.

Permissions

fetch permission defaults to all users.

See also

Commands declare cursor, open, set

goto label

Description

Branches to a user-defined label.

Syntax

label:
    goto *label*

Examples

Shows the use of a label called restart:

```
declare @count smallint
select @count = 1
restart:
  print "yes"
select @count = @count + 1
while @count <=4
  goto restart
```

Usage

- The label name must conform to the rules for identifiers and must be followed by a colon (:) when it is declared. It is not followed by a colon when it is used with goto.
- Make the goto dependent on an if or while test, or some other condition, to avoid an endless loop between goto and the label.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

goto permission defaults to all users. No permission is required to use it.

See also

Commands if...else, while

grant

Description

Assigns permissions to individual users, groups of users, and roles. Assigns roles to users, or system- or user-defined roles.

Syntax

Grants permission to access database objects:

```
grant {all [privileges] | permission_list}
     on {table_name [correlation_name]
          [(column_list)]
          | view_name[(column_list)]
          | stored_procedure_name}
          | function_name
          | keyname}
     [where search_condition]
     [as pred_name]
     to {public | name_list | role_list}
     [with grant option]
```

Grants permission to use built-in functions:

```
grant select
     on [builtin] builtin
     to {name_list | role_list}
```

Grants permission to execute certain commands:

```
grant {all [privileges] | command_list}
     to {public | name_list | role_list}
```

Grants access on certain dbcc commands:

```
grant dbcc {dbcc_command [on {all | database}]
          [, dbcc_command [on {all | database}], ...]}
     to {user_list | role_list }
```

Grants permission to create encryption keys:

```
grant create encryption key to {user_list | role_list  | group_list}
```

Grants decrypt permission on a table or a list of columns in a table:

```
grant decrypt on [ owner. ]tablename[(columnname [{,columnname}])]
     to {user | group | role}
```

Grants the default permissions for specific system tables:

```
grant default permissions on system tables
```

Grants a role to a user or a role:

```
grant {role role_granted [, role_granted ...]}
     to grantee [, grantee...]
```

Switches your server user identity to any other server login and limit its use based on the target login roles:

grant set {proxy | tracing} to *role_list*
    [restrict role *role_list* | all | system]

Parameters

all

when used to assign permission to access database objects (the first syntax format), all specifies that all permissions, except decrypt, that are applicable to the specified object are granted. All object owners can use grant all with an object name to grant permissions on their own objects. You must grant decrypt permissions separately.

Only a system administrator or the database owner can assign permission to create database objects (the third syntax format). When used by a system administrator, grant all assigns all create permissions (create database, create default, create procedure, create rule, create table, and create view). When the database owner uses grant all, or executes grant all outside the master database, Adaptive Server grants all create permissions except create database, and connect and prints an informational message.

Specifying all does not include permission to execute set proxy or set session authorization, create trigger, and create encryption key. The system security officer must explicitly grant these permissions.

When all used to grant set proxy to *role_list*, restricts the grantee from being granted any new roles when switching identities.

permission_list

is a list of object access permissions granted. If more than one permission is listed, separate them with commas. This table illustrates the access permissions that can be granted on each type of object:

Object	permission_list can include
Table	select, insert, delete, update, references, update statistics, delete statistics, truncate table, decrypt
View	select, insert, delete, update, decrypt
Column	select, update, references, decrypt Column names can be specified in either *permission_list* or *column_list*.
Stored procedure	execute
Encryption key	select

If a grant statement includes the where *search_conditions* clause, then permission_list is restricted to those commands that can take a where clause: select, update, and delete. Commands that do not support a where clause cannot support a where clause expressed on the grant statement

correlation_name
is used for predicated privileges as an alias for referencing columns in *table_name* in the where clause.

table_name
is the name of the table on which you are granting permissions. The table must be in your current database. Only one object can be listed for each grant statement.

column_list
is one or more named columns, separated by commas, to which the permissions apply. If columns are specified, only select, references, and update permissions can be granted.

When the grant is made on one or more named columns, then the row-level access applies only if the named column is targeted for select or update, or is used in the where clause on a select, update, or delete statement.

view_name
is the name of the view on which you are granting permissions. The view must be in your current database. Only one object can be listed for each grant statement.

stored_procedure_name
is the name of the stored procedure on which you are granting permissions. The stored procedure must be in your current database. Only one object can be listed for each grant statement.

key_name
is the name of an encryption key on which you are granting access. The table must be in your current database. Only one object can be listed for each grant statement.

where *search_conditions*
on select, update, and delete statements (as specified in *permission_list*), *search_conditions* set the conditions for rows to be selected by the grantee or targeted in an update or delete statement by the grantee. The *search_conditions* act as a row filter, in conjunction with any where clause specified on the select, update, or delete. *search_conditions* can use all syntax allowed in a generic where clause. If the where clause accesses a different table, you must use a nested query.

as *pred_name*

is the name of the predicate. This optional parameter must be unique among other objects owned by the predicated privilege grantor in the current database and must conform to the rules for identifiers. If you omit *pred_name*, Adaptive Server assigns a unique, internal name to the grant predicate, which you can view by using sp_helprotect. You cannot name non-predicated grants; attempts to do so causes Adaptive Server to display an error message. Predicates are referenced by name by the revoke command.

public

is all users. For object access permissions, public excludes the object owner. For object creation permissions or set proxy authorizations, public excludes the database owner. You cannot grant permissions with grant option to "public" or to other groups or roles.

name_list

is a list of users' database names and group names, separated by commas.

role_list

is a list of roles—either system-defined or user-defined—to which you are granting the permission. If grantees do not have the roles in the *role_list* already granted to them, set proxy to the target login fails if the target login has any roles in the *role_list* granted.

role_list cannot be a variable.

Note You cannot grant or revoke dbcc commands to public or groups.

---

with grant option

allows the users specified in *name_list* to grant object access permissions to other users. You can grant permissions with grant option only to individual users, not to "public" or to a group or role.

builtin

is a built-in function. Specifying built-in functions allows you to differentiate between a table and a grantable built-in function with the same name. The functions are set_appcontext, get_appcontext, list_appcontext, and rm_appcontext.

command_list

is a list of commands that the user can execute. Use commas to separate multiple commands. The list can include create database, create default, create procedure, create rule, create table, create view, set proxy, set session authorization, create encryption key, and connect.

create database and set tracing permission can be granted only by a system administrator, and only from within the master database. Only a system security officer can grant permission to exectue create encryption key and create trigger.

Only a system security officer can grant users permission to execute set proxy or set session authorization. Granting permission to execute set proxy or set session authorization allows the grantee to impersonate another login in the server. set proxy and set session authorization are identical, except that set session authorization follows the ANSI92 standard, and set proxy is a Transact-SQL extension.

dbcc_command

is the name of the dbcc command you are granting. It cannot be a variable. Table 1-21 on page 453 lists the valid grant dbcc commands.

database

is the name of the database on which you are granting permissions. It is used with database-specific dbcc commands to grant permission only on the target database. The grantee must be a valid user in the target database. *database* conforms to the rules for identifiers and cannot be a variable.

If there are multiple granted actions in the same command, *database* must be unique.

See “on all | database parameter and server-level commands” on page 454.

role

grants a role to a user or to a system- or user-defined role.

role_granted

is the name of a system- or user-defined role that the system security officer is granting to a user or a role.

grantee

is the name of a system role, user-defined role, or a user, to whom you are granting a role.

role_list

is a list of system-defined or user-defined roles to which you are granting the permission.

proxy

Grants permission for a user to impersonate another user. Only the system security officer can grant set proxy.

tracing

Grants permission for a user to enable or disable tracing for set option, set plan, and dbcc traceon or traceoff. Only the system administrator can grant set tracing permission, and only from the master database. After being granted permission to set tracing, users need not be in the master database to run the tracing-related set options, and trace flags 3604 and 3605.

default permissions on system tables

specifies that you grant the default permissions for the system tables listed in “granting default permissions on system tables” on page 454.

system

ensures that the grantee has the same set of system roles as the target login.

Examples

Example 1 Grants Mary and the “sales” group permission to use the insert and delete commands on the titles table:

```
grant insert, delete
on titles
to mary, sales
```

Example 2 Grants select permission on the get_appcontext function to “public” (which includes all users):

```
grant select on builtin get_appcontext to public
```

Compare this to the following, which grants select permission on a table called get_appcontext, if a table with that name exists:

```
grant select on get_appcontext to public
```

Specifically including the builtin argument in your grant statement ensures that you do not mistakenly select a table that has the same name as a function—in this example, the get_appcontext function versus a table called get_appcontext.

Example 3 Two ways to grant update permission on the price and advance columns of the titles table to “public” (which includes all users):

```
grant update
on titles (price, advance)
to public
```

or:

```
grant update (price, advance)
on titles
```

```
to public
```

Example 4 Grants transfer table permission to user mary for the titles table:

```
grant transfer table on titles to mary
```

Example 5 Grants Harry and Billy permission to execute either set proxy or set session authorization to impersonate another user in the server:

```
grant set proxy to harry, billy
```

Example 6 Grants users with sso_role permission to execute either set proxy or set session authorization to impersonate another user in the server:

```
grant set session authorization to sso_role
```

Example 7 Grants users with vip_role the ability to impersonate another user in the server. vip_role must be a role defined by a system security officer with the create role command:

```
grant set proxy to vip_role
```

Example 8 Grants Mary and John permission to use the create database and create table commands. Because create database permission is being granted, the grant command can be executed only by a system administrator within the master database. Mary and John's create table permission applies only to the master database:

```
grant create database, create table
to mary, john
```

Example 9 Grants complete access permissions, except decrypt permission, on the titles table to all users:

```
grant all on titles
to public
```

Example 10 Grants all object creation permissions, except create encryption key, in the current database to all users. If this command is executed by a system administrator from the master database, it includes create database permission:

```
grant all
to public
```

Example 11 Gives Mary permission to use the update command on the authors table and to grant that permission to others:

```
grant update on authors
to mary
with grant option
```

Example 12 Gives Bob permission to use the select and update commands on the price column of the titles table and to grant that permission to others:

```
grant select, update on titles (price)
to bob
with grant option
```

Example 13 Grants permission to execute the new_sproc stored procedure to all system security officers:

```
grant execute on new_sproc
to sso_role
```

Example 14 Grants James permission to create a referential integrity constraint on another table that refers to the price column of the titles table:

```
grant references on titles (price)
to james
```

Note Before you create a table that includes a referential integrity constraint to reference another user's table, you must be granted references permission on that referenced table. The table must also include a unique constraint or unique index on the referenced columns. See create table for more information about referential integrity constraints.

Example 15 Grants the database owner permission to specify column encryption using the `ssn_key`, when executed by the key owner. The database owner requires select permission on `ssn_key` to reference it on create table, alter table, or select into:

```
grant select on ssn_key to dbo
```

Example 16 Grants Bob permission to create encyption keys:

```
grant create encyption key to Bob
```

Example 17 Grants decrypt permission on all encrypted columns in the customer table:

```
grant decrypt on customer to accounts_role
```

Example 18 Grants the role "specialist," with all its permissions and privileges, to the role "doctor":

```
grant role specialist_role to doctor_role
```

Example 19 Grants the role "doctor" to Mary:

```
grant role doctor_role to mary
```

Example 20 On a user database called pubs2 owned by Jane, only Jane or the system administrator can execute the dbcc checkdb command:

```
1> dbcc checkdb (pubs2)
2> go
```

Others encounter the following error:

```
Msg 10302, Level 14, State 1:
Line 1:
Only the DBO of database 'test' or a user with system
administrator (SA) role can run this command. DBCC
execution completed. If DBCC printed error messages,
contact a user with system administrator (SA) role.
```

Example 21 If Walter needs to be a maintenance user for pubs2 but the system administrator does not want to grant him administrator-level privileges elsewhere, the system administrator can execute:

```
1> use pubs2
2> go
1> grant dbcc checkdb on pubs2 to walter
2> go
```

Note The system administrator must be in the target database—in this case pubs2—and Walter must be a valid user in this target database.

Example 22 Walter (from the previous example) can now execute the dbcc checkdb command on the customers database without encountering an error:

```
%isql -Uwalter -Pwalterpassword -SSERVER
1> use pubs2
2> go
1> dbcc checkdb (pubs2)
2> go

Checking sysobjects: Logical pagesize is 2048 bytes
The total number of data pages in this table is 2.
Table has 27 data rows.
...
Table has 1 data rows.
DBCC execution completed. If DBCC printed error
messages, contact a user with system administrator (SA)
role.
```

Example 23 Grants the use of dbcc to a role instead of a user. This lets system administrators assign the ability to execute dbcc to individual users based on their role:

```
1> use master
2> go
1> create role checkdb_role
2> go
1> use pubs2
2> go
1> grant dbcc checkdb on pubs2 to checkdb_role
2> go
```

Next, the system administrator grants the role to Joe:

```
1> create login joe with password joepassword
2> go

Password correctly set.
Account unlocked.
New login created.
 (return status = 0)

1> use pubs2
2> sp_adduser joe
3> go

1> grant role checkdb_role to joe
2> go
```

Joe can now execute the dbcc checkdb command on the pubs2 database when activating checkdb_role. Joe must be a valid user in pubs2:

```
% isql -Ujoe -Pjoepassword -SSERVER
1> use pubs2
2> go
1> dbcc checkdb (pubs2)
2> go

Msg 10302, Level 14, State 1:
Line 1:
Only the DBO of database 'pubs2' or a user with system
administrator (SA) role can run this command. DBCC
execution completed. If DBCC printed error messages,
contact a user with system administrator (SA) role.

1> set role checkdb_role on
2> go
1> dbcc checkdb (pubs2)
2> go

Checking sysobjects: Logical pagesize is 2048 bytes
The total number of data pages in this table is 2.
...
The total number of data pages in this table is 1.
```

```
Table has 1 data rows. DBCC execution completed. If DBCC
printed error messages, contact a user with system
administrator (SA) role.
```

Example 24 Through the use of a role, the system administrator allows Carlos to run dbcc checkalloc on any database where he is a valid user, or where a database allows a "guest" user.

Note You do not need to add Carlos as an actual user in the master database if the user "guest" already exists in master.

```
1> use master
2> go
1> create role checkalloc_role
2> go
1> grant dbcc checkalloc on all to checkalloc_role
2> go
1> create login carlos with password carlospassword
2> go
1> grant role checkalloc_role to carlos
2> go
```

Example 25 Gives Frank, a valid user in the master database, the ability to execute dbcc checkdb for all databases in the server:

```
1> use master
2> go
1> create login frank with password frankpassword
2> go

Password correctly set.
Account unlocked.
New login created.
 (return status = 0)

1> sp_adduser frank
2> go

New user added.
 (return status = 0)

1> grant dbcc checkdb on all to frank
2> go
```

Now Frank can execute the dbcc checkdb command on each database in the server where he is a valid user:

```
% isql -Ufrank -Pfrankpassword -SSERVER
1> dbcc checkdb (tempdb)
```

```
2> go

Checking tempdb: Logical pagesize is 2048 bytes
Checking sysobjects: Logical pagesize is 2048 bytes
...
The total number of data pages in this table is 1. DBCC
execution completed. If DBCC printed error messages,
contact a user with system administrator (SA) role.
```

Note You cannot grant or revoke dbcc commands to public or groups.

Example 26 Grants Alex permission to use the dbcc tune command on pubs2. This example returns an error because you cannot grant server-level dbcc commands at the database level:

```
grant dbcc tune on pubs2 to alex

Msg 4626, Level 16, State 1:
Line 1:
DBCC command 'tune' cannot be assigned at
database-level.
```

Example 27 Grants dbcc tune on the master database to Alex. This returns an error because even if the current database is master, the on *database* parameter shows the intention to restrict the access to the current database scope, and this is not possible for server-level commands:

```
grant dbcc tune on master to alex

Msg 4626, Level 16, State 1:
Line 1:
DBCC command 'tune' cannot be assigned at the
database-level.
```

Example 28 Grants dbcc tune to Alex. This returns an error because server-level commands require that master be the current database:

```
use pubs2
grant dbcc tune to alex

Msg 4627, Level 16, State 1:
Line 1:
The user must be in the master database to GRANT/REVOKE
this command.
```

Example 29 Grants dbcc checkalloc on the pubs2 database to “nonuser.” This returns an error because a user must be a valid user in the database to be granted database-level access:

```
grant dbcc checkalloc on pubs2 to nonuser
```

```
Msg 11105, Level 11, State 1:
Line 1:
No such user/role 'nonuser' exists.
```

Example 30 Grants dbcc tune on all to Alex:

```
grant dbcc tune on all to alex
```

The on all parameter is ignored because server-wide commands are always granted in the master database, and, by default, any access granted in the master database is granted for any database. Although the on all clause is not designed for server-wide commands, its use does not cause any errors because it is a default behavior.

Example 31 Grants dbcc checkalloc on all and dbcc checkdb on pubs2 to Alex. Although several commands can be granted under the same statement, they must all affect the same database, so you must be in master if one of them is on all:

```
grant dbcc checkalloc on all,
dbcc checkdb on pubs2 to alex
```

```
Msg 4627, Level 16, State 1:
Line 1:
The user must be in the master database in order to
grant/revoke server-wide DBCC access.
```

Example 32 Erroneously applies grant dbcc and revoke dbcc to groups or public:

```
1> grant dbcc tablealloc on pubs2 to public
```

```
Msg 4629, Level 16, State 1:
Line 1:
GRANT/REVOKE DBCC does not apply to groups or PUBLIC.
```

```
1> sp_addgroup gr
```

```
New group added.
 (return status = 0)
```

```
1> grant dbcc tablealloc on pubs2 to gr
```

```
Msg 4629, Level 16, State 1:
Line 1:
GRANT/REVOKE DBCC does not apply to groups or PUBLIC.
```

Example 33 Granting a database-level command at the database level has no effect if a server-wide permission exists:

```
1> grant dbcc checkalloc on all to alex
1> use pubs2
1> grant dbcc checkalloc on pubs2, dbcc tablealloc on pubs2 to alex
1> exec sp_helprotect

grantor   grantee   type   action   object    column           grantable
-------   -------   ----   ------   -------   -------          ---------
dbo       alex     Grant   DBCC    DBCC      dbcc tablealloc   FALSE
 (return status = 0)
```

Example 34 Granting dbcc tablealloc to Alex results in an error message because the user does not have system administrator privileges:

```
set role sa_role off
grant dbcc tablealloc on all to alex

Msg 10353, Level 14, State 1:
Line 1:
You must have the following roles to execute this command/procedure:
'sa_role'. Please contact a user with the appropriate role for help.
```

Example 35 Granting a dbcc traceon results in an error message because dbcc traceon is not a grantable command:

```
grant dbcc traceon to joe
go

Msg 4607, Level 16, State 2:
Line 12:
Privilege DBCC traceon may not be GRANTed or REVOKEd.
```

See Table 1-21 on page 453 for a list of commands you can grant.

Example 36 The col_name function displays only the dbcc commands that can be granted, and returns the string `dbcc internal` for all the dbcc commands that cannot be granted.

```
1> declare @a int
2> select @a=1
3> while (@a<200)
4> begin
5> insert #t values (@a, col_name (-317, @a))
6> select @a=@a+1
7> end
8> select dbcc_id=a, dbcc_command=b from #t where b!="dbcc internal"

 dbcc_id  dbcc_command
-------- ------------------------------

        1 dbcc catalogcheck
        2 dbcc checktable
```

```
 3 dbcc checkalloc
 4 dbcc checkdb
 5 dbcc checkindex
 6 dbcc reindex
 9 dbcc fix_text
11 dbcc tablealloc
12 dbcc indexalloc
13 dbcc textalloc
18 dbcc tune
37 dbcc checkstorage
40 dbcc checkverify
```

Example 37 You cannot use the grant dbcc command using the grant option:

```
grant dbcc tune to alex with grant option
```

```
Msg 156, Level 15, State 1:
Line 1:
Incorrect syntax near the keyword 'with'.
```

Example 38 Runs checkverify on the table tab, with exclusion list disabled, in the database my_db:

```
dbcc checkverify(my_db, tab)
```

Example 39 Runs dbcc checkverify on table tab, in database my_db, with the exclusion list enabled:

```
dbcc checkverify (my_db, tab, 0)
```

Example 40 Runs dbcc checkverify on table tab, in database my_db, with the exclusion list disabled, enter:

```
dbcc checkverify (my_db, tab, 1)
```

Example 41 Allows Harry to use truncate table and updates statistics on the authors table:

```
grant truncate table on authors to harry
grant update statistics on authors to harry
```

Example 42 Allows Billy to use the delete statistics command on the authors table:

```
grant delete statistics on authors to billy
```

Example 43 Grants truncate table, update, and delete statistics privileges to all users with the oper_role (if Billy and Harry possess the oper_role, they can now execute these commands on authors):

```
grant truncate table on authors to oper_role
```

```
grant update statistics on authors to oper_role
grant delete statistics on authors to oper_role
```

Example 44 Implicitly grants permissions for truncate table, delete statistics, and update statistics through a stored procedure. For example, assuming Billy owns the authors table, he can execute the following to grant Harry privileges to run truncate table and update statistics on authors:

```
create procedure sproc1
as
truncate table authors
update statistics authors
go
grant execute on sproc1 to harry
go
```

You can also implicitly grant permissions at the column level for update statistics and delete statistics through stored procedures.

Example 45 Grants set proxy to Joe but restricts him from switching identities to any user with the sa, sso, or admin roles (however, if he already has these roles, he can set proxy for any user with these roles):

```
grant set proxy to joe
restrict role sa_role, sso_role, admin_role
```

When Joe tries to switch his identity to a user with admin_role (in this example, Our_admin_role), the command fails unless he already has admin_role:

```
set proxy Our_admin_role
```

```
Msg 10368, Level 14, State 1:
Server 's', Line 2:Set session authorization permission
denied because the target login has a role that you do
not have and you have been restricted from using.
```

After Joe is granted the admin_role and retries the command, it succeeds:

```
grant role admin_role to joe
set proxy Our_admin_role
```

Example 46 Restricts Joe from being granted any new roles when switching identities:

```
grant set proxy to joe
restrict role all
```

Joe can set proxy only to those users who have the same roles (or roles with fewer privileges) than he has.

Example 47 Restricts Joe from acquiring any new system roles when using set proxy:

```
grant set proxy to joe
restrict role system
```

set proxy fails if the target login has system roles that Joe lacks.

Usage

- grant dbcc issues the following warning when you execute it while set fipsflagger option is enabled:

  ```
  SQL statement on line number 1 contains Non-ANSI
  text. The error is caused due to the use of DBCC.
  ```

- You can substitute the word from for to in the grant syntax.
- Table 1-20 summarizes default permissions on Transact-SQL commands in Adaptive Server. The user listed under the "Defaults to" heading is the lowest level of user that is automatically granted permission to execute a command. This user can grant or revoke permission if it is transferable. Users at higher levels than the default are either automatically assigned permission or (in the case of database owners) can get permission by using the setuser command.

  For example, database owners do not automatically receive permission on objects owned by other users; they can gain such permission by assuming the identity of the object owner with the setuser command, and then issuing the appropriate grant or revoke statement. System administrators have permission to access all commands and objects at any time.

  The Adaptive Server installation script assigns a set of permissions to the default group "public." grant and revoke statements need not be written for these permissions.

  Table 1-20 does not include the system security officer, who has special permissions only on certain system procedures, but not on commands and objects.

Table 1-20: Command and object permissions

Statement	Defaults to					Can be granted/revoked		
	System admin	Operator	Database owner	Object owner	Public	Yes	No	N/A
alter database			X			1)		
alter role								X
alter table				X			X	
begin transaction					X			X

Statement	Defaults to					Can be granted/revoked		
	System admin	**Operator**	**Database owner**	**Object owner**	**Public**	**Yes**	**No**	**N/A**
break								
checkpoint			X				X	
close								
commit					X			X
compute clause								
connect to						X		
create database	X					X		
create default			X			X		
create encryption key	Defaults to the system security officer and the key custodian. The system security officer can grant this permission to other users.							
create index				X			X	
create procedure			X			X		
create role								X
create rule			X			X		
create table			X		(2)	X (2)		
create trigger					X	X		
create view			X			X		
dbcc	Varies depending upon options. See dbcc in this manual.						X	
delete				X (3)		X		
delete statistics								
decrypt permission	Defaults to the object owner and the system security officer. The object owner and the system security officer can grant decrypt permission to other users.							
disk init	X						X	
disk mirror	X							
disk refit	X							
disk reinit	X							
disk remirror	X							
disk unmirror	X						X	
drop any object				X			X	
dump database		X	X				X	
dump transaction		X	X				X	
execute				X (4)		X		
grant on object				X		X		
grant command			X			X		

Statement	Defaults to					Can be granted/revoked		
	System admin	Operator	Database owner	Object owner	Public	Yes	No	N/A
break								
checkpoint			X				X	
close								
commit					X			X
compute clause								
connect to						X		
create database	X					X		
create default			X			X		
create encryption key	Defaults to the system security officer and the key custodian. The system security officer can grant this permission to other users.							
create index				X			X	
create procedure			X			X		
create role								X
create rule			X			X		
create table			X		(2)	X (2)		
create trigger					X	X		
create view			X			X		
dbcc	Varies depending upon options. See dbcc in this manual.						X	
delete				X (3)		X		
delete statistics								
decrypt permission	Defaults to the object owner and the system security officer. The object owner and the system security officer can grant decrypt permission to other users.							
disk init	X						X	
disk mirror	X							
disk refit	X							
disk reinit	X							
disk remirror	X							
disk unmirror	X						X	
drop any object				X			X	
dump database		X	X				X	
dump transaction		X	X				X	
execute				X (4)		X		
grant on object				X		X		
grant command			X			X		

Statement	**Defaults to**					**Can be granted/revoked**		
	System admin	**Operator**	**Database owner**	**Object owner**	**Public**	**Yes**	**No**	**N/A**
break								
checkpoint			X				X	
close								
commit					X			X
compute clause								
connect to						X		
create database	X					X		
create default			X			X		
create encryption key	Defaults to the system security officer and the key custodian. The system security officer can grant this permission to other users.							
create index				X			X	
create procedure			X			X		
create role								X
create rule			X			X		
create table			X		(2)	X (2)		
create trigger					X	X		
create view			X			X		
dbcc	Varies depending upon options. See dbcc in this manual.						X	
delete				X (3)		X		
delete statistics								
decrypt permission	Defaults to the object owner and the system security officer. The object owner and the system security officer can grant decrypt permission to other users.							
disk init	X						X	
disk mirror	X							
disk refit	X							
disk reinit	X							
disk remirror	X							
disk unmirror	X						X	
drop any object				X			X	
dump database		X	X				X	
dump transaction		X	X				X	
execute				X (4)		X		
grant on object				X		X		
grant command			X			X		

Statement	Defaults to					Can be granted/revoked		
	System admin	Operator	Database owner	Object owner	Public	Yes	No	N/A
insert				X (3)		X		
kill	X						X	
load database		X	X				X	
load transaction		X	X				X	
print					X			X
raiserror					X			X
readtext				X		5)		
revoke on object				X			X	
revoke command			X				X	
rollback					X			X
save transaction					X			X
select				X (3)		X		
set					X			X
setuser			X				X	
shutdown	X						X	
transfer table				X		X		
truncate table				X		X		
update				X (3)		X		
update all statistics				X			X	
update index statistics								
update partition statistics				X			X	
update statistics				X		X		
writetext				X		(6)		

(1) Transferred with database ownership
(2) Public can create temporary tables, no permission required
(3) If a view, permission defaults to view owner
(4) Defaults to stored procedure owner
(5) Transferred with select permission
(6) Transferred with update permission
"No" means use of the command is never restricted
"N/A" means use of the command is always restricted

- If the object to which you are granting permission is an encryption key, select permission defaults to the system security officer and the key owner.
- You can grant permissions only on objects in your current database.
- grant and revoke commands are order-sensitive. The command that takes effect when there is a conflict is the one issued most recently.

- A user can be granted permission on a view or stored procedure even if he or she has no permissions on objects referenced by the procedure or view. See Chapter 16, "Managing User Permissions," in the *System Administration Guide*.
- Adaptive Server grants all users permission to declare cursors, regardless of the permissions defined for the base tables or views referenced in the declare cursor statement. Cursors are not defined as Adaptive Server objects (such as tables), so no permissions can be applied against a cursor. When a user opens a cursor, Adaptive Server determines whether the user has select permissions on the objects that define that cursor's result set. It checks permissions each time a cursor is opened.

  If the user has permission to access the objects defined by the cursor, Adaptive Server opens the cursor and allows the user to fetch row data through the cursor. Adaptive Server does not apply permission checking for each fetch. However, if the user performs a delete or an update through that cursor, the regular permission checking applies for deleting and updating the data of objects referenced in the cursor result set.
- A grant statement adds one row to the sysprotects system table for each user, group, or role that receives the permission. If you subsequently revoke the permission from the user or group, Adaptive Server removes the row from sysprotects. If you revoke the permission from selected group members only, but not from the entire group to which it was granted, Adaptive Server retains the original row and adds a new row for the revoked permission.
- If a user inherits a particular permission by virtue of being a member of a group, and the same permission is explicitly granted to the user, no row is added to sysprotects. For example, if "public" has been granted select permission on the phone column in the authors table, then John, a member of "public," is granted select permission on all columns of authors. The row added to sysprotects as a result of the grant to John contains references to all columns in the authors table except for the phone column, on which he already had permission.

- By default, permission to issue the create trigger command is granted to users. When you revoke permission for a user to create triggers, a revoke row is added in the sysprotects table for that user. To grant permission to that user to issue create trigger, you must issue two grant commands. The first command removes the revoke row from sysprotects; the second inserts a grant row. If you revoke permission to create triggers, the user cannot create triggers even on tables that the user owns. Revoking permission to create triggers from a user affects only the database where the revoke command was issued.
- Use these system procedures to display information about permissions:
  - sp_helprotect reports permissions information for database objects, users, groups, and roles.
  - sp_column_privileges reports permissions information for one or more columns in a table or view.
  - sp_table_privileges reports permissions information for all columns in a table or view.
  - sp_activeroles displays all active roles—and all roles contained by those roles—for the current login session of Adaptive Server.
  - sp_displayroles displays all roles granted to another role or user, or displays the entire hierarchy tree of roles in table format.
- You can view permissions using sp_helprotect:

```
1> use pubs2
2> go
1> sp_helprotect
2> go

grantor  grantee  type   action   object         column       grantable
-------  -------  ----   ------   -------        -------      ---------
dbo     public    Grant  Select   sysalternates  All           FALSE
...
dbo     Walter    Grant  DBCC     DBCC           dbcc checkdb FALSE

 (1 row affected)
 (return status = 0)
```

- You cannot use the grant with grant option with grant dbcc.

grant all object creation permissions

- grant all in a database does not grant create encryption key or decrypt permission.

- When used with only user or group names (no object names), grant all assigns these permissions: create database, create default, create procedure, create rule, create table, and create view. create database permission can be granted only by a system administrator and only from within the master database.
- Only the database owner and a system administrator can use the grant all syntax without an object name to grant create command permissions to users or groups. When the grant all command is used by the database owner, an informational message is printed, stating that only a system administrator can grant create database permission. All other permissions noted above are granted.
- All object owners can use grant all with an object name to grant permissions on their own objects. When used with a table or view name plus user or group names, grant all enables delete, delete statistics, insert, select, truncate table, update, and update statistics permissions on the table.

grant with grant option rules

- You cannot grant permissions with grant option to "public" or to a group or role.
- In granting permissions, a system administrator is treated as the object owner. If a system administrator grants permission on another user's object, the owner's name appears as the grantor in sysprotects and in sp_helprotect output.
- You cannot grant create encryption key permission with the grant option parameter.
- Information for each grant command is kept in the sysprotects system table, with the following exceptions:
    - Adaptive Server displays an informational message if a specific permission is granted to a user more than once by the same grantor. Only the first grant record is kept.
    - If wotgrants are exactly same except that one of them is granted with grant option, the grant with grant option is kept.
    - If wotgrant statements grant the same permissions on a particular table to a specific user, but to different columns, Adaptive Server treats the grants as if they were one statement. For example, the following grant statements are equivalent:

```
grant select on titles (price, contract)
    to keiko
```

```
grant select on titles (advance) to keiko
grant select on titles (price, contract,
    advance)
to keiko
```

Granting permission to roles

- You can use the grant command to grant permissions to all users who have been granted a specified role. The role can be either a system role, like sso_role or sa_role, or a user-defined role. The system security officers must create the role user-defined roles using a create role command.

  However, grant execute permission does not prevent users who do not have a specified role from being individually granted permission to execute a stored procedure. To ensure, for example, that only system security officers can ever be granted permission to execute a stored procedure, use the proc_role system function within the stored procedure itself. It checks to see whether the invoking user has the correct role to execute the procedure. See proc_role.

- Permissions that are granted to roles override permissions that are granted to users or groups. For example, say John has been granted the system security officer role, and sso_role has been granted permission on the sales table. If John's individual permission on sales is revoked, he can still access sales because his role permissions override his individual permissions.

Users and user groups

- User groups allow you to grant or revoke permissions to more than one user with a single statement. Each user can be a member of one other group and is always a member of "public."
- The database owner or system administrator can add new users with sp_adduser and create groups with sp_addgroup. To allow users with logins on Adaptive Server to use the database with limited privileges, you can add a "guest" user with sp_adduser and assign limited permissions to "guest." All users with logins can access the database as "guest."
- To remove a user, use sp_dropuser. To remove a group, use sp_dropgroup.

  To add a new user to a group other than "public," use sp_adduser. To change an established user's group, use sp_changegroup.

  To display the members of a group, use sp_helpgroup.

- When sp_changegroup is executed to change group membership, it clears the in-memory protection cache by executing:

```
grant all to null
```

so that the cache can be refreshed with updated information from the sysprotects table. To modify sysprotects directly, contact Sybase Technical Support.

grant dbcc command options

Table 1-21 lists the valid grant dbcc commands.

Table 1-21: dbcc command options

Command name	Description
checkalloc	Checks the specified database to make sure all of its pages are correctly allocated, and that there are no unused allocated pages.
checkcatalog	Checks for consistency in and between system tables.
checkdb	Runs the same checks as checktable, but on each table in the specified database, including syslogs.
checkindex	Checks the specified index to make sure that: • Index and data pages are correctly linked. • Indexes are correctly sorted. • All pointers are consistent. • Data information on each page is reasonable. • Page offsets are reasonable.
checkstorage	Checks the specified database for: • Allocation • OAM page entries • Page consistency • Text-valued columns • Allocation of text-valued columns • Text-column chains
checktable	Checks the specified table to make sure that: • Index and data pages are correctly linked. • Indexes are correctly sorted. • All pointers are consistent. • Data information on each page is reasonable. • Page offsets are reasonable.
checkverify	Verifies the results of the most recent run of dbcc checkstorage for the specified database.
fix_text	Upgrades text values after any Adaptive Server character set is converted to a new multibyte character set.
indexalloc	Checks the specified index to make sure all pages are correctly allocated, and that there are no unused allocated pages.

Command name	Description
reindex	Checks the integrity of indexes on user tables by running a fast version of dbcc checktable.
tablealloc	Checks the specified table to make sure that all pages are correctly allocated, and that there are no unused allocated pages.
textalloc	Checks for a violation of the format of the root page of a text, unitext, or image index.
tune	Enables or disables tuning flags for special performance situations.

All of the options in Table 1-21 are database-level commands except for tune, which is a server-level command.

See Chapter 25, "Checking Database Consistency" in the *System Administration Guide* for more information on these dbcc commands.

on all | *database* parameter and server-level commands

The on *database* parameter specifies the database on which to invoke the database-level grant dbcc command. Because on master grants the ability to use dbcc commands on all databases, on master is the same as on all. You must be in the master database to use either the on all or on master parameters.

Neither the on *database* nor on all parameters work when invoking a server-level grant dbcc command such as dbcc tune, because by doing so, you are forcing a server-level command to restrict itself to individual databases. For this reason, using the server-level grant dbcc tune on master command raises an error.

on all and guest

Before you grant dbcc permission for a database to a user, that user must first be a valid user in the database, and cannot be a "guest" user. However, if you grant dbcc through roles, the users can then execute that dbcc command in any database where they are a valid user, including the user "guest."

granting default permissions on system tables

The system tables that you can grant and revoke the default permissions for when you issue the command from any database are:

- sysalternates
- sysattributes
- syscolumns
- syscomments
- sysconstraints
- sysdepends
- sysindexes
- sysjars
- syskeys
- syslogs
- sysobjects
- syspartitions
- sysprocedures
- sysprotects
- sysqueryplans
- sysreferences
- sysroles
- syssegments
- sysstatistics
- systabstats
- systhresholds
- systypes
- sysusermessages
- sysusers
- sysxtypes

The command also makes the following changes:

- Revokes syscolumns (encrkyid) and syscolumns (encrkydb) permissions from public.
- Revokes syscolumns (encrkydb) and syscolumns (encrkyid) permissions from public.
- Revokes sysobjects(audflags) permissions from public
- Grants permissions for sysobjects to sso_role
- Revokes select on all columns of sysencryptkeys from public
- Grants select on all sysencryptkeys columns to sso_role
- Grants permissions for syscolumns to sso_role

The system tables for which you can grant and revoke the default permissions when you issue the command from the master database are:

- sysdatabases
- sysdevices
- syslocks
- sysmessages
- sysprocesses
- systransactions
- sysusages
- sysconfigures
- syscurconfigs
- syslanguages
- syscharsets
- sysservers
- systimeranges
- sysresourcelimits
- syslogins
- sysremotelogins
- syssessions

The command also:

- Revokes select on sysdatabases(deftabaud) from public
- Revokes select on sysdatabases(defvwaud) from public
- Revokes select on sysdatabases(defpraud) from public

- Revokes select on sysdatabases(audflags2) from public
- Grants select on sysdatabases to sso_role
- Revokes select on syslogins(password) to public
- Revokes select on syslogins(audflags) from public
- Grants select on syslogins to sso_role
- Revokes select on syslisteners(net_type) from public
- Revokes select on syslisteners(address_info) from public
- Grants select on syslisteners to sso_role
- Revokes select on syssrvroles(srid) from public
- Revokes select on syssrvroles(name) from public
- Revokes select on syssrvroles(password) from public
- Revokes select on syssrvroles(pwdate) from public
- Revokes select on syssrvroles(status) from public
- Revokes select on syssrvroles(logincount) from public
- Grants select on syssrvroles to public
- Revokes select on sysloginroles(suid) from public
- Revokes select on sysloginroles(srid) from public
- Revokes select on sysloginroles(status) from public
- Grants select on sysloginroles to sso_role

Granting permissions for *update statistics*, *delete statistics*, and *truncate table*

Adaptive Server allows you to grant permissions for users, roles, and groups for the update statistics, delete statistics, and truncate table commands. Table owners can also provide permissions through an implicit grant by adding update statistics, delete statistics, and truncate table to a stored procedure and then granting execute permissions on that procedure to a user or role.

You cannot grant permissions for update statistics at the column level. You must have the sso_role to run update statistics or delete statistics on sysroles, syssrvroles, and sysloginroles security tables.

By default, users with the sa_role have permission to run update statistics and delete statistics on system tables other than sysroles, syssrvroles, and sysloginroles, and can transfer this privilege to other users.

You can also issue grant all to grant permissions on update statistics, delete statistics, and truncate table.

Note Once you grant permission to execute update statistics to a user, he or she also has permission to execute variations of this command, such as update all statistics, update partition statistics, update index statistics, update statistics *table*, and so on. For example, the following grants Billy permission to run all variations of update statistics on the authors table:

```
grant update statistics on authors to billy
```

If you revoke a user's permission to execute update statistics, you also revoke his or her ability to execute the variations of this command.

You cannot grant variants of update statistics (for example, update index statistics) separately. That is, you *cannot* issue:

```
grant update all statistics to harry
```

You can, however, write stored procedures that control who executes these commands. For example, the following grants Billy execute permission for update index statistics on the authors table:

```
create proc sp_ups as
update index statistics on authors
go
revoke update statistics on authors from billy
go
grant execute on sp_ups to billy
```

You cannot grant and revoke delete statistics permissions at the column level.

Although Adaptive Server audits truncate table as a global, miscellaneous audit, it does not audit update statistics. To retain clear audit trails for both truncate table and update statistics, Sybase recommends that you include both commands in a stored procedure to which you grant users execute permission, as described above.

The command fails and generates an error message if a user issues update statistics, delete statistics, or truncate table and:

- Does not own the table.
- Does not have the sa_role.
- Is not a database owner who has successfully used setuser to become the table owner.

- Has not been granted update statistics, delete statistics, or truncate table privileges.

Granting proxies and session authorizations

- Granting permission to execute set proxy or set session authorization allows the grantee to impersonate another login in Adaptive Server. set proxy and set session authorization are identical, except set session authorization follows the SQL standard, and set proxy is a Transact-SQL extension.
- To grant set proxy or set session authorization permission, you must be a system security officer, and you must be in the master database.
- The name you specify in the grant set proxy command must be a valid user in the database; that is, the name must be in the sysusers table in the database.
- grant all does not include the set proxy or set session authorization permissions.
- You can restrict roles incrementally using grant set proxy. For example, you can first restrict the sa_role, then the sso_role:

```
grant set proxy to joe
restrict role sa_role
grant set proxy to joe
restrict role sso_role
```

- You cannot unrestrict individual roles. You must revoke set proxy to revoke permissions from all roles, as illustrated in this query:

```
select distinct user_name (p.uid), b.name, p.grantor,
                 Restricted_role=case
convert (tinyint,substring (isnull (p.columns,0x1),1,1)) & 1
                       when 1 then
                            "None"
                       else
                            isnull (role_name (c.number - 1), "System
"+convert (char,c.number))
                                    end
    from sysprotects p, master.dbo.spt_values b, master.dbo.spt_values c
    where
          convert (tinyint,substring (isnull (p.columns,0x1), c.low,1))
&
c.high = 0
         and c.type = "P" and c.number <= 1024 and c.number >0 and
p.action = 167
         and b.type = "T"
```

```
and b.number = (p.protecttype + 204)
 and role_name (c.number - 1) is not null
```

Granting permissions in a shared-disk cluster

grant fails if you attempt to grant permissions to user-defined roles in a local temporary database.

Standards

ANSI SQL – Compliance level: Entry-level compliant. grant dbcc is also a Transact-SQL extension.

grant dbcc, and granting permissions to groups and granting set proxy are Transact-SQL extensions. Granting set session authorization (identical in function to set proxy) follows the ANSI standard.

Permissions

Command execution Only system administrators can grant create database permission, and only from the master database. Only system security officers can grant create trigger permission.

Only system security officers can grant create trigger and create encryption key permissions.

Database consistency checking Only system administrators can run grant dbcc commands.

Database object access grant permission for database objects defaults to object owners. Object owners can grant permission to other users on their own database objects.

Functions Only system administrators can grant permissions on built-in functions.

Encrypted columns Only the systems security officer and the key custodian have implicit permission to create encryption keys.

Proxy and session authorization Only system security officers can grant set proxy or set session authorization, and only from the master database. Granting permission to execute set proxy or set session authorization allows the grantee to impersonate another login in the server. set proxy and set session authorization are identical, except that set session authorization follows the ANSI92 standard, and set proxy is a Transact-SQL extension.

Roles You can grant roles only from the master database. Only system security officers can grant sso_role, oper_role or a user-defined role to a user or a role. Only system administrators can grant sa_role to a user or a role. Only users who have both sa_role and sso_role can grant a role that includes sa_role.

System tables Database owners can grant default permissions on system tables.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
40	grant	grant	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect
85	roles	create role, drop role, alter role, grant role, or revoke role	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Catalog stored procedures sp_column_privileges, sp_table_privileges

Commands create role, revoke, setuser, set

Functions proc_role, show_role

System procedures sp_addgroup, sp_adduser, sp_changedbowner, sp_changegroup, sp_dropgroup, sp_dropuser, sp_helpgroup, sp_helprotect, sp_helpuser, sp_role

group by and having clauses

Description

Used in select statements to divide a table into groups and to return only groups that match conditions in the having clause. group by is typically used in conjunction with aggregates to specify how to group the unaggregated columns of a select query. having clauses are applied to these groups.

Syntax

Start of select *statement*

[group by [all] *aggregate_free_expression*
  [, *aggregate_free_expression*]...]

[having *search_conditions*]

End of select *statement*

Parameters

group by

specifies the groups into which the table is divided, and if aggregate functions are included in the select list, finds a summary value for each group. These summary values appear as columns in the results, one for each group. You can refer to these summary columns in the having clause.

You can use the avg, count, count_big, max, min, and sum aggregate functions in the select list before group by (the expression is usually a column name). See Chapter 2, "Transact-SQL Functions" of *Reference Manual: Building Blocks*.

A table can be grouped by any combination of columns—that is, groups can be nested within each other, as in Example 2.

all

is a Transact-SQL extension that includes all groups in the results, even those excluded by a where clause. For example:

```
select type, avg (price)
from titles
where advance > 7000
group by all type

type
-----------------  ----------
UNDECIDED                NULL
business                 2.99
mod_cook                 2.99
popular_comp            20.00
psychology               NULL
trad_cook               14.99
```

```
(6 rows affected)
```

"NULL" in the aggregate column indicates groups that would be excluded by the where clause. A having clause negates the meaning of all.

aggregate_free_expression
is an expression that includes no aggregates. A Transact-SQL extension allows grouping by an aggregate-free expression as well as by a column name.

You cannot group by column heading or alias. This example is correct:

```
select Price=avg (price), Pay=avg (advance),
Total=price * $1.15
from titles
group by price * $1.15
```

having
sets conditions for the group by clause, similar to the way in which where sets conditions for the select clause.

having search conditions can include aggregate expressions; otherwise, having search conditions are identical to where search conditions. This is an example of a having clause with aggregates:

```
select pub_id, total = sum (total_sales)
from titles
where total_sales is not null
group by pub_id
having count (*)>5
```

When Adaptive Server optimizes queries, it evaluates the search conditions in where and having clauses, and determines which conditions are search arguments (SARGs) that can be used to choose the best indexes and query plan. All of the search conditions are used to qualify the rows. For more information on search arguments, see the *Performance and Tuning Guide: Optimizer and Abstract Plans*.

Examples

Example 1 Calculates the average advance and the sum of the sales for each type of book:

```
select type, avg (advance), sum (total_sales)
from titles
group by type
```

Example 2 Groups the results by type, then by pub_id within each type:

```
select type, pub_id, avg (advance), sum (total_sales)
from titles
group by type, pub_id
```

Example 3 Calculates results for all groups, but displays only groups whose type begins with "p":

```
select type, avg (price)
from titles
group by type
having type like 'p%'
```

Example 4 Calculates results for all groups, but displays results for groups matching the multiple conditions in the having clause:

```
select pub_id, sum (advance), avg (price)
from titles
group by pub_id
having sum (advance) > $15000
and avg (price) < $10
and pub_id > "0700"
```

Example 5 Calculates the total sales for each group (publisher) after joining the titles and publishers tables:

```
select p.pub_id, sum (t.total_sales)
from publishers p, titles t
where p.pub_id = t.pub_id
group by p.pub_id
```

Example 6 Displays the titles that have an advance of more than $1000 and a price that is more than the average price of all titles:

```
select title_id, advance, price
from titles
where advance > 1000
having price > avg (price)
```

Usage

- You can use a column name or any expression (except a column heading or alias) after group by. You can use group by to calculate results or display a column or an expression that does not appear in the select list (a Transact-SQL extension described in "Transact-SQL extensions to group by and having" on page 466).
- The maximum number of group by columns (or expressions) is not explicitly limited. The only limit of group by results is that the width of the group by columns plus the aggregate results be no greater than 64K.
- Null values in the group by column are put into a single group.
- You cannot name text, unitext, or image columns in group by and having clauses.

- You cannot use a group by clause in the select statement of an updatable cursor.
- Aggregate functions can be used only in the select list or in a having clause. They cannot be used in a where or group by clause.

  Aggregate functions are of two types. Aggregates applied to *all the qualifying rows in a table* (producing a single value for the whole table per function) are called *scalar aggregates*. An aggregate function in the select list with no group by clause applies to the whole table; it is one example of a scalar aggregate.

  Aggregates applied to *a group of rows in a specified column or expression* (producing a value for each group per function) are called *vector aggregates*. For either aggregate type, the results of the aggregate operations are shown as new columns that the having clause can refer to.

  You can nest a vector aggregate inside a scalar aggregate. See Chapter 2, "Transact-SQL Functions" of *Reference Manual: Building Blocks* for more information.

How *group by* works with the optimizer

In Adaptive Server version 15.0, there are two possible algorithms (implemened as operators) for doing group by: GroupHashing and GroupSorted. The optimizer chooses which operator to use based on factors such as the requirements these operators place on the input data streams.

The GroupSorted operator requires that the input rows to be aggregated are already sorted on the group by columns. Since the input rows must be sorted, the optimizer uses either of the following:

- An index on the order by columns to read the rows from the source table, and the maximum width of the group by columns is limited by the maximum width of an index key, which depends upon the database page size.
- Asort operator to order the rows on the group by columns before they are processed by the GroupSorted operator. The group by columns and the columns to be aggregated must fit into a worktable, so the maximum width of the group by columns is limited to the maxiumu row size on a database page, minus the width of the columns to be aggregated. The maximum group by column width is limited by the database page size.

The optimizer uses the GroupHashing operator if ordering on the group by columns is not available or the row size limitations of the GroupSorted operator are exceeded. The GroupHashing operator applies a hashing function to the values of the group by columns to be able to put rows with the same group by column values into the same hash bucket. Once the input rows have all been hashed into buckets, the rows in the buckets are aggregated to generate the group by results. The only limitation of the GroupHashing operator is that the total row size of group by columns and aggregate results cannot be larger than 64K. There is no limitation on the number of group by columns or the number of aggregation operations, just the total row width.

How *group by* and *having* queries with aggregates work

The where clause excludes rows that do not meet its search conditions; its function remains the same for grouped or nongrouped queries.

The group by clause collects the remaining rows into one group for each unique value in the group by expression. Omitting group by creates a single group for the whole table.

Aggregate functions specified in the select list calculate summary values for each group. For scalar aggregates, there is only one value for the table. Vector aggregates calculate values for the distinct groups.

The having clause excludes groups from the results that do not meet its search conditions. Even though the having clause tests only rows, the presence or absence of a group by clause may make it appear to be operating on groups:

- When the query includes group by, having excludes result group rows. This is why having seems to operate on groups.
- When the query has no group by, having excludes result rows from the (single-group) table. This is why having seems to operate on rows (the results are similar to where clause results).

Standard *group by* and *having* queries

All group by and having queries in the Examples section adhere to the SQL standard, which dictates that queries using group by, having, and vector aggregate functions produce one row and one summary value per group, using these guidelines:

- Columns in a select list must also be in the group by expression, or they must be arguments of aggregate functions.
- A group by expression can contain only column names that are in the select list. However, columns used only as arguments of aggregate functions in the select list do not qualify.

- Columns in a having expression must be single-valued—arguments of aggregates, for instance—and they must be in the select list or group by clause. Queries with a select list aggregate and a having clause *must* have a group by clause. If you omit the group by for a query without a select list aggregate, all the rows not excluded by the where clause are considered to be a single group.

In nongrouped queries, the principle that “where excludes rows” seems straightforward. In grouped queries, the principle expands to “where excludes rows before group by, and having excludes rows from the display of results.”

The SQL standard allows queries that join two or more tables to use group by and having, if they also adhere to the above guidelines. When specifying joins or other complex queries, use the standard syntax of group by and having until you fully comprehend the effect of the Transact-SQL extensions to both clauses.

To help you avoid problems with extensions, Adaptive Server provides the fipsflagger option to the set command that issues a nonfatal warning for each occurrence of a Transact-SQL extension in a query. See set for more information.

Transact-SQL extensions to *group by* and *having*

Transact-SQL extensions to standard SQL make displaying data more flexible, by allowing references to columns and expressions that are not used for creating groups or summary calculations:

- A select list that includes aggregates can include *extended* columns that are not arguments of aggregate functions and are not included in the group by clause. An extended column affects the display of final results, since additional rows are displayed.
- The group by clause can include columns or expressions that are not in the select list.
- The group by all clause displays all groups, even those excluded from calculations by a where clause. See the example for the keyword all in the “Parameters” section.
- The having clause can include columns or expressions that are not in the select list and not in the group by clause.

When the Transact-SQL extensions add rows and columns to a display, or if group by is omitted, query results may be hard to interpret. The examples that follow can help you understand how Transact-SQL extensions can affect query results.

The following examples illustrate the differences between queries that use standard group by and having clauses and queries that use the Transact-SQL extensions:

1 An example of a standard grouping query:

```
select type, avg (price)
from titles
group by type

type
---------------------  ----------
UNDECIDED                    NULL
business                    13.73
mod_cook                    11.49
popular_comp                21.48
psychology                  13.50
trad_cook                   15.96

 (6 rows affected)
```

2 The Transact-SQL extended column, price (in the select list, but not an aggregate and not in the group by clause), causes all qualified rows to display in each qualified group, even though a standard group by clause produces a single row per group. The group by still affects the vector aggregate, which computes the average price per group displayed on each row of each group (they are the same values that were computed for example a):

```
select type, price, avg (price)
from titles
group by type

type           price
------------ --------------- -------------
business       19.99            13.73
business       11.95            13.73
business        2.99            13.73
business       19.99            13.73
mod_cook       19.99            11.49
mod_cook        2.99            11.49
UNDECIDED       NULL             NULL
popular_comp   22.95            21.48
popular_comp   20.00            21.48
popular_comp    NULL            21.48
psychology     21.59            13.50
psychology     10.95            13.50
psychology      7.00            13.50
```

```
psychology     19.99            13.50
psychology      7.99            13.50
trad_cook      20.95            15.96
trad_cook      11.95            15.96
trad_cook      14.99            15.96

 (18 rows affected)
```

3 The way Transact-SQL extended columns are handled can make it look as if a query is ignoring a where clause. This query computes the average prices using only those rows that satisfy the where clause, but it also displays rows that do not match the where clause.

Adaptive Server first builds a worktable containing only the type and aggregate values using the where clause. This worktable is joined back to the titles table in the grouping column type to include the price column in the results, but the where clause is *not* used in the join.

The only row in titles that is not in the results is the lone row with type = "UNDECIDED" and a NULL price, that is, a row for which there were no results in the worktable. If you also want to eliminate the rows from the displayed results that have prices of less than $10.00, you must add a having clause that repeats the where clause, as shown in Example 4:

```
select type, price, avg (price)
from titles
where price > 10.00
group by type
```

```
type           price
------------ --------------- -------------
business        19.99            17.31
business        11.95            17.31
business         2.99            17.31
business        19.99            17.31
mod_cook        19.99            19.99
mod_cook         2.99            19.99
popular_comp    22.95            21.48
popular_comp    20.00            21.48
popular_comp     NULL            21.48
psychology      21.59            17.51
psychology      10.95            17.51
psychology       7.00            17.51
psychology      19.99            17.51
psychology       7.99            17.51
trad_cook       20.95            15.96
trad_cook       11.95            15.96
```

```
trad_cook       14.99            15.96

 (17 rows affected)
```

4 If you are specifying additional conditions, such as aggregates, in the having clause, also include all conditions specified in the where clause. Adaptive Server appears to ignore any where clause conditions that are missing from the having clause:

```
select type, price, avg (price)
from titles
where price > 10.00
group by type
having price > 10.00

type           price
----------- ---------------  --------------
business       19.99           17.31
business       11.95           17.31
business       19.99           17.31
mod_cook       19.99           19.99
popular_comp   22.95           21.48
popular_comp   20.00           21.48
psychology     21.59           17.51
psychology     10.95           17.51
psychology     19.99           17.51
trad_cook      20.95           15.96
trad_cook      11.95           15.96
trad_cook      14.99           15.96

 (12 rows affected)
```

5 This is an example of a standard grouping query using a join between two tables. It groups by pub_id, then by type within each publisher ID, to calculate the vector aggregate for each row:

```
select p.pub_id, t.type, sum (t.total_sales)
from publishers p, titles t
where p.pub_id = t.pub_id
group by p.pub_id, t.type

pub_id  type
------  ------------  --------
0736    business       18722
0736    psychology      9564
0877    UNDECIDED       NULL
0877    mod_cook       24278
0877    psychology       375
```

```
0877    trad_cook      19566
1389    business       12066
1389    popular_comp   12875

 (8 rows affected)
```

It may seem that it is only necessary to specify group by for the pub_id and type columns to produce the results, and add extended columns as follows:

```
select p.pub_id, p.pub_name, t.type,
    sum (t.total_sales)
from publishers p, titles t
where p.pub_id = t.pub_id
group by p.pub_id, t.type
```

However, the results for the above query are much different from the results for the first query in this example. After joining the two tables to determine the vector aggregate in a worktable, Adaptive Server joins the worktable to the table (publishers) of the extended column for the final results. Each extended column from a different table invokes an additional join.

As you can see, using the extended column extension in queries that join tables can easily produce results that are difficult to comprehend. In most cases, use the standard group by to join tables in your queries.

6 This example uses the Transact-SQL extension to group by to include columns that are not in the select list. Both the pub_id and type columns are used to group the results for the vector aggregate. However, the final results do not include the type within each publisher. In this case, you may only want to know how many distinct title types are sold for each publisher:

```
select p.pub_id, sum (t.total_sales)
from publishers p, titles t
where p.pub_id = t.pub_id
group by p.pub_id, t.type

pub_id
------  --------
0736       18722
0736        9564
0877        NULL
0877        24278
0877          375
0877        19566
1389        12066
1389        12875
```

```
(8 rows affected)
```

7 This example combines two Transact-SQL extension effects. First, it omits the group by clause while including an aggregate in the select list. Second, it includes an extended column. By omitting the group by clause:

- The table becomes a single group. The scalar aggregate counts three qualified rows.
- pub_id becomes a Transact-SQL extended column because it does not appear in a group by clause. No having clause is present, so all rows in the group are qualified to be displayed.

```
select pub_id, count (pub_id)
from publishers

pub_id
---------- ---------
0736               3
0877               3
1389               3

(3 rows affected)
```

8 The where clause excludes publishers with a pub_id of 1000 or more from the single group, so the scalar aggregate counts two qualified rows. The extended column pub_id displays all qualified rows from the publishers table:

```
select pub_id, count (pub_id)
from publishers
where pub_id < "1000"

pub_id
-------------- -----------
0736                     2
0877                     2
1389                     2

(3 rows affected)
```

9 This example illustrates an effect of a having clause used without a group by clause.

- The table is considered a single group. No where clause excludes rows, so all the rows in the group (table) are qualified to be counted.
- The rows in this single-group table are tested by the having clause.

- These combined effects display the two qualified rows.

```
select pub_id, count (pub_id)
from publishers
having pub_id < "1000"

pub_id
-------------- ---------
0736                   3
0877                   3
 (2 rows affected)
```

10 This example uses the extension to having that allows columns or expressions not in the select list and not in the group by clause. It determines the average price for each title type, but it excludes those types that do not have more than $10,000 in total sales, even though the sum aggregate does not appear in the results:

```
select type, avg (price)
from titles
group by type
having sum (total_sales) > 10000

type
------------  ----------
business           13.73
mod_cook           11.49
popular_comp       21.48
trad_cook          15.96

 (4 rows affected)
```

group by and *having* and sort orders

If your server has a case-insensitive sort order, group by ignores the case of the grouping columns. For example, given this data on a case-insensitive server:

```
select lname, amount
from groupdemo
lname           amount
---------- ------------------
Smith                10.00
smith                 5.00
SMITH                 7.00
Levi                  9.00
Lévi                 20.00
```

grouping by lname produces these results:

```
select lname, sum (amount)
from groupdemo

lname
---------- ----------------
Levi                   9.00
Lévi                  20.00
Smith                 22.00
```

The same query on a case- and accent-insensitive server produces these results:

```
lname
---------- -----------------
Levi                  29.00
Smith                 22.00
```

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The use of columns within the select list that are not in the group by list and have no aggregate functions is a Transact-SQL extension.

The use of the all keyword is a Transact-SQL extension.

See also

Commands compute clause, declare, select, where clause

Documentation Chapter 2, “Transact-SQL Functions” of *Reference Manual: Building Blocks*

if...else

Description

Imposes conditions on the execution of a SQL statement.

Syntax

if *logical_expression* [plan "*abstract plan*"]
    statements

[else
    [if *logical_expression*] [plan "*abstract plan*"]
        statement]

Parameters

logical_expression
is an expression (a column name, a constant, any combination of column names and constants connected by arithmetic or bitwise operators, or a subquery) that returns TRUE, FALSE, or NULL. If the expression contains a select statement, you must enclose the select statement in parentheses.

plan "*abstract plan*"
specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. Plans can be specified only for optimizable SQL statements, that is, select queries that access tables. See Chapter 16, "Creating and Using Abstract Plans," in the *Performance and Tuning Guide: Optimizer and Abstract Plans*.

statements
is either a single SQL statement or a block of statements delimited by begin and end.

Examples

Example 1 Prints "yes" if 3 is larger than 2:

```
if 3 > 2
    print "yes"
```

Example 2 The if...else condition tests for the presence of authors whose postal codes are 94705, then prints "Berkeley author" for the resulting set:

```
if exists (select postalcode from authors
    where postalcode = "94705")
    print "Berkeley author"
```

Example 3 The if...else condition tests for the presence of user-created objects (all of which have ID numbers greater than 100) in a database. Where user tables exist, the else clause prints a message and selects their names, types, and ID numbers:

```
if (select max (id) from sysobjects) < 100
    print "No user-created objects in this database"
else
 begin
    print "These are the user-created objects"
```

```
    select name, type, id
    from sysobjects
    where id > 100
 end
```

Example 4 Since the value for total sales for PC9999 in the titles table is NULL, this query returns FALSE. The else portion of the query is performed when the if portion returns FALSE or NULL. For more information on truth values and logical expressions, see "Expressions" in Chapter 4, "Expressions, Identifiers, and Wildcard Characters" of *Reference Manual: Building Blocks*.

```
if (select total_sales
    from titles
    where title_id = "PC9999") > 100
select "true"
else
select "false"
```

Usage

- The statement following an if keyword and its condition is executed if the condition is satisfied (when the logical expression returns TRUE). The optional else keyword introduces an alternate SQL statement that executes when the if condition is not satisfied (when the logical expression returns FALSE).
- The if or else condition affects the performance of only a single SQL statement, unless statements are grouped into a block between the keywords begin and end (see Example 3).

  The statement clause can be an execute command or any other legal SQL statement or statement block.
- If a select statement is used as part of the Boolean expression, it must return a single value.
- if...else constructs can be used either in a stored procedure (where they are often used to test for the existence of some parameter) or in *ad hoc* queries (see Examples 1 and 2).

- if tests can be nested either within another if or following an else. The maximum number of if tests you can nest varies with the complexity of any select statements (or other language constructs) that you include with each if...else construct.

  Note When an alter table, create table, or create view command occurs within an if...else block, Adaptive Server creates the schema for the table or view before determining whether the condition is true. This may lead to errors if the table or view already exists.

- If you create tables with varchar, nvarchar, univarchar, or varbinary columns whose total defined width is greater than the maximum allowed row size, a warning message appears, but the table is created. If you try to insert more than the maximum number bytes into such a row, or to update a row so that its total row size is greater than the maximum length, Adaptive Server produces an error message, and the command fails.

Note When a create table command occurs within an if...else block or a while loop, Adaptive Server creates the schema for the table before determining whether the condition is true. This may lead to errors if the table already exists. To avoid this situation, either make sure a view with the same name does not already exist in the database or use an execute statement, as follows:

```
if not exists
     (select * from sysobjects where name="my table")
begin
execute ("create table mytable (x int)")
end
```

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — if...else permission defaults to all users. No permission is required to use it.

See also — **Commands** begin...end, create procedure

insert

Description

Adds new rows to a table or view.

Syntax

```
insert [into] [database.[owner.]]{table_name|view_name}
          [(column_list)]
          {values (expression [, expression]...)
               |select_statement [plan "abstract plan"]}
```

Parameters

into

is optional.

table_name | *view_name*

is the name of the table or view from which you want to remove rows. Specify the database name if the table or view is in another database, and specify the owner's name if more than one table or view of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

column_list

is a list of one or more columns to which data is to be added. Enclose the list in parentheses. The columns can be listed in any order, but the incoming data (whether in a values clause or a select clause) must be in the same order. If a column has the IDENTITY property, you can substitute the syb_identity keyword for the actual column name.

The column list is necessary when some, but not all, of the columns in the table are to receive data. If no column list is given, Adaptive Server assumes that the insert affects all columns in the receiving table (in create table order).

See "The column list" on page 479 for more information.

values

introduces a list of expressions.

expression

specifies constant expressions, variables, parameters, or null values for the indicated columns. Enclose character and datetime constants in single or double quotes.

You cannot use a subquery as an *expression*.

The values list:

- Must be enclosed in parentheses
- Must match the explicit or implicit column list
- Can use “default” as a value

See “Chapter 1, “System and User-Defined Datatypes” in *Reference Manual: Building Blocks* for more information about data entry rules.

select_statement

is a standard select statement used to retrieve the values to be inserted.

plan "*abstract plan*"

specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. Plans can only be specified for insert...select statements. See Chapter 16, “Creating and Using Abstract Plans,” in the *Performance and Tuning Guide: Optimizer and Abstract Plans* for more information.

Examples

Example 1

```
insert titles
values ("BU2222", "Faster!", "business", "1389",
    null, null, null, "ok", "06/17/87", 0)
```

Example 2

```
insert titles
 (title_id, title, type, pub_id, notes, pubdate,
    contract)
values ('BU1237', 'Get Going!', 'business',
    '1389', 'great', '06/18/86', 1)
```

Example 3

```
insert newauthors
    select *
    from authors
    where city = "San Francisco"
```

Example 4

```
insert test
```

```
    select *
    from test
    where city = "San Francisco"
```

Example 5

```
insert table1 (col1, col2, col3, col4)
    values (10, 4, default, 34)
```

Usage

- Use insert only to add new rows. Use update to modify column values in a row you have already inserted.

The column list

The column list determines the order in which values are entered. For example, suppose that you have a table called newpublishers that is identical in structure and content to the publishers table in pubs2. In the example below, the columns in the column list of the newpublishers table match the columns of the select list in the publishers table.

```
insert newpublishers (pub_id, pub_name)
select pub_id, pub_name
    from publishers
    where pub_name="New Age Data"
```

The pub_id and pub_name for "New Age Data" are stored in the pub_id and pub_name columns of newpublishers.

In the next example, the order of the columns in the column list of the newpublishers table does not match the order of the columns of the select list of the publishers table.

```
insert newpublishers (pub_id, pub_name)
    select pub_name, pub_id
    from publishers
    where pub_name="New Age Data"
```

The result is that the pub_id for "New Age Data" is stored in the pub_name column of the newpublishers table, and the pub_name for "New Age Data" is stored in the pub_id column of the newpublishers table.

You can omit items from the column and values lists as long as the omitted columns allow null values (see Example 2).

Validating column values

- insert interacts with the ignore_dup_key, ignore_dup_row, and allow_dup_row options, which are set with the create index command. See create index for more information.

- A rule or check constraint can restrict the domain of legal values that can be entered into a column. Rules are created with the create rule command and bound with sp_bindrule. check constraints are declared with create table.
- A default can supply a value if you do not explicitly enter one. Defaults are created with the create default command and bound with sp_bindefault, or they are declared with create table.
- If an insert statement violates domain or integrity rules (see create rule and create trigger), or if it is the wrong datatype (see create table and Chapter 1, “System and User-Defined Datatypes” in *Reference Manual: Building Blocks*), the statement fails, and Adaptive Server displays an error message.

Treatment of blanks

- Inserting an empty string ("") into a variable character type or text column inserts a single space. char columns are padded to the defined length.
- All trailing spaces are removed from data that is inserted into varchar and univarchar columns, except in the case of a string that contains only spaces. Strings that contain only spaces are truncated to a single space. Strings that are longer than the specified length of a char, nchar, unichar, univarchar, varchar, or nvarchar column are silently truncated unless the string_rtruncation option is set to on.

Inserting into *text*, *unitext*, and *image* columns

An insert of a NULL into a text , ortext, or an image column simply allocates space for a text pointer. Use update to get a valid text pointer for that column.

insert triggers

You can define a trigger that takes a specified action when an insert command is issued on a specified table.

Using *insert* when CIS is enabled

You can send an insert as a language event or as a parameterized dynamic statement to remote servers.

Inserting rows selected from another table

You can select rows from a table and insert them into the same table in a single statement (see Example 4).

To insert data with select from a table that has null values in some fields into a table that does not allow null values, provide a substitute value for any NULL entries in the original table. For example, to insert data into an advances table that does not allow null values, substitute 0 for the NULL fields:

```
insert advances
select pub_id, isnull (advance, 0) from titles
```

Without the isnull function, this command inserts all the rows with non-null values into the advances table, which produces error messages for all the rows where the advance column in the titles table contained NULL.

If you cannot make this kind of substitution for your data, you cannot insert data containing null values into the columns that have a not null specification.

Two tables can be identically structured, and yet be different as to whether null values are permitted in some fields. Use sp_help to see the null types of the columns in your table.

Transactions and *insert*

When you set chained transaction mode, Adaptive Server implicitly begins a transaction with the insert statement if no transaction is currently active. To complete any inserts, you must commit the transaction, or roll back the changes. For example:

```
insert stores (stor_id, stor_name, city, state)
  values ('999', 'Books-R-Us', 'Fremont', 'AZ')
if exists (select t1.city
  from stores t1, stores t2
  where t1.city = t2.city
  and t1.state = t2.state
  and t1.stor_id < t2.stor_id)
    rollback transaction
else
    commit transaction
```

In chained transaction mode, this batch begins a transaction and inserts a new row into the stores table. If it inserts a row containing the same city and state information as another store in the table, it rolls back the changes to stores and ends the transaction. Otherwise, it commits the insertions and ends the transaction. For more information about chained transaction mode, see the *Transact-SQL User's Guide*.

Inserting values into IDENTITY columns

- When inserting a row into a table, do not include the name of the IDENTITY column in the column list or its value in the values list. If the table consists of only one column, an IDENTITY column, omit the column list and leave the values list empty as follows:

  ```
  insert id_table values ()
  ```

- The first time you insert a row into a table, Adaptive Server assigns the IDENTITY column a value of 1. Each new row gets a column value that is one higher than the last. This value takes precedence over any defaults declared for the column in the create table or alter table statement or defaults bound to the column with sp_bindefault.

  Server failures can create gaps in IDENTITY column values. The maximum size of the gap depends on the setting of the identity burning set factor configuration parameter. Gaps can also result from manual insertion of data into the IDENTITY column, deletion of rows, and transaction rollbacks.

- Only the table owner, database owner, or system administrator can explicitly insert a value into an IDENTITY column after setting identity_insert *table_name* on for the column's base table. A user can set identity_insert *table_name* on for one table at a time in a database. When identity_insert is on, each insert statement must include a column list and must specify an explicit value for the IDENTITY column.

  Inserting a value into the IDENTITY column allows you to specify a seed value for the column or to restore a row that was deleted in error. Unless you have created a unique index on the IDENTITY column, Adaptive Server does not verify the uniqueness of the value; you can insert any positive integer.

  To insert an explicit value into an IDENTITY column, the table owner, database owner, or system administrator must set identity_insert *table_name* on for the column's base table, not for the view through which it is being inserted.

- The maximum value that can be inserted into an IDENTITY column is $10^{precision} - 1$ for a numeric. For integer identities, it is the maximum permissible value of its type (such as 255 for tinyint, 32767 for smallint). Once an IDENTITY column reaches this value, any additional insert statements return an error that aborts the current transaction.

  When this happens, use the create table statement to create a new table that is identical to the old one, but that has a larger precision for the IDENTITY column. Once you have created the new table, use either the insert statement or the bcp utility to copy the data from the old table to the new one.

- Use he t*@@identity* global variable to retrieve the last value that you inserted into an IDENTITY column. If the last insert or select into statement affected a table with no IDENTITY column, *@@identity* returns the value 0.

- An IDENTITY column selected into a result table observes the following rules with regard to inheritance of the IDENTITY property:
  - If an IDENTITY column is selected more than once, it is defined as not null in the new table. It does not inherit the IDENTITY property.
  - If an IDENTITY column is selected as part of an expression, the resulting column does not inherit the IDENTITY property. It is created as null if any column in the expression allows nulls; otherwise, it is created as not null.
  - If the select statement contains a group by clause or aggregate function, the resulting column does not inherit the IDENTITY property. Columns that include an aggregate of the IDENTITY column are created null; others are created not null.
  - An IDENTITY column that is selected into a table with a union or join does not retain the IDENTITY property. If the table contains the union of the IDENTITY column and a null column, the new column is defined as null; otherwise, it is defined as not null.

Inserting data through views

- If a view is created with check option, each row that is inserted through the view must meet the selection criteria of the view.

  For example, the stores_cal view includes all rows of the stores table for which state has a value of "CA":

  ```
  create view stores_cal
  as select * from stores
  where state = "CA"
  with check option
  ```

  The with check option clause checks each insert statement against the view's selection criteria. Rows for which state has a value other than "CA" are rejected.

- If a view is created with check option, all views derived from the *base* view must satisfy the view's selection criteria. Each new row inserted through a derived view must be visible through the base view.

  Consider the view stores_cal30, which is derived from stores_cal. The new view includes information about stores in California with payment terms of "Net 30:"

  ```
  create view stores_cal30
  as select * from stores_cal
  where payterms = "Net 30"
  ```

Because stores_cal was created with check option, all rows inserted or updated through stores_cal30 must be visible through stores_cal. Any row with a state value other than "CA" is rejected.

stores_cal30 does not have a with check option clause of its own. This means you can insert or update a row with a payterms value other than "Net 30" through stores_cal30. The following update statement would be successful, even though the row would no longer be visible through stores_cal30:

```
update stores_cal30
set payterms = "Net 60"
where stor_id = "7067"
```

- insert statements are not allowed on join views created with check option.
- If you insert or update a row through a join view, all affected columns must belong to the same base table.

Partitoning tables for improved insert performance

An unpartitioned table with no clustered index consists of a single doubly linked chain of database pages, so each insertion into the table uses the last page of the chain. Adaptive Server holds an exclusive lock on the last page while it inserts the rows, blocking other concurrent transactions from inserting data into the table.

Partitioning a table with the partition clause of the alter table command creates additional page chains. Each chain has its own last page, which can be used for concurrent insert operations. This improves insert performance by reducing page contention. If the table is spread over multiple physical devices, partitioning also improves insert performance by reducing I/O contention while the server flushes data from cache to disk. For more information about partitioning tables for insert performance, see Chapter 6, "Controlling Physical Data Placement," in *Performance and Tuning Guide: Basics*.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The following are Transact-SQL extensions:

- A union operator in the select portion of an insert statement.
- Qualification of a table or column name by a database name.
- Insertion through a view that contains a join.

Note The FIPS flagger does not detect insertions through a view that contains a join.

Permissions

- insert permission defaults to the table or view owner, who can transfer it to other users.
- insert permission for a table's IDENTITY column is limited to the table owner, database owner, and system administrator.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo

41	insert	insert into a table	• *Roles* – current active roles
			• *Keywords or options*– if:
			  • insert – INSERT
			  • select into – INSERT INTO followed by the fully qualified object name
			• *Previous value* – NULL
			• *Current value* – NULL
			• *Other information* – NULL
			• *Proxy information* – original login name, if set proxy is in effect

42	insert	insert into a view	• *Roles* – current active roles • *Keywords or options* – INSERT • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a set proxy is in effect

See also

Commands alter table, create default, create index, create rule, create table, create trigger, dbcc, delete, select, update

Datatypes Chapter 1, "System and User-Defined Datatypes" of *Reference Manual: Building Blocks*

System procedures sp_bindefault, sp_bindrule, sp_help, sp_helpartition, sp_unbindefault, sp_unbindrule

Utilities bcp

kill

Description

Kills a process.

Syntax

kill *spid* with statusonly

Parameters

spid

is the identification number of the process you want to kill. *spid* must be a constant; it cannot be passed as a parameter to a stored procedure or used as a local variable. Use sp_who to see a list of processes and other information.

with statusonly

reports on the progress of a server process ID (spid) in rollback status. It does not terminate the spid. The statusonly report displays the percent of rollback completed and the estimated length of time in seconds before the rollback completes.

Examples

Example 1 Kills process number 1378:

```
kill 1378
```

Example 2 Reports on the process of the rollback of spid number 13:

```
kill 13 with statusonly
spid: 13 Transaction rollback in progress. Estimated rollback completion:17%
Estimated time left: 13 seconds
```

To track the progress of a rollback, you must run kill...with statusonly multiple times. If the rollback of the spid has completed when you issue kill...statusonly or if Adaptive Server is not rolling back the specified spid, kill...statusonly returns the following message:

```
Status report cannot be obtained. KILL spid:nn is not
in progress.
```

Usage

Execute sp_who to get a report on the current processes, such as:

```
fid spid status      loginame orig name hostname blk dbname   cmd
--- ---- --------    -------- --------  -------- --- ------   -----------
 0    1  recv sleep  bird     bird      jazzy     0   master  AWAITING COMMAND
 0    2  sleeping    NULL     NULL                0   master  NETWORK HANDLER
 0    3  sleeping    NULL     NULL                0   master  MIRROR HANDLER
 0    4  sleeping    NULL     NULL                0   master  AUDIT PROCESS
 0    5  sleeping    NULL     NULL                0   master  CHECKPOINT SLEEP
 0    6  recv sleep  rose     rose      petal     0   master  AWAITING COMMAND
 0    7  running     robert   sa        helos     0   master  SELECT
 0    8  send sleep  daisy    daisy     chain     0   pubs2   SELECT
 0    9  alarm sleep lily     lily      pond      0   master  WAITFOR
 0   10  lock sleep  viola    viola     cello     7   pubs2   SELECT
```

The spid column contains the process identification numbers used in the Transact-SQL kill command. The blk column contains the process ID of a blocking process, if there is one. A blocking process (which may have an exclusive lock) is one that is holding resources that are needed by another process. In this example, process 10 (a select on a table) is blocked by process 7 (a begin transaction followed by an insert on the same table).

The status column reports the state of the command. Table 1-22 shows the status values and the effects of sp_who:

Table 1-22: Status values reported by sp_who

Status	Description	Effect of kill command
`recv sleep`	Waiting on a network read.	Immediate.
`send sleep`	Waiting on a network send.	Immediate.
`alarm sleep`	Waiting on an alarm, such as waitfor delay "10:00".	Immediate.
`lock sleep`	Waiting on a lock acquisition.	Immediate.
`sleeping`	Waiting on disk I/O or some other resource. Probably indicates a process that is running, but doing extensive disk I/O.	Process is killed when it "wakes up;" usually immediately. A few sleeping processes do not wake up, and require an Adaptive Server restart to clear.
`runnable`	In the queue of runnable processes.	Immediate.
`running`	Actively running on one of the server engines.	Immediate.
`infected`	Adaptive Server has detected a serious error condition; extremely rare.	kill command not recommended. Adaptive Server restart probably required to clear process.
`background`	A process, such as a threshold procedure, run by Adaptive Server rather than by a user process.	Immediate; use kill with extreme care. Recommend a careful check of sysprocesses before killing a background process.
`log suspend`	Processes suspended by reaching the last-chance threshold on the log.	Immediate.

To get a report on the current locks and the *spid*s of the processes holding them, use sp_lock.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

kill permission defaults to system administrators and is not transferable.

See also

Commands shutdown

System procedures sp_lock, sp_who

load database

Description

Loads a backup copy of a user database, including its transaction log, that was created with dump database, as well as materialize archive databases that have been loaded with a database dump.

The target platform of a load database operation need not be the same platform as the source platform where the dump database operation occurred. dump database and load database are performed from either a big endian platform to a little endian platform, or from a little endian platform to a big endian platform.

See *Using Backup Server with IBM Tivoli Storage Manager* for the load database syntax when the Tivoli Storage Manager is licensed at your site.

Syntax

Makes a routine database load:

```
load database database_name
    from [compression=]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]
        with verify only [= header | full]
    [stripe on [compression=]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]
    [[stripe on [compression=]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]]...]
    [with {
        density = density_value,
        blocksize = number_bytes,
        compression,
        dumpvolume = volume_name,
        file = file_name,
        [dismount | nodismount],
        [nounload | unload],
        passwd = password,
        notify = {client | operator_console},
        [override]}]]
```

Returns header or file information without loading the backup:

```
load database database_name
    from [compress::]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]
    [stripe on [compress::]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]
    [[stripe on [compress::]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]]...]
    [with {
        density = density_value,
        blocksize = number_bytes,
        compression,
        dumpvolume = volume_name,
        file = file_name,
        [dismount | nodismount],
        [nounload | unload],
        passwd = password,
        listonly [= full],
        headeronly,
        notify = {client | operator_console}
        }]]
```

Materializes an archive database:

```
load database database_name
    from dump_device
    [ [stripe on stripe_device] ... ]
    [with [norecovery,][passwd=password]
```

Loads a copy of the database when the Tivoli Storage Manager is licensed at your site:

```
load database database_name
    from syb_tsm::[[-S source_sever_name][-D source_database_name]
        ::]object_name [blocksize = number_bytes]
    [stripe on syb_tsm::[[-S source_sever_name]
        [-D source_database_name]::]object_name
        [blocksize = number_bytes]]
    [[stripe on syb_tsm::[[-S source_sever_name]
        [-D source_database_name]::]object_name
        [blocksize = number_bytes]]...]
```

```
[with {
      blocksize = number_bytes,
      passwd = password,
      listonly [= full],
      headeronly,
      notify = {client | operator_console},
      [[verifyonly | verify] [= header | full]]
      } ]
```

Parameters

database_name

is the name of the database to receive the backup copy. It can be either a database created with the for load option, or an existing database. Loading dumped data to an existing database overwrites all existing data. The receiving database must be at least as large as the dumped database. The database name can be specified as a literal, a local variable, or a stored procedure parameter.

For archive databases, *database_name* is the name of the archive database into which you want to load.

compress::

invokes the decompression of the archived database. For more information about the compress option, see Chapter 27, "Backing Up and Restoring User Databases" in the *System Administration Guide*.

Note Sybase recommends the native "compression = *compress_level*" option as preferred over the older "compress::*compression_level*" option. If you use the native option for dump database, you do not need to use "compress::*compression_level*" when loading your database.

---

from *dump_device*

specifies the name of the disk database dump from which you want to load the dump.

from *stripe_device*

is the device from which data is being loaded. See "Specifying dump devices" on page 512 for information about what form to use when specifying a dump device. For a list of supported dump devices, see the Adaptive Server installation and configuration guides.

at *backup_server_name*

is the name of a remote Backup Server running on the machine to which the dump device is attached. For platforms that use interfaces files, the *backup_server_name* must appear in the interfaces file.

density = *density_value*
is ignored. See the dump database command.

blocksize = *number_bytes*
overrides the default block size for a dump device. If you specify a block size on UNIX systems, it should be identical to that used to make the dump. See the dump database command.

dumpvolume = *volume_name*
is the volume name field of the ANSI tape label. load database checks this label when the tape is opened and generates an error message if the wrong volume is loaded.

Note When using load database, the dumpvolume option does not provide an error message if an incorrect file name is given for the file=*filename* option. The backup server searches the entire tape looking for that file, regardless of an incorrect tape mounted.

---

file = *file_name*
is the name of a particular database dump on the tape volume. If you did not record the dump file names when you made the dump, use listonly to display information about all dump files.

stripe on *stripe_device*
is an additional dump device. You can use up to 32 devices, including the device named in the to *stripe_device* clause. The Backup Server loads data from all devices concurrently, reducing the time and the number of volume changes required. See “Specifying dump devices” on page 512 for more information.

compression
indicates that the database you are loading was compressed to a file on a remote server. You do not need to specify the compression level for load database.

Note Sybase recommends the native "compression = *compress_level*" option as preferred over the older "compress::*compression_level*" option. If you use the native option for dump database, you do not need to use "compress::*compression_level*" when loading your database.

---

dismount | nodismount

on platforms that support logical dismount – determines whether tapes remain mounted. By default, all tapes used for a load are dismounted when the load completes. Use nodismount to keep tapes available for additional loads or dumps.

nounload | unload

determines whether tapes rewind after the load completes. By default, tapes do not rewind, allowing you to make additional loads from the same tape volume. Specify unload for the last dump file to be loaded from a multidump volume. This rewinds and unloads the tape when the load completes.

with [norecovery,]

indicates when materializing an archive database that the load database command will not run recovery, and that the database is brought online automatically after the load database command has completed.

passwd = *password*

is the password you provided to protect the dump file from unauthorized users. The password must be between 6 and 30 characters long. You cannot use variables for passwords. For rules on passwords, see Chapter 14, “Managing Adaptive Server Logins, Database Users, and Client Connections,” in the *System Administration Guide, Volume 1*.

listonly [= full]

displays information about all dump files on a tape volume, but *does not load the database*. listonly identifies the database and device, the date and time the dump was made, and the date and time it can be overwritten. listonly = full provides additional details about the dump. Both reports are sorted by ANSI tape label.

After listing the files on a volume, the Backup Server sends a volume change request. The operator can either mount another tape volume or terminate the list operation for all dump devices.

Due to current implementation, the listonly option overrides the headeronly option.

Warning! Do not use load database with listonly on 1/4-inch cartridge tape.

with verify[only][=header | full]

performs a minimal header or structural row check on the data pages as they are being copied to the archives, but **does not load the database**. There are no structural checks done at this time to gam, oam, allocation pages, indexes, text, or log pages. The only other check is done on pages where the page number matches to the page header.

headeronly

displays header information for a single dump file, but **does not load the database**. headeronly displays information about the first file on the tape unless you use the file = *file_name* option to specify another file name. The dump header indicates:

- Type of dump (database or transaction log)
- Database ID
- File name
- Date the dump was made
- Character set
- Sort order
- Page count
- Next object ID

notify = {client | operator_console}

overrides the default message destination.

- On operating systems that offer an operator terminal feature, volume change messages are always sent to the operator terminal on the machine on which the Backup Server is running. Use client to route other Backup Server messages to the terminal session that initiated the dump database.
- On operating systems (such as UNIX) that do not offer an operator terminal feature, messages are sent to the client that initiated the dump database. Use operator_console to route messages to the terminal on which the Backup Server is running.

override

you must use with override to successfully load the database containing encryption keys that encrypt columns in other databases.

syb_tsm::*object_name*
is the keyword that invokes the libsyb_tsm.so module that enables communication between Backup Server and TSM.

-S *source_server_name*
specifies the name of the source Adaptive Server when it is not the same as the target Adaptive Server. This parameter is required when the target server for the load operation is different from the source server used for the dump operation.

-D *source_database_name*
specifies the name of the source database when it is not the same as the target database. This parameter is required when the target database for the load operation is different from the source database used for the dump operation.

Examples

Example 1 Reloads the database pubs2 from a tape device:

```
load database pubs2
    from "/dev/nrmt0"
```

Example 2 Loads the pubs2 database, using the Backup Server REMOTE_BKP_SERVER. This command names three devices:

```
load database pubs2
        from "/dev/nrmt4" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt5" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt0" at REMOTE_BKP_SERVER
```

Example 3 Loads the pubs2 database from a compressed dump file called *dmp090100.dmp* located at */opt/bin/Sybase/dumps*:

```
load database pubs2 from
    "compress::/opt/bin/Sybase/dumps/dmp090100.dmp"
```

Example 4 Loads the key_db database, which contains encryption keys. You must use with override if the encryption keys in key_db were used to encrypt columns in other databases:

```
load database key_db from "/tmp/key_db.dat" with
override
```

Example 5 Loads the testdb database from "syb_tsm::obj1.2". See dump database on page 376 for the associated dump command.

```
load database testdb from "syb_tsm::obj1.2"
stripe on "syb_tsm::obj1.2"
stripe on "syb_tsm::obj1.2"
stripe on "syb_tsm::obj1.2"
stripe on "syb_tsm::obj1.2"
```

Example 6 Loads the pubs2 database from the TSM backup object "obj1.1" when the source database (testdb) of the associated dump command is different than the target database (pubs2) of the load command.

```
load database pubs2 from "syb_tsm::-D testdb::obj1.1"
```

Usage

- If you use sp_hidetext followed by a cross-platform dump and load, you must manually drop and re-create all hidden objects.
- The listonly and headeronly options display information about the dump files without loading them.
- Dumps and loads are performed through Backup Server.
- To make sure databases are synchronized correctly so that all proxy tables have the correct schema to the content of the primary database you just reloaded, you may need to run the alter database *dbname* for proxy_update command on the server hosting the proxy database.
- Table 1-23 describes the commands and system procedures used to restore databases from backups:

Table 1-23: Commands used to restore databases from dumps

Use this command	To do this
create database for load	Create a database for the purpose of loading a dump.
load database	Restore a database from a dump.
load transaction	Apply recent transactions to a restored database.
online database	Make a database available for public use after a normal load sequence or after upgrading the database to the current version of Adaptive Server.
load {database | transaction} with {headeronly | listonly}	Identify the dump files on a tape.
sp_volchanged	Respond to Backup Server volume change messages.

- See "Encrypted columns and dump database" on page 393 in the section for dump database for more information about loading databases with encrypted columns.

Restrictions

- CIS only – Any proxy tables in the database are part of the database save set. The content data of proxy tables is not included in the save; only the pointer is saved and restored.
- You cannot load a dump that was made on a different platform.
- You cannot load a dump that was generated on a server earlier than version 11.9.

- If a database has cross-database referential integrity constraints, the sysreferences system table stores the *name*—not the ID number—of the external database. Adaptive Server cannot guarantee referential integrity if you use load database to change the database name or to load it onto a different server.
- Each time you add or remove a cross-database constraint or drop a table that contains a cross-database constraint, dump *both* of the affected databases.

Warning! Loading earlier dumps of these databases can cause database corruption. Before dumping a database to load it with a different name or move it to another Adaptive Server, use alter table to drop all external referential integrity constraints.

- load database clears the suspect page entries pertaining to the loaded database from master..sysattributes.
- load database overwrites any existing data in the database.
- After a database dump is loaded, two processes may require additional time before the database can be brought online:
  - Backup Server zeroes the non-allocated pages that are in the source database's space map. This zeroing is embedded as part of the physical load, and happens during the load database.

    If the target database is larger than the source, then the space above the ceiling of the source database's space map is zeroed by Adaptive Server after Backup Server has completed the load.
  - Recovery ignores transactions that completed before the checkpoint that was written by dump database at the start of its operation. Completed transactions in the active portion of the transaction log are rolled forward by recovery. In a load sequence, rollback of incomplete transactions happens at the end of that sequence, under online database.
- The receiving database must be as large as or larger than the database to be loaded. If the receiving database is too small, Adaptive Server displays an error message that gives the required size.
- You cannot load from the null device (on UNIX, /dev/null).
- You cannot use load database in a user-defined transaction.

- Once you load a database, Adaptive Server automatically identifies the endian type on the dump file and performs all necessary conversions while the load database and online database commands execute.

  After Adaptive Server converts the index rows, the order of index rows may be incorrect. Adaptive Server marks the following indexes on user tables as suspect indexes during execution of online database:

  - Nonclustered index on APL (all pages locked) table
  - Clustered index on DOL (data-only locked) table
  - Nonclustered index on DOL table

  During cross-platform dump and load operations, suspect partitions are handled as follows:

  - During the first online database command, after you execute load database across two platforms with different endian types, the hash partition is marked suspect.
  - Any global clustered index on a round-robin partition, which has an internally generated partition condition with a unichar or univarchar partition key, is marked suspect.
  - After the database is online, use sp_post_xpload to fix the suspect partitions and indexes.

  Note See Chapter 1, "System Procedures," in *Reference Manual: Procedures* for information about checking and rebuilding indexes on user tables using the sp_post_xpload stored procedure.

- dump transaction and load transaction are not allowed across platforms.
- dump database and load database to or from a remote backupserver are not supported across platforms.
- You cannot load a password-protected dump file across platforms.
- If you perform dump database and load database for a parsed XML object, you must parse the text again after the load database command has completed.
- You cannot perform dump database and load database across platforms on Adaptive Servers versions earlier than 11.9.
- Adaptive Server cannot translate embedded data structures stored as binary, varbinary, or image columns.

- load database is not allowed on the master database across platforms.
- Stored procedures and other compiled objects are recompiled from the SQL text in syscomments at the first execution after the load database.

  If you do not have permission to recompile from text, then the person who does has to recompile from text using dbcc upgrade_object to upgrade objects.

Locking out users during loads

- A database cannot be in use while it is being loaded. load database sets the status of the database to "offline." No one can use the database while its status is "offline." The "offline" status prevents users from accessing and changing the database during a load sequence.
- A database loaded by load database remains inaccessible until online database is issued.

Upgrading database and transaction log dumps

- To restore and upgrade a user database dump from a version 11.9 or later server to the current version of Adaptive Server:

  a Load the most recent database dump.

  b Load, *in order*, all transaction log dumps made since the last database dump.

  Adaptive Server checks the timestamp on each dump to make sure that it is being loaded to the correct database and in the correct sequence.

  c Issue online database to do the upgrade and make the database available for public use.

  d Dump the newly upgraded database immediately after upgrade, to create a dump consistent with the current version of Adaptive Server.

Specifying dump devices

- You can specify the dump device as a literal, a local variable, or a parameter to a stored procedure.
- You can specify a local device as:
  - A logical device name from the sysdevices system table
  - An absolute path name
  - A relative path name

The Backup Server resolves relative path names using the current working directory in Adaptive Server.

- When loading across the network, specify the absolute path name of the dump device. The path name must be valid on the machine on which the Backup Server is running. If the name includes characters other than letters, numbers, or the underscore (_), enclose the entire name in quotes.
- Ownership and permissions problems on the dump device may interfere with use of load commands.
- You can run more than one load (or dump) at the same time, as long as each load uses a different physical device.

Backup Servers

- You must have a Backup Server running on the same machine as Adaptive Server. The Backup Server must be listed in the master..sysservers table. This entry is created during installation or upgrade; do not delete it.
- If your backup devices are located on another machine, so that you load across a network, you must also have a Backup Server installed on the remote machine.

Volume names

- Dump volumes are labeled according to the ANSI tape labeling standard. The label includes the logical volume number and the position of the device within the stripe set.
- During loads, Backup Server uses the tape label to verify that volumes are mounted in the correct order. This allows you to load from a smaller number of devices than you used at dump time.

Note When dumping and loading across the network, you must specify the same number of stripe devices for each operation.

Changing dump volumes

If the Backup Server detects a problem with the currently mounted volume, it requests a volume change by sending messages to either the client or its operator console. After mounting another volume, the operator notifies the Backup Server by executing sp_volchanged on any Adaptive Server that can communicate with the Backup Server.

Restoring the system databases

See the *System Administration Guide* for step-by-step instructions for restoring the system databases from dumps.

Disk mirroring

- At the beginning of a load, Adaptive Server passes Backup Server the primary device name of each logical database and log device. If the primary device has been unmirrored, Adaptive Server passes the name of the secondary device instead. If any named device fails before Backup Server completes its data transfer, Adaptive Server aborts the load.
- If you attempt to unmirror any named device while a load database is in progress, Adaptive Server displays a message. The user executing disk unmirror can abort the load or defer the disk unmirror until after the load completes.
- Backup Server loads the data onto the primary device, then load database copies it to the secondary device. load database takes longer to complete if any database device is mirrored.

Materializing an archive database

An archive database is a placeholder that is useful only once it has been loaded with a database dump. The load process does not actually copy pages, however, it materializes the database using page mapping.

Note You do not need to have Backup Server running when loading a database dump into an archive database.

Using *load database with norecovery*

The with norecovery option of the load database command allows a database dump to be loaded into an archive database without recovering anything, reducing the time required to load. Many database pages can be modified or allocated during recovery, causing them to be stored in the modified pages section. Therefore, skipping recovery consumes minimum space in the modified pages section. The with norecovery option allows a quick view into an archive database.

If you use with norecovery, the database is brought online automatically.

However, using load database with norecovery for a database that requires recovery may leave it transactionally and physically inconsistent. Running dbcc checks on a physically inconsistent database may produce many errors.

Once you have loaded an archive database with norecovery, you must have sa_role or database owner privileges to use it.

Using logical devices with an archive database

You can use sp_addumpdevice to create a logical device from which an archive database can be loaded:

```
sp_addumpdevice 'archive database', 'logical_name',
    'physical_name'
```

After you have executed this command, use the *logical_name* instead of the *physical_name* as the *dump_device* or *stripe_device* in a load database command.

Note You cannot use an archive database logical device as a device specification for a load into a traditional database or when dumping a traditional database.

---

load database limitations with an archive database

load database has the following limitations when used with an archive database:

- The database dump for an archive database is required to be a disk dump on a file system mounted on the local machine. This can be local storage or NFS storage. `load database ... at <remote server>` syntax is not supported, nor are database dumps on tape.
- Cross-architecture loads are not supported. The database dump and the load database command must be performed on the same architecture with respect to byte ordering.
- The dumped database must have the same page size as that used by the server that is hosting the archive database.
- The major version of the server on which the dump was taken must be earlier than or equal to the major version of the server hosting the archive database.
- The character set and sort order on the server on which the database dump was taken must be the same as the character set and sort order of the server hosting the archive database.

load database and encrypted columns

If you store keys in a database that is separate from the columns encrypted by those keys, you must load both databases from dumps that were made simultaneously, avoiding a problem where the encrypted column's key is missing after the load.

After loading the databases for keys and data, bring both databases on line simultaneously.

You should not load your key database into a database with a different name because metadata dependencies exist between encrypted columns and their keys. If you must change the name of the key database:

1. Before dumping the database containing the encrypted columns, use alter table to decrypt the data.
2. Dump the databases containing keys and encrypted columns.
3. After loading the databases, use alter table to re-encrypt the data with the keys in the newly named database.

Loading compressed data

- You cannot create a dump of a compressed table on one platform and load this dump on a different platform.
- create index commands on compressed tables that contain any form of compressed or uncompressed rows are fully recovered during a load transaction.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only a system administrator, database owner, or user with the Operator role can execute load database.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
43	load	load database	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Documents Chapter 28, “Backing Up and Restoring User Databases” in the *System Administration Guide*.

Commands alter database, dbcc, dump database, dump transaction, load transaction, online database

System procedures sp_helpdb, sp_helpdevice, sp_hidetext, sp_volchanged

load transaction

Description

Loads a backup copy of the transaction log that was created with dump transaction.

Syntax

Makes a routine log load:

```
load tran[saction] database_name
      from [compress::]stripe_device
            [at backup_server_name]
            [density = density_value,
            blocksize = number_bytes,
            dumpvolume = volume_name,
            file = file_name]
      [stripe on [compress::]stripe_device
            [at backup_server_name]
            [density = density_value,
            blocksize = number_bytes,
            dumpvolume = volume_name,
            file = file_name]
      [[stripe on [compress::]stripe_device
            [at backup_server_name]
            [density = density_value,
            blocksize = number_bytes,
            dumpvolume = volume_name,
            file = file_name]]...]
      [with {
            density = density_value,
            blocksize = number_bytes,
            compression,
            dumpvolume = volume_name,
            file = file_name,
            [dismount | nodismount],
            [nounload | unload],
            notify = {client | operator_console}
            }]]
```

Returns header or file information without loading the backup log:

```
load tran[saction] database_name
      from [compress::]stripe_device
            [at backup_server_name]
            [density = density_value,
            blocksize = number_bytes,
            dumpvolume = volume_name,
            file = file_name]
      [stripe on [compress::]stripe_device
            [at backup_server_name]
            [density = density_value,
            blocksize = number_bytes,
            dumpvolume = volume_name,
            file = file_name]
```

```
[[stripe on [compress::]stripe_device
      [at backup_server_name]
      [density = density_value,
      blocksize = number_bytes,
      dumpvolume = volume_name,
      file = file_name]]...]
[with {
      density = density_value,
      blocksize = number_bytes,
      compression,
      dumpvolume = volume_name,
      file = file_name,
      [dismount | nodismount],
      [nounload | unload],
      listonly [= full],
      headeronly,
      notify = {client | operator_console}
      until_time = datetime}]]
```

Loads a transaction log into an archive database:

```
load tran[saction] database_name
      from dump_device
      [[stripe on stripe_device] ... ]
```

(Tivoli Storage Manager only) Loads a copy of the transaction log when the Tivoli Storage Manager is licensed at your site.

```
load transaction database_name
      from syb_tsm::[[-S source_sever_name][-D source_database_name]
            ::]object_name [blocksize = number_bytes]
      [stripe on syb_tsm::[[-S source_sever_name]
            [-D source_database_name]::]object_name
            [blocksize = number_bytes]]
      [[stripe on syb_tsm::[[-S source_sever_name]
            [-D source_database_name]::]object_name
            [blocksize = number_bytes]]...]
      [with {
            blocksize = number_bytes,
            passwd = password,
            listonly [= full],
            headeronly,
            notify = {client | operator_console},
            until_time = datetime
            } ]
```

Parameters

database_name

is the name of the database to receive data from a dumped backup copy of the transaction log. The log segment of the receiving database must be at least as large as the log segment of the dumped database. The database name can be specified as a literal, a local variable, or a parameter of a stored procedure. For archive databases, *database_name* is the archive database into which you are loading the transaction log.

compress::

invokes the decompression of the archived transaction log. See Chapter 27, "Backing Up and Restoring User Databases" in the *System Administration Guide* for more information about the compress option.

Note Sybase recommends the native "compression = *compress_level*" option as preferred over the older "compress::*compression_level*" option. If you use the native option for dump database, you do not need to use "compress::*compression_level*" when loading your database.

---

from *stripe_device*

is the name of the dump device from which you are loading the transaction log. For information about the form to use when specifying a dump device, see "Specifying dump devices" on page 512. For a list of supported dump devices, see the Adaptive Server installation and configuration guides.

at *backup_server_name*

is the name of a remote Backup Server running on the machine to which the dump device is attached. For platforms that use interfaces files, the *backup_server_name* must appear in the interfaces file.

from *dump_device*

is the local disk transaction log dump.

density = *density_value*

overrides the default density for a tape device. **This option is ignored.**

blocksize = *number_bytes*

overrides the default block size for a dump device. If you specify a block size on UNIX systems, it should be identical to that used to make the dump.

dumpvolume = *volume_name*

is the volume name field of the ANSI tape label. load transaction checks this label when the tape is opened and generates an error message if the wrong volume is loaded.

file = *file_name*

is the name of a particular database dump on the tape volume. If you did not record the dump file names when you made the dump, use listonly to display information about all the dump files.

stripe on *stripe_device*

is an additional dump device. You can use up to 32 devices, including the device named in the to *stripe_device* clause. The Backup Server loads data from all devices concurrently, reducing the time and the number of volume changes required. See “Specifying dump devices” on page 512 for information about how to specify a dump device.

compression

indicates that the log you are loading was compressed to a file on a remote server. You do not need to specify the compression level for load transaction.

The with compression option differs from the compress option, which you use to load a compressed log from a local file.

Note Sybase recommends the native "compression = *compress_level*" option as preferred over the older "compress::*compression_level*" option. If you use the native option for dump database, you do not need to use "compress::*compression_level*" when loading your database.

---

dismount | nodismount

(On platforms that support logical dismount) Determines whether tapes remain mounted. By default, all tapes used for a load are dismounted when the load completes. Use nodismount to keep tapes available for additional loads or dumps.

nounload | unload

determines whether tapes rewind after the load completes. By default, tapes do not rewind, allowing you to make additional loads from the same tape volume. Specify unload for the last dump file to be loaded from a multidump volume. This rewinds and unloads the tape when the load completes.

listonly [= full]

displays information about all the dump files on a tape volume, but **does not load the transaction log**. listonly identifies the database and device, the date and time the dump was made, and the date and time it can be overwritten. listonly = full provides additional details about the dump. Both reports are sorted by ANSI tape label.

After listing the files on a volume, the Backup Server sends a volume change request. The operator can either mount another tape volume or terminate the list operation for all dump devices.

In the current implementation, listonly overrides headeronly.

Warning! Do not use load transaction with listonly on 1/4-inch cartridge tape.

headeronly

displays header information for a single dump file, but **does not load the database**. headeronly displays information about the first file on the tape unless you use the file = *file_name* option to specify another file name. The dump header indicates:

- Type of dump (database or transaction log)
- Database ID
- File name
- Date the dump was made
- Character set
- Sort order
- Page count
- Next object ID
- Checkpoint location in the log
- Location of the oldest begin transaction record
- Old and new sequence dates

notify = {client | operator_console}

overrides the default message destination.

- On operating systems that offer an operator terminal feature, volume change messages are always sent to the operator terminal on the machine on which the Backup Server is running. Use client to route other Backup Server messages to the terminal session that initiated the dump database.
- On operating systems (such as UNIX) that do not offer an operator terminal feature, messages are sent to the client that initiated the dump database. Use operator_console to route messages to the terminal on which the Backup Server is running.

until_time

loads the transaction log up to a specified time in the transaction log. Only transactions committed before the specified time are saved to the database.

syb_tsm

is the keyword that invokes the libsyb_tsm.so module that enables communication between Backup Server and TSM.

object_name

is the name of the backup object on TSM server.

-S *source_server_name*

specifies the name of the source Adaptive Server when it is not the same as the target Adaptive Server. This parameter is required when the target server for the load operation is different from the source server used for the dump operation.

-D *source_database_name*

specifies the name of the source database when it is not the same as the target database. This parameter is required when the target database for the load operation is different from the source database used for the dump operation.

Examples

Example 1 Loads the transaction log for the database pubs2 tape:

```
load transaction pubs2
    from "/dev/nrmt0"
```

Example 2 Loads the transaction log for the pubs2 database, using the Backup Server REMOTE_BKP_SERVER:

```
load transaction pubs2
        from "/dev/nrmt4" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt5" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt0" at REMOTE_BKP_SERVER
```

Example 3 Loads the transaction log for pubs2, up to March 20, 2008, at 10:51:43:866 a.m:

```
load transaction pubs2
    from "/dev/ntmt0"
    with until_time = "mar 20, 2008 10:51:43:866am"
```

Example 4 Loads transactions from the TSM backup object "demo2.1" to the testdb database. The source and target databases are the same. See dump transaction on page 396 for information:

```
load transaction testdb from "syb_tsm::demo2.1"
```

Example 5 Loads transactions from the TSM backup object "obj1.1" when the target database (pubs2) is different from the source database (testdb):

```
load transaction pubs2 from "syb_tsm::
    -D testdb::obj1.1"
```

Usage

- If you use sp_hidetext followed by a cross-platform dump and load, you must manually drop and re-create all hidden objects.
- The listonly and headeronly options display information about the dump files without loading them.
- Dumps and loads are performed through Backup Server.
- Table 1-24 describes the commands and system procedures used to restore databases from backups:

Table 1-24: Commands used to restore databases

Use this command	To do this
create database for load	Create a database for the purpose of loading a dump.
load database	Restore a database from a dump.
load transaction	Apply recent transactions to a restored database.
online database	Make a database available for public use after a normal load sequence or after upgrading the database to the current version of Adaptive Server.
load {database | transaction} with {headeronly | listonly}	Identify the dump files on a tape.
sp_volchanged	Respond to the Backup Server volume change messages.

Restrictions

- You cannot load a dump that was generated on a version earlier than 11.9 server.
- The database and transaction logs must be at the same release level.
- Load transaction logs in chronological order.

- You cannot load from the null device (on UNIX, /dev/null).
- You cannot use load transaction after an online database command that performs an upgrade. The correct sequence for upgrading a database is load database, load transaction, online database.
- Do not issue online database until all transaction logs are loaded. The command sequence is:

  a Load database

  b Load transaction (repeat as needed)

  c Online database

  However, to load additional transaction logs while retaining read-only access to the database (a typical "warm backup" situation), use the dump tran for standby_access option to generate the transaction dumps. You can then issue online database for standby_access for read-only access.
- You cannot use the load transaction command in a user-defined transaction.

Restoring a database

- To restore a database:
  - Load the most recent database dump
  - Load, *in order*, all transaction log dumps made since the last database dump
  - Issue online database to make the database available for public use
- Each time you add or remove a cross-database constraint, or drop a table that contains a cross-database constraint, dump *both* of the affected databases.

  Warning! Loading earlier dumps of these databases can cause database corruption.

- For more information on backup and recovery of Adaptive Server databases, see the *System Administration Guide*.

Recovering a database to a specified time

- You can use the until_time option for most databases that can be loaded or dumped. until_time does not apply to databases such as master, in which the data and logs are on the same device. Also, you cannot use it on any database that has had a truncated log since the last dump database, such as tempdb.
- The until_time option is useful for the following reasons:
  - It enables you to have a database consistent to a particular time. For example, in an environment with a decision-support system (DSS) database and an online transaction processing (OLTP) database, the system administrator can roll the DSS database to an earlier specified time to compare data between the earlier version and the current version.
  - If a user inadvertently destroys data, such as dropping an important table, you can use the until_time option to back out the errant command by rolling forward the database to a point just before the data was destroyed.
- To effectively use the until_time option after data has been destroyed, you must know the exact time the error took place. You can find out by executing a select getdate () command immediately after the error. For a more precise time using milliseconds, use the convert function, for example:

  ```
  select convert (char (26), getdate (), 109)
  --------------------------
  Feb 26 1997 12:45:59:650PM
  ```

- After you load a transaction log using until_time, Adaptive Server restarts the database's log sequence. This means that until you dump the database again, you cannot load subsequent transaction logs after the load transaction using until_time. Dump the database before you dump another transaction log.
- Only transactions that committed before the specified time are saved to the database. However, in some cases, transactions committed shortly after the until_time specification are applied to the database data. This may occur when several transactions are committing at the same time. The ordering of transactions may not be written to the transaction log in time-ordered sequence. In this case, the transactions that are out of time sequence are reflected in the data that has been recovered. The time should be less than a second.

- For more information on recovering a database to a specified time, see the *System Administration Guide*.

Locking users out during loads

- A database cannot be in use when you load it. you are loading a database, it cannot be in use. load transaction, unlike load database, does not change the offline/online status of the database. load transaction leaves the status of the database the way it found it. load database sets the status of the database to "offline." No one can use the database while it is "offline." The "offline" status prevents users from accessing and changing the database during a load sequence.
- A database loaded by load database remains inaccessible until online database is issued.

Upgrading database and transaction log dumps

To restore and upgrade a user database dump from a version 11.9 or later server to the current version of Adaptive Server:

1. Load the most recent database dump.
2. Load, *in order*, all transaction logs generated after the last database dump.
3. Use online database to do the upgrade.
4. Dump the newly upgraded database immediately after the upgrade, to create a dump that is consistent with the current version of Adaptive Server.

Specifying dump devices

- You can specify the dump device as a literal, a local variable, or a parameter to a stored procedure.
- When loading from a local device, you can specify the dump device as:
  - An absolute path name
  - A relative path name
  - A logical device name from the sysdevices system table

  Backup Server resolves relative path names, using the current working directory in the Adaptive Server.

- When loading across the network, specify the absolute path name of the dump device. (You cannot use a relative path name or a logical device name from the sysdevices system table.) The path name must be valid on the machine on which the Backup Server is running. If the name includes any characters other than letters, numbers or the underscore (_), you must enclose it in quotes.
- Ownership and permissions problems on the dump device may interfere with use of load commands. sp_addumpdevice adds the device to the system tables, but does not guarantee that you can load from that device or create a file as a dump device.
- You can run more than one load (or dump) at the same time, as long as each one uses a different physical device.

Backup Servers

- You must have a Backup Server running on the same machine as your Adaptive Server. The Backup Server must be listed in the master..sysservers table. This entry is created during installation or upgrade and should not be deleted.
- If your backup devices are located on another machine so that you load across a network, you must also have a Backup Server installed on the remote machine.

Volume names

- Dump volumes are labeled according to the ANSI tape-labeling standard. The label includes the logical volume number and the position of the device within the stripe set.
- During loads, Backup Server uses the tape label to verify that volumes are mounted in the correct order. This allows you to load from a smaller number of devices than you used at dump time.

Note When dumping and loading across a network, you must specify the same number of stripe devices for each operation.

Changing dump volumes

If Backup Server detects a problem with the currently mounted volume, it requests a volume change by sending messages to either the client or its operator console. After mounting another volume, the operator notifies Backup Server by executing sp_volchanged on any Adaptive Server that can communicate with Backup Server.

Restoring the system databases

For step-by-step instructions for restoring the system databases from dumps, see the *System Administration Guide*.

Disk mirroring

- At the beginning of a load, Adaptive Server passes the primary device name of each logical database device and each logical log device to the Backup Server. If the primary device has been unmirrored, Adaptive Server passes the name of the secondary device instead. If any named device fails before the Backup Server completes its data transfer, Adaptive Server aborts the load.
- If you attempt to unmirror any of the named devices while a load transaction is in progress, Adaptive Server displays a message. The user executing disk unmirror can abort the load, or defer disk unmirror until after the load completes.
- Backup Server loads the data onto the primary device, then load transaction copies it to the secondary device. load transaction takes longer to complete if any database device is mirrored.

Loading a transaction log into an archive database

When you load a transaction log into an archive database, load tran runs the recovery redo pass. Modified and new database pages are written to the permanent changes segment. You must have enough space in the modified pages section to accommodate these changes. If necessary, increase space for the modified pages section by using alter database to increase the normal database storage allocated to the archive database.

Unlike a traditional database, an archive database can be brought online in the middle of a load sequence without breaking the load sequence. When a traditional database is loaded and then brought online without using the for standby_access clause, it is no longer possible to load the next transaction log in the load sequence. An archive database however, can be brought online without the for standby_access clause and later, loaded with the next transaction log in the load sequence. This allows read-only operations like running consistency checks, at any time during the load sequence. This is possible because when loading a transaction log into the archive database, Adaptive Server automatically removes the disposable changes segment from the modified pages section. This effectively reverts the archive database to its state after the previous load was done, thereby allowing the next transaction log in the sequence to be loaded.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

load transaction permission defaults to the database owner and operators. It is not transferable.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
44	load	load transaction	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Documents Chapter 28, "Backing Up and Restoring User Databases" in the *System Administration Guide*.

Commands disk unmirror, dump database, dump transaction, load database, online database

System procedures sp_dboption, sp_helpdb, sp_helpdevice, sp_hidetext, sp_volchanged

lock table

Description

Explicitly locks a table within a transaction.

Syntax

lock table *table_name* in {share | exclusive} mode
[wait [*numsecs*] | nowait]

Parameters

table_name
specifies the name of the table to be locked.

share | exclusive
specifies the type of lock, shared or exclusive, to be applied to the table.

wait *numsecs*
specifies the number of seconds to wait, if a lock cannot be acquired immediately. If *numsecs* is omitted, specifies that the lock table command should wait until lock is granted.

nowait
causes the command to fail if the lock cannot be acquired immediately.

Examples

Example 1 Tries to acquire a shared table lock on the titles table. If a session-level wait has been set with set lock wait, the lock table command waits for that period of time; otherwise, the server-level wait period is used:

```
begin transaction
lock table titles in share mode
```

Example 2 Tries to acquire an exclusive table lock on the authors table. If the lock cannot be acquired within 5 seconds, the command returns an informational message. Subsequent commands within the transaction continue as they would have without lock table:

```
begin transaction
lock table authors in exclusive mode wait 5
```

Example 3 If a table lock is not acquired within 5 seconds, the procedure checks the user's role. If the procedure is executed by a user with sa_role, the procedure prints an advisory message and proceeds without a table lock. If the user does not have sa_role, the transaction is rolled back:

```
create procedure bigbatch
as
begin transaction
lock table titles in share mode wait 5
if @@error = 12207
begin
    /*
    ** Allow SA to run without the table lock
    ** Other users get an error message
```

```
        */
        if (proc_role ("sa_role") = 0)
        begin
        print "You cannot run this procedure at
            this time, please try again later"
        rollback transaction
        return 100
        end
    else
        begin
        print "Couldn't obtain table lock,
            proceeding with default locking."
        end
    end
    /* more SQL here */
    commit transaction
```

Usage

- You can use lock table with an archive database.
- If you use lock table as the first statement after the set chained on command, this creates a new transaction.
- You can use lock table only within a transaction. The table lock is held for the duration of the transaction.
- The behavior of lock table depends on the wait-time options that are specified in the command or that are active at the session level or server level.
- If he twait and nowait option are not specified, lock table uses either the session-level wait period or the server-level wait period. If a session-level wait has been set using set lock wait, it is used, otherwise, the server-level wait period is used.
- If the table lock cannot be obtained with the time limit (if any), the lock table command returns message 12207. The transaction is not rolled back. Subsequent commands in the transaction proceed as they would have without the lock table command.
- You cannot use lock table on system tables or temporary tables.
- You can issue multiple lock table commands in the same transaction.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must have select access permission on the table to use lock table in share mode. You must have delete, insert, or update access permission on the table to use lock table in exclusive mode.

See also

Commands set

merge

Description

Transfers rows from a source table into a target table:

- Inserts rows that are in the source and have no matching key columns in the target.
- Updates rows with key columns that already exist in the target with the values from the source row.

Syntax

```
merge
    into [[database.]owner.]identifier [as table_alias]
    using [[database.]owner.]identifier [as table_alias]
        | (select_query) as alias_name [column_list]
    on merge_search_condition
    [ when matched [and search_conditions ]
        then {update set {col_name = expression} | delete} ]
    [ when not matched [and search_conditions ]
        then insert [(column_list)] values (value_list)
```

Parameters

into [[*database*.]*owner*.]*identifier* [as *table_alias*]

specifies the target object as a table or updatable view as a table alias. The target can be a fully qualified name identifier or a short name identifier—does not include the database name and the owner name—and in which case Adaptive Server uses the current database and the user or database owner.

You may also specify the table alias as an alternative to reference the target table.

using [[*database*.]*owner*.]*identifier* [as *table_alias*] | (*select_query*) as *alias_name* [*column_list*]

specifies the source object as a table, view, or derived table. When the source object is:

- A table or view – use [[*database*.]*owner*.]*identifier*.
- A derived table – reference it by the select query, in the form of an alias name and an optional column list that defines the derived table.

merge_search_conditions

checks whether the row in the source table matches the row in the target table, and consists of a list of predicates such as "*col_name* = *col_name*".

search_conditions

are well-formed Boolean expressions used in the matched/not matched clauses.

update set {*col_name* = *expression*} | delete

both options are always in the matched clause. update assigns new values to the matching row, while delete removes the current matching row.

insert [(*column_list*)] values (*value_list*)
always appears in the not matched clause, and inserts the nonmatching row in the target table.

Examples

Example 1 Merges the DailySales table into GlobalSales:

```
merge into GlobalSales
        (Item_number, Description, Quantity)as G
    using DailySales as D
    ON D.Item_number = G.Item_number
    when not matched
        then
        insert (Item_number, Description, Quantity )
     values (D.Item_number, D.Description, D.Quantity)
    when matched
        then update set
            G.Quantity = G.Quantity + D.Quantity
```

Example 2 Uses a derived table as the source table with dynamic parameter markers:

```
merge into GlobalSales
        (Item_number, Description, Quantity)as G
     using select (?, ?, ?) as
     D (Item_number, Description, Quantity)
     ON D.Item_number = G.Item_number
     when not matched
        then
        insert (Item_number, Description, Quantity )
     values (D.Item_number, D.Description, D.Quantity)
     when matched
        then update set
          G.Quantity = G.Quantity + D.Quantity
```

Usage

- The target table cannot have any triggers declared on it.
- The target table cannot be part of any referential integrity constraint.
- There are no specific optimization for merge queries with on clauses that reference constant Boolean expressions, such as (1=0) or (1=1) .
- The target columns referenced in the on clause cannot be in the set clause of the update action.
- Although you can invoke a merge statement from within a stored procedure, update and insert statements are not allowed within a scalar SQL function.
- The target table cannot be an updatable view with instead of triggers.

- The merge statements can be cached, and the literals in the set clause of the update action and in the insert value list in the insert action are the target of the literal parameterization process.
- The target table cannot be a proxy table.
- For each row in the source table, if the row:
  - Has a matching row in the target table and the search condition is evaluated to true – execute the update in the target table, or the corresponding row in the target table.
  - Has no matching row in the target table and the search condition is evaluated to true – insert the row in the target table.
  - Has more than one matching row in the target table – an error is raised. This is standard SQL-2003 behavior.

  The merge statement can have multiple when matched and when not matched clauses with different search conditions. The first when in the when clauses that has its condition satisfied runs the corresponding action; the rest are ignored.

Permissions

Any user who has select permission on the source object, and insert, update, or delete permission on the target object can use merge.

mount

Description

Attaches a database to a destination or secondary Adaptive Server.

The mount command decodes the information in the **manifest file** and makes the set of databases available. The mount command differs from other copying procedures such as the bcp bulk copy utility in that all required supporting activities are executed, including adding database devices, if necessary, and activating them, creating the catalog entries for the new databases, and recovering them.

If you are using different device names at the destination Adaptive Server when mounting the databases, use mount with listonly and modify the device path names at the destination server. Then use mount to actually mount the databases.

Note For every login that is allowed access to a database on the original Adaptive Server, it is more convenient to have a corresponding login for the same suid at the destination Adaptive Server, as this avoids user ID reconciliation issues.

For permissions to remain unchanged, the login maps at the destination Adaptive Server must be identical to that on the source Adaptive Server. For more information on login maps, see Chapter 15, “Managing Remote Servers” in *System Administration Guide, Volume 1*.

Syntax

```
mount database all | database_mapping[, database_mapping, ...]
          from "manifest_file"
          [using device_mapping [, device_mapping...]
               [with listonly]
          database_mapping:
                    origdbname as newdbname
               |    newdbname = origdbname
               |    origdbname
               |    newdbname
          device_mapping
                    logical_device_name as new_physical_name
               |    new_physical_name = logical_device_name
               |    original_physical_name
               |    new_physical_name
```

Parameters

manifest_file

The manifest file is the binary file that describes the databases that are present on a set of database devices.

Operations that can perform character translations of the file contents (such as ftp) corrupt the manifest file unless performed in binary mode.

Examples

Example 1 Finds the path names listed on the manifest file from the source Adaptive Server:

```
mount database all from "/data/sybase2/mfile1" with listonly
go
```

```
[database]
  mydb
[device]
  "/data/sybase1/d0.dbs" = "1dev1"
  "/data/sybase2/d14.dbs" = "1dev13"
```

When you use the path names different from the source ones, verify or modify them to meet your criteria at the destination Adaptive Server.

Example 2 After the database devices are copied to the secondary Adaptive Server, you then mount it:

```
mount database all from "/data/sybase2/mfile1" using
    "/data/sybase2/d0.dbs" = "1dev1",
    "/data/sybase2/d14.dbs" = "1dev13"
```

When the mount process has completed, the database or databases are still offline. Use the online database command to bring them online. You need not restart the server.

Example 3 The destination server can be the same as the source server. In this case, the database names must be mapped to a different name, and the logical device names will be internally renamed.

1 Create an exact copy of database mydb in the same server:

```
1> quiesce database mydb_tag hold mydb for external dump to
   "/data/mydb.manifest"
2> go
```

2 Copy the OS file:

```
$ cp /data/sybase2/mydb.dbs /data/sybase2/mydb_copy.dbs
```

3 You can now mount it as a copy:

```
1> quiesce database mydb_tag release
2> go
1> mount database mydb as mydb_copy
2> from "/data/mydb.manifest"
3> using mydb_dev as "/data/sybase2/mydb_copy.dbs"
3> go
```

The physical device *//data/sybase2/mydb_copy.dbs/* is automatically assigned a machine-generated logical name with the format *Cccc$<mydb_dev>* where:

- *C* – is [A–Z]
- *c* – is [A–Z, 0–9], and refers to the encoded logical device number
- *mydb_dev* – contains up to 26 characters from the old logical device name.

Database IDs for the transported databases should not exist on the destination Adaptive Server. Because the database has been mounted on the same server, the database ID had to be changed. The allocation pages in the mounted device keep the original database ID, and that information is used by the disk refit command. Use the dbcc checkalloc command to reconcile the dbid after running mount database so that disk refit can work on the mounted devices. Run checkalloc if the database is not being mounted for temporary use.

Usage

- The using clause allows you to define a mapping via the "=" sign or the "as" clause.
- If there are more than one device, a mapping can be one using "=" and another using "as."
- In both databases and devices, you can map devices by name, specifying both logical and physical, and by order. If a database is mapped by name, all databases must be mapped by name and vic eversa. The same happens for devices.
- You cannot mount a subset of a transported set of databases at the destination Adaptive Server; all databases and their devices in the manifest file must be mounted together.
- When executing the mount command at the destination Adaptive Server:
  - The page size in the destination Adaptive Server must be equal to the page size in the source Adaptive Server.
  - There must be enough devices configured at the destination Adaptive Server to successfully add all the devices belonging to the mounted databases.
  - If the logical device you are mounting from the source Adaptive Server has the same name as the logical device on the destination Adaptive Server, these devices are automatically renamed unless you include an alias with the mount command.

    If the physical device name already exists on the destination Adaptive Server, you must rename the physical device name on the source Adaptive Server at the operating system level and provide the new physical device name with the mount command.

- The log version must be the same in the source and destination Adaptive Servers.
- You cannot mount a database from an Adaptive Server with a higher major version number. For example, you cannot mount a 15.0 version database on a 12.5.x version of Adaptive Server.
- The platforms of the source and destination Adaptive Servers must be the same.
- Differences in the sort order or character set are resolved by rules followed by load database. A database with a different character set can be mounted only if the sort order is binary.

Cluster Edition

mount database and unmount database are supported in the Cluster Edition. If an instance fails while one of these commands is in progress, the command may abort. In this case, the user must re-issue mount database or unmount database when the instance failover recovery is complete.

Destination changes

Once databases are mounted on the destination Adaptive Server, certain settings are cleared on the mounted database:

- Replication is turned off.
- Audit settings are cleared and turned off.
- CIS options, default remote location, and type are cleared.
- Cache bindings are dropped for both the mounted databases and their objects.
- Recovery order is dropped for the mounted databases and becomes the default dbid order.

System considerations

- You cannot use the mount command in a transaction.
- You cannot mount a database on server configured for high availability.

Performance considerations

When you mount databases onto an Adaptive Server, if you change the dbid of the database you are mounting, all procedures are marked for recompilation in the database. This increases the time it takes to recover the database at the destination, and delays the first execution of the procedure.

Renaming devices

The manifest file contains the device paths known to the source Adaptive Server that created the manifest file. If the destination Adaptive Server accesses the devices with a different path, you can specify the new path to the mount command.

1 Use the mount command with listonly to display the old path:

```
mount database all from "/work2/Mpubs_file" with listonly
go
```

```
[database]
  mydb
[device]
  "/work2/Devices/pubsdat.dat" = "pubs2dat"
```

2 If the new path for the device pubs2dat is */work2/Devices/pubsdevice.dat* (the devices path in Windows), specify the new device in the mount command:

```
mount database all from "/work2/Mpubs_file" using
   "/work2/datadevices/pubsdevice.dat" = "pubs2dat"
```

If the logical device names exist in the destination server, they will be renamed using an automatically generated unique name.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

mount requires an SA role.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
101	mount	mount database	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a set proxy is in effect

See also

Commands unmount, quiesce database

Documentation Chapter 7, "Database Mount and Unmount," in *System Administration Guide Volume 2*

online database

Description

Marks a database available for public use after a normal load sequence; if needed, upgrades a loaded database to the current version of Adaptive Server; brings a database online after loading a transaction log dumped with the for standby_access option. You can also use online database to bring an archive database online.

Syntax

online database *database_name* [for standby_access]

Parameters

database_name
specifies the name of the database to be brought online.

for standby_access
brings the database online on the assumption that the database contains no open transactions.

Examples

Example 1 Makes the pubs2 database available for public use after a load sequence completes:

```
online database pubs2
```

Example 2 Brings the database inventory_db online. Used after loading inventory_db with a transaction-log dump obtained through dump tran...with standby_access:

```
online database inventory_db for standby_access
```

Usage

- online database brings a database online for general use after a normal database or transaction log load sequence.
- When load database is issued, the database's status is set to "offline." The offline status is set in the sysdatabases system table and remains set until online database completes.
- Do *not* issue online database until all transaction logs are loaded. The command sequence is:
  - load database
  - load transaction (there may be more than one load transaction)
  - online database
- If you execute online database against a currently online database, no processing occurs and no error messages are generated.

- You can only use online database...for standby_access with a transaction log that was dumped using dump transaction...with standby_access. If you use online database...for standby_access after loading a transaction log that was dumped without using dump transaction...with standby access, online database generates an error message and fails.
- You can use sp_helpdb to find out whether a database is currently online, online for standby access, or offline.

Upgrading databases

- online database initiates, if needed, the upgrade of a loaded database and transaction log dumps to make the database compatible with the current version of Adaptive Server. After the upgrade completes, the database is made available for public use. If errors occur during processing, the database remains offline.
- online database is required only after a database or transaction log load sequence. It is not required for new installations or upgrades. When you upgrade Adaptive Server to a new version, all databases associated with that server are automatically upgraded.
- online database only upgrades version 11.9 or later user databases.
- After you upgrade a database with online database, dump the newly upgraded database to create a dump that is consistent with the current version of Adaptive Server. You must dump the upgraded database before you can issue a dump transaction command.

Archive databases

The online database *database_name* command performs undo recovery during which modified and allocated pages may be remapped to the modified pages section.

You do not need to bring a database online if it has been loaded with norecovery, since the load automatically brings the database online without running the recovery undo pass.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Only a system administrator, database owner, or user with the Operator role can execute online database.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
83	security	online database	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands dump database, dump transaction, load database, load transaction

System procedures sp_helpdb

open

Description

Opens a cursor for processing.

Syntax

open *cursor_name*

Parameters

cursor_name
is the name of the cursor to open.

Examples

Opens the cursor named authors_crsr:

```
open authors_crsr
```

Usage

- open opens a cursor. Cursors allow you to modify or delete rows on an individual basis. You must first open a cursor to use the fetch, update, and delete statements. For more information about cursors, see the *Transact-SQL User's Guide*.
- Adaptive Server returns an error message if the cursor is already open or if the cursor has not been created with the declare cursor statement.
- Opening the cursor causes Adaptive Server to evaluate the select statement that defines the cursor (specified in the declare cursor statement) and makes the cursor result set available for processing.
- When the cursor is first opened, it is positioned before the first row of the cursor result set.
- You can use open with an archive database.
- When you set the chained transaction mode, Adaptive Server implicitly begins a transaction with the open statement if no transaction is currently active.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

open permission defaults to all users.

See also

Commands close, declare cursor, fetch

order by clause

Description

Returns query results in the specified columns in sorted order.

Syntax

[*Start of* select *statement*]

[order by
    {[*table_name*.| *view_name*.]
        column_name | *select_list_number* | *expression*}
        [asc | desc]
    [,{[*table_name*.| *view_name*.]
        column_name | *select_list_number* | *expression*}
        [asc | desc]]...]

[*End of* select *statement*]

Parameters

order by
sorts the results by columns.

asc
sorts the results in ascending order. If you do not specify asc or desc, asc is assumed.

desc
sorts the results in descending order.

Examples

Example 1 Selects the titles whose price is greater than $19.99 and lists them with the titles in alphabetical order:

```
select title, type, price
from titles
where price > $19.99
order by title
```

```
title
        type         price
------------------------------------------------------------
         ------------ ------------------------
But Is It User Friendly?
         popular_comp                    22.95
Computer Phobic and Non-Phobic Individuals: Behavior Variations
          psychology                     21.59
Onions, Leeks, and Garlic: Cooking Secrets of the Mediterranean
         trad_cook                       20.95
Secrets of Silicon Valley
         popular_comp                   20.00
```

Example 2 Lists the books from the titles table, in descending alphabetical order of the type, and calculates the average price and advance for each type:

```
select type, price, advance
```

```
from titles
order by type desc
compute avg (price), avg (advance) by type
```

Example 3 Lists the title IDs from the titles table, with the advances divided by the total sales, ordered from the lowest calculated amount to the highest:

```
select title_id, advance/total_sales
from titles
order by advance/total_sales
```

```
 title_id
 -------- ------------------------
 MC3026                       NULL
 PC9999                       NULL
 MC2222                       0.00
 TC4203                       0.26
 PS3333                       0.49
 BU2075                       0.54
 MC3021                       0.67
 PC1035                       0.80
 PS2091                       1.11
 PS7777                       1.20
 BU1032                       1.22
 BU7832                       1.22
 BU1111                       1.29
 PC8888                       1.95
 TC7777                       1.95
 PS1372                      18.67
 TC3218                      18.67
 PS2106                      54.05
```

Example 4 Lists book titles and types in order by the type, renaming the columns in the output:

```
select title as BookName, type as Type
from titles
order by Type
```

Usage

- order by returns query results in the specified columns in sorted order. order by is part of the select command.
- In Transact-SQL, you can use order by to sort items that do not appear in the select list. You can sort by a column heading, a column name, an expression, an alias name (if specified in the select list), or a number representing the position of the item in the select list (*select_list_number*).

- If you sort by *select_list_number*, the columns to which the order by clause refers must be included in the select list, and the select list cannot be * (asterisk).
- Use order by to display your query results in a meaningful order. Without an order by clause, you cannot control the order in which Adaptive Server returns results.

Restrictions

- The maximum number of columns allowed in an order by clause is 31.
- You cannot use order by on text, unitext, or image datatype columns.
- Subqueries and view definitions cannot include an order by clause (or a compute clause or the keyword into). Conversely, you cannot use a subquery in an order by list.
- You cannot update the result set of a server- or language- type cursor if it contains an order by clause in its select statement. For more information about the restrictions applied to updatable cursors, see the *Transact-SQL User's Guide*.
- If you use compute by, you must also use an order by clause. The expressions listed after compute by must be identical to or a subset of those listed after order by, must be in the same left-to-right order, must start with the same expression, and must not skip any expressions. For example, if the order by clause is:

  ```
  order by a, b, c
  ```

  the compute by clause can be any (or all) of these:

  ```
  compute by a, b, c
  compute by a, b
  compute by a
  ```

  You can also use the keyword compute can be used without by to generate grand totals, grand counts, and so on. In this case, order by is optional.

Collating sequences

- With order by, null values precede all others.
- The sort order (collating sequence) on your Adaptive Server determines how your data is sorted. The sort order choices are binary, dictionary, case-insensitive, case-insensitive with preference, and case- and accent-insensitive. Sort orders that are specific to national languages may also be provided.

Table 1-25: Effect of sort order choices

Adaptive Server sort order	Effects on *order by* results
Binary order	Sorts all data according to the numeric byte-value of each character in the character set. Binary order sorts all uppercase letters before lowercase letters. Binary sort order is the only option for multibyte character sets.
Dictionary order	Sorts uppercase letters before their lowercase counterparts (case-sensitive). Dictionary order recognizes the various accented forms of a letter and sorts them after the unaccented form.
Dictionary order, case-insensitive	Sorts data in dictionary order but does not recognize case differences. Uppercase letters are equivalent to their lowercase counterparts and are sorted as described in "Sort rules" next.
Dictionary order, case-insensitive with preference	Sorts an uppercase letter in the preferred position, before its lowercase version. It does not recognize case difference when performing comparisons (for example, in where clauses).
Dictionary order, case- and accent-insensitive	Sorts data in dictionary order, but does not recognize case differences; treats accented forms of a letter as equivalent to the associated unaccented letter. This sort order intermingles accented and unaccented letters in sorting results.

- sp_helpsort reports the sort order installed on Adaptive Server.

Sort rules

When two rows have equivalent values in the Adaptive Server sort order, the following rules are used to order the rows:

- The values in the columns named in the order by clause are compared.
- If two rows have equivalent column values, the binary value of the entire rows is compared byte by byte. This comparison is performed on the row in the order in which the columns are stored internally, not the order of the columns as they are named in the query or in the original create table clause. In brief, data is stored with all the fixed-length columns, in order, followed by all the variable-length columns, in order.
- If rows are equal, row IDs are compared.

  Given this table:

```
create table sortdemo (lname varchar (20),
                       init char (1) not null)
```

  and this data:

```
lname      init
---------- ----
Smith      B
SMITH      C
smith      A
```

you get these results when you order by *lname*:

```
lname      init
---------- ----
smith      A
Smith      B
SMITH      C
```

Since the fixed-length char data (the init column) is stored first internally, the order by sorts these rows based on the binary values “Asmith”, “BSmith,” and “CSMITH”.

However, if the init is of type varchar, the *lname* column is stored first, and then the init column. The comparison takes place on the binary values “SMITHC”, “SmithB”, and “smithA”, and the rows are returned in that order.

Descending scans

- Use of the keyword desc in an order by clause allows the query optimizer to choose a strategy that eliminates the need for a worktable and a sort step to return results in descending order. This optimization scans the page chain of the index in reverse order, following the previous page pointers on each index page.

  To use this optimization, the columns in the order by clause must match the index order. They can be a subset of the keys, but must be a prefix subset, that is, they must include the first keys. You cannot use the descending scan optimization if the columns named in the order by clause are a superset of the index keys.

  If the query involves a join, all tables can be scanned in descending key order, as long as the requirements for a prefix subset of keys are met. You can also use descending scan optimization for one or more tables in a join, while other tables are scanned in ascending order.

- If other user processes are scanning forward to perform updates or deletes, performing descending scans can cause deadlocks. Deadlocks may also be encountered during page splits and shrinks. You can use sp_sysmon to track deadlocks on your server, or you can use the configuration parameter print deadlock information to send deadlock information to the error log.

- If your applications must return results in descending order, but the descending scans optimization creates deadlock problems, some possible workarounds are:

  - Use set transaction isolation level 0 scans for descending scans. For more information on the effect of isolation level 0 reads, see the set command, and Chapter 4, "Using Locking Commands" in *Performance and Tuning Guide: Locking*.
  - Disable descending scan optimization with the configuration parameter allow backward scans so that all queries that use desc scan the table in ascending order and sort the result set into descending order. See the *System Administration Guide*.
  - Break problematic descending scans into two steps, selecting the required rows into a temporary table in ascending order in the first step, and selecting from the temporary table in descending order in the second step.
- If a backward scan uses a clustered index that contains overflow pages because duplicate key values are present, the result set returned by the descending scan may not be in exact reverse order of the result set that is returned with an ascending scan. The specified key values are returned in order, but the order of the rows for the identical keys on the overflow pages may be different. For an explanation of how overflow pages in clustered indexes are stored, see Chapter 12, "How Indexes Work" in *Performance and Tuning Guide: Basics*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Specifying new column headings in the order by clause of a select statement when the union operator is used is a Transact-SQL extension.

See also

Commands compute clause, declare, group by and having clauses, select, where clause

System procedures sp_configure, sp_helpsort, sp_lock, sp_sysmon

prepare transaction

Description

Used by DB-Library in a two-phase commit application to see if a server is prepared to commit a transaction.

Syntax

prepare tran[saction]

Usage

- See the *Open Client DB-Library Reference Manual*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

See also

Commands begin transaction, begin transaction, rollback, save transaction

print

Description

Prints a user-defined message on the user's screen.

Syntax

```
print
    {format_string | @local_variable |
    @@global_variable}
        [, arg_list]
```

Parameters

format_string

can be either a variable or a string of characters. The maximum length of *format_string* is 1023 bytes.

Format strings can contain up to 20 unique placeholders in any order. These placeholders are replaced with the formatted contents of any arguments that follow *format_string* when the text of the message is sent to the client.

To allow reordering of the arguments when format strings are translated to a language with a different grammatical structure, placeholders are numbered. A placeholder for an argument appears in this format: " %*nn* !"—a percent sign (%), followed by an integer from 1 to 20, followed by an exclamation point (!). The integer represents the argument number in the string in the argument list. "%1!" is the first argument in the original version, "%2!" is the second argument, and so on.

Indicating the position of the argument in this way makes it possible to translate correctly, even when the order in which the arguments appear in the target language is different.

For example, assume the following is an English message:

```
%1! is not allowed in %2!.
```

The German version of this message is:

```
%1! ist in %2! nicht zulässig.
```

The Japanese version of this message is:

```
%2! の中で %1! は許されません。
```

In this example, "%1!" represents the same argument in all three languages, as does "%2!". This example shows the reordering of the arguments that is sometimes necessary in the translated form.

@local_variable

must be of type char, nchar, varchar, or nvarchar, and must be declared within the batch or procedure in which it is used.

@@global_variable
must be of type char or varchar, or be automatically convertible to these types, such as *@@version*. Currently, *@@version* is the only character-type global variable.

arg_list
may be a series of either variables or constants separated by commas. *arg_list* is optional unless a format string containing placeholders of the form "*%nn* !" is provided. In that case, the *arg_list* must have at least as many arguments as the highest numbered placeholder. An argument can be any datatype except text or image; it is converted to a character datatype before being included in the final message.

Examples

Example 1 Prints "Berkeley author" if any authors in the authors table live in the 94705 postal code:

```
if exists (select postalcode from authors
where postalcode = '94705')
print "Berkeley author"
```

Example 2 Declares a variable, assigns a value to the variable, and prints the value:

```
declare @msg char (50)
select @msg = "What's up, doc?"
print @msg
```

```
What's up, doc?
```

Example 3 Demonstrates the use of variables and placeholders in messages:

```
declare @tabname varchar (30)
select @tabname = "titles"

declare @username varchar (30)
select @username = "ezekiel"

print "The table '%1!' is not owned by the user '%2!'.",
@tabname, @username
```

```
The table 'titles' is not owned
by the user 'ezekiel.'
```

Usage

- The maximum output string length of *format_string* plus all arguments after substitution is 1023 bytes.

- If you use placeholders in a format string, keep this in mind: for each placeholder *n* in the string, the placeholders 1 through *n*- 1 must also exist in the same string, although they do not have to be in numerical order. For example, you cannot have placeholders 1 and 3 in a format string without having placeholder 2 in the same string. If you omit a number in a format string, an error message is generated when print is executed.
- The *arg_list* must include an argument for each placeholder in the *format_string*, or the transaction is aborted. You can use more arguments than placeholders.
- To include a literal percent sign as part of the error message, use two percent signs ("%%") in the *format_string*. If you include a single percent sign ("%") in the *format_string* that is not used as a placeholder, Adaptive Server returns an error message.
- If an argument evaluates to NULL, it is converted into a zero-length character string. If you do not want zero-length strings in the output, use the isnull function. For example, if *@arg* is null, the following statement prints `I think we have nothing here.`:

```
declare @arg varchar (30)
select @arg = isnull (col1, "nothing") from
table_a where ...
print "I think we have %1! here", @arg
```

- You can add user-defined messages to the system table sysusermessages for use by any application. Use sp_addmessage to add messages to sysusermessages; use sp_getmessage to retrieve messages for use by print and raiserror.
- Use raiserror instead of print to print a user-defined error message and have the error number stored in *@@error*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

print permission defaults to all users. No permission is required to use it.

See also

Commands declare, raiserror

System procedures sp_addmessage, sp_getmessage

quiesce database

Description

Suspends and resumes updates to a specified list of databases.

Syntax

quiesce database *tag_name* hold *database_list* [for external dump]
    [to *manifest_file* [with override]]

or:

quiesce database *tag_name* release

Parameters

tag_name
is a user-defined name that designates the list of databases to hold or release. The *tag_name* must conform to the rules for identifiers.

hold
when used with to manifest_file clause, holds the database and creates a manifest file.

Warning! Since the manifest file is binary, operations that perform character translations of the file contents (such as ftp) corrupt the file unless performed in binary mode.

---

database_list
is the list of the databases included in the quiesce database hold command.

for external dump
specifies that while updates to the databases in the list are suspended, you will physically copy all affected database devices, using some facility external to Adaptive Server. The copy operation serves as a replacement for the combination of dump database and load database.

manifest_file
the binary file that describes the databases that are present on a set of database devices. It can be created only if the set of databases that occupy those devices are isolated, self-contained on those devices.

Since the manifest file is a binary file, operations that can perform character translations of the file contents (such as ftp) will corrupt the file unless performed in binary mode.

with override
overrides any restrictions that prevent you from successfully executing quiesce database on a database.

Examples

Example 1 Suspends update activity on salesdb and ordersdb:

```
quiesce database report_dbs hold salesdb, ordersdb
```

Example 2 Resumes update activity on the databases labeled report_dbs:

```
quiesce database report_dbs release
```

Example 3 Suspends update activity to the pubs2 database and signifies your intent to make an external copy of this database:

```
quiesce database pubs_tag hold pubs2 for external dump
```

Example 4 Places the database in a hold status and builds the manifest file for a database to be copied to another Adaptive Server:

```
quiesce database pubs_tag hold pubs2 for external dump to
    "/work2/sybase1/mpubs_file with override
```

Once the command completes, control returns to the user.

Example 5 Copies the database devices, using the mount database with listonly to list all of the devices to be copied to view:

```
1> mount database all from "/data/sybase2/mfile1" with listonly
2> go
```

```
"/data/sybase1/d0.dbs" = "1dev1"
```

You cannot create a manifest file if the set of databases that are quiesced contain references to databases outside of the set. Use with override option to bypass this restriction:

```
quiesce database pubs2_tag release for external dump to Mpubs_file
```

Example 6 These succeed where *key_db* contains the encryption key used to encrypt columns in *col_db*:

```
quiesce database key_tag hold key_db for external
         dump to "/tmp/keydb.dat"

quiesce database encr_tag hold col_db for external dump
      to "/tmp/col.dat" with override

quiesce database col_tag hold key_db, col_db for
    external dump to "/tmp/col.dat"
```

Usage

- quiesce database used with the hold keyword suspends all updates to the specified database. Transactions cannot update data in suspended databases, and background tasks such as the checkpoint process and housekeeper process skip all databases that are in the suspended state.
- quiesce database used with the release keyword allows updates to resume on databases that were previously suspended.

- quiesce database used with the for external dump clause signifies that you intend to make an external copy of the database.
- Recovery for this database may fail or the database may not be consistent If you:
  - Quiesce a reduced-durability database (including tempdb)
  - Copy the device
  - Mount this database on another Adaptive Server

  Change a database's durability with alter database before you issue a quiesce database command.
- The quiesce database hold and release commands need not be executed from the same user session.
- If the databases specified in the quiesce database hold command contain distributed or multidatabase transactions that are in the prepared state, Adaptive Server waits during a five-second timeout period for those transactions to complete. If the transactions do not complete during the timeout period, quiesce database hold fails.
- If Adaptive Server is executing a dump database or dump transaction command on a database specified in quiesce database hold, the database is suspended only after the dump command completes.
- If you execute a dump database or dump transaction command on a database while updates to the database are suspended, Adaptive Server blocks those commands until the database is released with quiesce database release.
- If you attempt to run a query against a database that is quisced, Adaptive Server issues error message 880:

  ```
  Your query is blocked because it tried to write and
  database '%.*s' is in quiesce state. Your query will
  proceed after the DBA performs QUIESCE DATABASE
  RELEASE
  ```

  The query is run once the database is no longer in a quiescent state.
- You can specify a maximum of eight databases in a single quiesce database hold command. If you must suspend updates to additional databases, execute additional quiesce database hold commands.

- To duplicate or copy databases, use quiesce database with the extension for creating the manifest file. The quiesce database effects the quiesce hold by blocking writes in the database, and then creates the manifest file. The command then returns control of the database to the user. You can now use a utility to copy the database to another Adaptive Server. These rules for quiesce database hold must be followed for the copy operation:
  - The copy operation cannot begin until the quiesce database hold process has completed.
  - Every device for every database in the quiesce database command must be copied.
  - The copy process must complete before you invoke quiesce database release.

Encrypted columns and *quiesce database*

- You can use quiesce database when the database contains an encryption key.
- You must use with override to quiesce a database whose columns are encrypted with keys stored in other databases.
- quiesce database *key_db, col_db* is allowed where *key_db* is the database with the encryption key and *col_db* is the database with a table that has a column encrypted with the key in *key_db*.

quiesce database in a clustered environment

- If you issue shutdown instance or shutdown cluster, the cluster aborts all quiesce database commands.
- The cluster rejects all quiescedb commands issued by a user if shutdown instance or shutdown cluster commands are in progress.
- The cluster aborts all quiesce database commands if instance failover recovery is in progress.
- The cluster rejects all quiesce database commands issued by a user if instance failover recovery is in progress.
- You cannot add a new instance to the cluster while the master database is part of an ongoing quiesce database hold command.

Permissions

quiesce database permission defaults to system administrators.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
96	quiesce	quiesce database	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a set proxy is in effect

See also

Commands dump database, dump transaction, mount, unmount

System procedures sp_helpdb, sp_who

raiserror

Description

Prints a user-defined error message on the user's screen and sets a system flag to record that an error condition has occurred.

Syntax

raiserror *error_number*
[{*format_string* | @*local_variable*}] [, *arg_list*]
[with errordata *restricted_select_list*]

Parameters

error_number

is a local variable or an integer with a value greater than 17,000. If the *error_number* is between 17,000 and 19,999, and *format_string* is missing or empty (""), Adaptive Server retrieves error message text from the sysmessages table in the master database. These error messages are used chiefly by system procedures.

If *error_number* is 20,000 or greater and *format_string* is missing or empty, raiserror retrieves the message text from the sysusermessages table in the database from which the query or stored procedure originates. Adaptive Server attempts to retrieve messages from either sysmessages or sysusermessages in the language defined by the current setting of *@@langid*.

format_string

is a string of characters with a maximum length of 1024 bytes. Optionally, you can declare *format_string* in a local variable and use that variable with raiserror (see *@local_variable*).

raiserror recognizes placeholders in the character string that is to be printed out. Format strings can contain up to 20 unique placeholders in any order. These placeholders are replaced with the formatted contents of any arguments that follow *format_string*, when the text of the message is sent to the client.

To allow reordering of the arguments, when format strings are translated to a language with a different grammatical structure, the placeholders are numbered. A placeholder for an argument appears in this format: "%nn!"—a percent sign (%), followed by an integer from 1 to 20, followed by an exclamation point (!). The integer represents the argument number in the string in the argument list. "%1!" is the first argument in the original version, "%2!" is the second argument, and so on.

Indicating the position of the argument in this way makes it possible to translate correctly, even when the order in which the arguments appear in the target language is different from their order in the source language.

For example, assume the following is an English message:

```
%1! is not allowed in %2!.
```

The German version of this message is:

```
%1! ist in %2! nicht zulassig.
```

The Japanese version of this message is:

```
%2! の中で %1! は許されません。
```

In this example, "%1!" represents the same argument in all three languages, as does "%2!". This example shows the reordering of the arguments that is sometimes necessary in the translated form.

@local_variable
is a local variable containing the *format_string* value. It must be of type char or varchar and must be declared within the batch or procedure in which it is used.

arg_list
is a series of variables or constants separated by commas. *arg_list* is optional unless a format string containing placeholders of the form "%*nn* !" is provided. An argument can be any datatype except text or image; it is converted to the char datatype before being included in the final string.

If an argument evaluates to NULL, Adaptive Server converts it to a zero-length char string.

with errordata
supplies extended error data for Client-Library™ programs.

restricted_select_list
consists of one or more of the following items:

- "*", representing all columns in create table order.
- A list of column names in the order you want to see them. When selecting an existing IDENTITY column, you can substitute the syb_identity keyword, qualified by the table name, where necessary, for the actual column name.
- A specification to add a new IDENTITY column to the result table:

  ```
  column_name = identity (precision)
  ```

- A replacement for the default column heading (the column name), in the following forms:

  ```
  column_heading = column_name
  column_name column_heading
  ```

```
column_name as column_heading
```

The column heading may be enclosed in quotation marks for any of these forms. The heading must be enclosed in quotation marks if it is not a valid identifier (that is, if it is a reserved word, if it begins with a special character, or if it contains spaces or punctuation marks).

- An expression (a column name, constant, function, or any combination of column names, constants, and functions connected by arithmetic or bitwise operators, or a subquery).
- A built-in function or an aggregate.
- Any combination of the items listed above.

The *restricted_select_list* can also perform variable assignment, in the form:

```
@variable = expression
[, @variable = expression ...]
```

Restrictions to *restricted_select_list* are:

- You cannot combine variable assignment with any of the other *restricted_select_list* options.
- You cannot use from, where, or other select clauses in *restricted_select_list*.
- You cannot use "*" to represent all columns in *restricted_select_list*.

See the *Transact-SQL User's Guide*.

Examples

Example 1 This stored procedure example returns an error if it does not find the table supplied with the *@tabname* parameter:

```
create procedure showtable_sp @tabname varchar (18)
as
if not exists (select name from sysobjects
    where name = @tabname)
    begin
        raiserror 99999 "Table %1! not found.",
        @tabname
    end
else
    begin
        select sysobjects.name, type, crdate, indid
        from sysindexes, sysobjects
        where sysobjects.name = @tabname
        and sysobjects.id = sysindexes.id
    end
```

Example 2 This example adds a message to sysusermessages, then tests the message with raiserror, providing the substitution arguments:

```
sp_addmessage 25001,
"There is already a remote user named '%1!'
for remote server '%2!'."

raiserror 25001, jane, myserver
```

Example 3 This example uses the with errordata option to return the extended error data *column* and *server* to a client application, to indicate which column was involved and which server was used:

```
raiserror 20100 "Login must be at least 5
    characters long" with errordata "column" =
    "login", "server" = @@servername
```

Usage

- User-defined messages can be generated ad hoc, as in Example 1 and Example 3, or they can be added to the system table sysusermessages for use by any application, as shown in Example 2. Use sp_addmessage to add messages to sysusermessages; use sp_getmessage to retrieve messages for use by print and raiserror.
- Error numbers for user-defined error messages must be greater than 20,000. The maximum value is 2,147,483,647 (2^{31} -1).
- The severity level of all user-defined error messages is 16. This level indicates that the user has made a nonfatal error.
- The maximum output string length of *format_string* plus all arguments after substitution is 1024 bytes.
- If you use placeholders in a format string, keep this in mind: for each placeholder *n* in the string, the placeholders *1* through *n-1* must exist in the same string, although they do not have to be in numerical order. For example, you cannot have placeholders 1 and 3 in a format string without having placeholder 2 in the same string. If you omit a number in a format string, an error message is generated when raiserror is executed.
- If there are too few arguments relative to the number of placeholders in *format_string*, Adaptive Server displays an error message and aborts the currently executing statement, but does not abort any open transactions. However, if this error occurs within a stored procedure, Adaptive Server continues with the next statement at the line that called raiserror, and any open transactions remain open. If the error occurs in a batch of SQL code, Adaptive Server aborts the batch, and any open transactions remain open.

- To include a literal percent sign as part of the error message, use two percent signs ("%%") in the *format_string*. If you include a single percent sign ("%") in the *format_string* that is not used as a placeholder, Adaptive Server returns an error message.
- If an argument evaluates to NULL, it is converted into a zero-length char string. If you do not want zero-length strings in the output, use the isnull function.
- When raiserror is executed, the error number is placed in the global variable *@@error*, which stores the error number that was most recently generated by the system.
- Use raiserror instead of print if you want an error number stored in *@@error*.
- To include an *arg_list* with raiserror, put a comma after *error_number* or *format_string* before the first argument. To include extended error data, separate the first *extended_value* from *error_number*, *format_string*, or *arg_list* using a space (not a comma).

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

raiserror permission defaults to all users. No permission is required to use it.

See also

Commands declare, print

System procedures sp_addmessage, sp_getmessage

readtext

Description

Reads text, unitext, and image values, starting from a specified offset and reading a specified number of bytes or characters.

Syntax

```
readtext [[database.]owner.]table_name.column_name
        text_pointer offset size
        [holdlock | noholdlock] [readpast]
        [using {bytes | chars | characters}]
        [at isolation {
            [read uncommitted | 0] |
            [read committed | 1] |
            [repeatable read | 2]|
            [serializable | 3]}]
```

Parameters

table_name.column_name
is the name of the text, unitext, or image column. You must include the table name. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

text_pointer
is a varbinary (16) value that stores the pointer to the text, unitext, or image data. Use the textptr function to determine this value. text, unitext, and image data is not stored in the same set of linked pages as other table columns. It is stored in a separate set of linked pages. A pointer to the actual location is stored with the data; textptr returns this pointer.

offset
specifies the number of bytes or characters to skip before starting to read text, unitext, or image data.

size
specifies the number of bytes or characters of data to read.

holdlock
causes the text value to be locked for reads until the end of the transaction. Other users can read the value, but they cannot modify it.

noholdlock
prevents the server from holding any locks acquired during the execution of this statement, regardless of the transaction isolation level currently in effect. You cannot specify both a holdlock and a noholdlock option in a query.

readpast
specifies that readtext should silently skip rows with exclusive locks, without waiting and without generating a message.

using
specifies whether readtext interprets the *offset* and *size* parameters as a number of bytes (bytes) or as a number of textptr characters (chars or characters are synonymous). This option has no effect when used with a single-byte character set or with image values (readtext reads image values byte by byte). If the using option is not given, readtext interprets the *size* and *offset* arguments as bytes.

at isolation
specifies the isolation level (0, 1, or 3) of the query. If you omit this clause, the query uses the isolation level of the session in which it executes (isolation level 1 by default). If you specify holdlock in a query that also specifies at isolation read uncommitted, Adaptive Server issues a warning and ignores the at isolation clause. For the other isolation levels, holdlock takes precedence over the at isolation clause.

read uncommitted
specifies isolation level 0 for the query. You can specify 0 instead of read uncommitted with the at isolation clause.

read committed
specifies isolation level 1 for the query. You can specify 1 instead of read committed with the at isolation clause.

repeatable read
specifies isolation level 2 for the query. You can specify 2 instead of serializable with the at isolation clause.

serializable
specifies isolation level 3 for the query. You can specify 3 instead of serializable with the at isolation clause.

Examples

Example 1 Selects the second through the sixth character of the copy column:

```
declare @val varbinary (16)
select @val = textptr (copy) from blurbs
where au_id = "648-92-1872"
readtext blurbs.copy @val 1 5 using chars
```

Example 2

```
declare @val varbinary (16)
select @val = textptr (copy) from blurbs readpast
where au_id = "648-92-1872"
readtext blurbs.copy @val 1 5 readpast using chars
```

Usage

- The textptr function returns a 16-byte binary string (text pointer) to the text, unitext, or image column in the specified row or to the text, unitext, or image column in the last row returned by the query, if more than one row is returned. Declare a local variable to hold the text pointer, then use the variable with readtext.
- The value in the global variable *@@textsize*, which is the limit on the number of bytes of data to be returned, supersedes the size specified for readtext if it is less than that size. Use set textsize to change the value of *@@textsize*.
- When using bytes as the offset and size, Adaptive Server may find partial characters at the beginning or end of thetext data to be returned. If it does, and character set conversion is on, the server replaces each partial character with a question mark (?) before returning the text to the client.
- Adaptive Server must determine the number of bytes to send to the client in response to a readtext command. When the *offset* and *size* are in bytes, determining the number of bytes in the returned text is simple. When the offset and size are in characters, the server must calculate the number of bytes being returned to the client. As a result, performance may be slower when using characters as the *offset* and *size*. The using characters option is useful only when Adaptive Server is using a multibyte character set: it ensures that readtext does not return partial characters.
- You cannot use readtext on text, unitext, or image columns in views.
- If you attempt to use readtext on text values after changing to a multibyte character set, and you have not run dbcc fix_text, the command fails, and an error message instructs you to run dbcc fix_text on the table.

Using *readtext* with *unitext* columns

When you issue readtext on a column defined for the unitext datatype, the readtext *offset* parameter specifies the number of bytes, or Unicode values, to skip before starting to read the unitext data. The readtext *size* parameter specifies the number of bytes, or 16-bit Unicode values, to read. If you specify using bytes (the default), the *offset* and *size* values are adjusted to always start and end on the Unicode character boundaries, if necessary.

If enable surrogate processing is on, readtext truncates only on the surrogate boundary, and starting/ending positions are also adjusted accordingly and returns whole Unicode characters. For this reason, issuing readtext against a column defined for unitext may return fewer bytes than specified.

In the following example, the unitext column ut includes the string U+0101U+0041U+0042U+0043:

```
declare @val varbinary (16)
select @val = textptr (ut) from unitable
where i = 1
readtext foo.ut @val 1 5
```

This query returns the value U+0041U+0042.

The *offset* position is adjusted to 2 since readtext cannot start from the second byte of a Unicode character. Unicode characters are always composed of an even number of bytes. Starting at the second byte (or ending in an odd number of bytes) shifts the result by one byte, and renders the result set inaccurate.

In the example above, the *size* value is adjusted to 4 since readtext cannot read the partial byte of the fourth character, U+0043.

In the following query, enable surrogate processing is enabled, and the ut column contains the string U+d800dc00U+00c2U+dbffdeffU+d800dc00:

```
declare @val varbinary (16)
select @val = textptr (ut) from unitable
where i = 2
readtext foo.ut @val 1 8
```

This query returns the value U+00c2U+dbffdeff. The starting position is reset to 2, and the actual result size is 6 bytes rather than 8 since readtext does not break in the middle of a surrogate pair. Surrogate pairs (in this example, the first value in the range d800..dbff and the second in the range dc00..dfff) require 4-byte boundaries, and the rules of Unicode conformance for UTF-16 do not allow the division of these 4-byte characters.

Using the *readpast* option

- readpast applies only to data-only-locked tables, and is ignored if it is specified for an allpages-locked table.
- readpast is incompatible with the holdlock option. If both are specified in a command, an error is generated and the command terminates.
- If readtext specifies at isolation read uncommitted, readpast generates a warning, but does not terminate the command.
- If the statement isolation level is set to 3, readpast generates an error and terminates the command.
- If the session-wide isolation level is 3, readpast is silently ignored.
- If the session-wide isolation level is 0, readpast generates a warning, but does not terminate the command.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

readtext requires select permission on the table. readtext permission is transferred when select permission is transferred.

See also

Commands set, writetext

System procedures text, image, and unitext datatypes

reconfigure

Description	The reconfigure command currently has no effect; it is included to allow existing scripts to run without modification.
Syntax	reconfigure
Usage	If you have scripts that include reconfigure, change them at your earliest convenience. Although reconfigure is included in this version, it may not continue to be supported in subsequent versions.
Standards	ANSI SQL – Compliance level: Transact-SQL extension.
Permissions	reconfigure permission defaults to system administrators and is not transferable.
See also	**System procedures** sp_configure

remove java

Description

Removes one or more Java-SQL classes, packages, or JARs from a database, when Java classes are installed in the database.

Syntax

```
remove java
    class class_name[, class_name]...
        | package package_name[, package_name]...
        | jar jar_name[, jar_name]...[retain classes]
```

Parameters

class *class_name*
: the name of one or more Java classes to be removed from the database. The classes must be installed in the current database.

package *package_name*
: the name of one or more Java packages to be removed. The packages must be stored in the current database.

jar *jar_name*
: either a SQL identifier or character string value of up to 30 bytes that contains a valid SQL identifier.

  Each *jar_name* must be equal to the name of a retained JAR in the current database.

retain classes
: specifies that the named JARs are no longer retained in the database, and the retained classes have no associated JAR.

Usage

- If remove java statement is contained in a stored procedure, the current database is the database that is current when the procedure is created, not the database that is current when the procedure is called.

  If a remove java statement is not contained in a stored procedure, the current database is the database that is current when the remove statement is executed.

- If class or package is specified and any removed class has an associated JAR, then an exception is raised.
- If any stored procedure, table, or view contains a reference to a removed class as the datatype of a column, variable, or parameter, then an exception is raised.
- All removed classes are:
  - Deleted from the current database.

- Unloaded from the Java Virtual Machine (Java VM) of the current connection. The removed classes are not unloaded from the Java VMs of other connections.

- If any exception is raised during the execution of remove java, then all actions of remove java are cancelled.
- You cannot remove a Java-SQL class if that class is directly referenced by a SQLJ stored procedure or function.
- To remove a Java-SQL class from the database, you must:
  a. Delete all SQLJ stored procedures or functions that directly reference the class using drop procedure and drop function.
  b. Delete the Java-SQL class from the database using remove java.

Locks

- When you use remove java, an exclusive table lock is placed on sysxtypes.
- If jar is specified, then an exclusive table lock is placed on sysjars.

Permissions

You must be a system administrator or database owner to use remove java.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
94	remove	remove java	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a set proxy is in effect

See also

Documentation *Java in Adaptive Server Enterprise*

System procedures sp_helpjava

System tables sysjars, sysxtypes

Utilities extractjava, installjava

reorg

Description

Reclaims unused space on pages, removes row forwarding, or rewrites all rows in the table to new pages, depending on the option used.

Syntax

reorg compact *table_name* [partition *partition_name*]
    [with {resume, time = *no_of_minutes*, compress}]

reorg forwarded_rows *table_name* [partition *partition_name*]
    [with {resume, time = *no_of_minutes*, compress}]

reorg rebuild *table_name* [*index_name* [partition *index_partition_name*]]

reorg reclaim_space *table_name* [*index_name*] [partition *partition_name*]
    [with {resume, time = *no_of_minutes*, compress}]

Parameters

compact
  combines the functions of reorg reclaim_space and reorg forwarded_rows to both reclaim space and undo row forwarding in the same pass.

forwarded_rows
  removes row forwarding.

  While unforwarding or reinserting a data row on a table configured for compression, the row is compressed according to the table's compression level.

index_partition_name
  is the name of the index partition on which you are running reorg. update statistics peforms a check to validate that *index_partition_name* is an index partition. If you specify an index partition, only that index partition is rebuilt

indexname
  specifies the name of the index to be reorganized.

partition_name
  is the name of the partition on which you are running reorg.

tablename
  specifies the name of the table to be reorganized. If *indexname* is specified, only the index is reorganized.

rebuild

if a table name is specified, rewrites all rows in a table to new pages, so that the table is arranged according to its clustered index (if one exists), with all pages conforming to current space management settings and with no forwarded rows and no gaps between rows on a page. If the table has an index, all indexes are dropped and re-created. If an index name is specified, reorg rebuilds that index while leaving the table accessible for read and update activities.

New rows follow the compression level of the partition or table, regardless of the compression level of the data in the original table or partition.

Note reorg rebuild is not supported for system catalogs.

---

reclaim_space

reclaims unused space left by deletes and updates. For each data page in a table, if there is unused space resulting from committed deletes or row-shortening updates, reorg reclaim_space rewrites the current rows contiguously, leaving all unused space at the end of the page. If there are no rows on the page, the page is deallocated.

If a table is marked for compression, reclaim_space compresses the data.

Note reorg reclaim_space only affects tables with variable-length rows, and only frees up space within a page. To reduce the number of pages used, use the reorg rebuild command.

---

with resume

initiates reorganization from the point at which a previous reorg command terminated. Used when the previous reorg command specified a time limit (with time = *no_of_minutes*).

with time = *no_of_minutes*

specifies the number of minutes that the reorg command is to run.

with compress

allows you to compress the rows affected by the reorg operation.

Examples

Example 1 Reclaims unused page space in the titles table:

```
reorg reclaim_space titles
```

Example 2 Reclaims unused page space in the index titleind:

```
reorg reclaim_space titles titleind
```

Example 3 Initiates reorg compact on the titles table. reorg starts at the beginning of the table and continues for 120 minutes. If the reorg completes within the time limit, it returns to the beginning of the table and continues until the full time period has elapsed:

```
reorg compact titles with time = 120
```

Example 4 Initiates reorg compact at the point where the previous reorg compact stopped and continues for 30 minutes:

```
reorg compact titles with resume, time = 30
```

Example 5 Runs reorg forwarded_rows on the smallsales partition of the titles table:

```
reorg forwarded_rows titles partition smallsales
```

Example 6 Runs reorg forwarded_rows on the authors table:

```
reorg forwarded_rows authors
```

Example 7 Runs reorg reclaim_space on the bigsales partition of titles:

```
reorg reclaim_space titles partition bigsales
```

Example 8 Runs reorg compact on the bigsales partition of titles:

```
reorg compact titles partition bigsales
```

Example 9 Runs reorg compact on the titles table and compresses the affected rows:

```
reorg compact titles with compress
```

Example 10 Runs reorg rebuild on the index partition idx_p2 of index local_idx on table sales:

```
reorg rebuild sales local_idx partition idx_p2
```

Usage

- The table specified in reorg—excluding reorg rebuild—must have a datarows- or datapages-locking scheme.
- Index scans traverse faster after you run reorg.
- Running reorg against a table can have a negative effect on performance of concurrent queries.
- If you do not include the index or partition name, the entire table is rebuilt.
- You can perform a dump tran on a table after rebuilding its index. However, you cannot perform a dump tran if the entire table has been rebuilt.

- Although online index rebuilding is allowed on a placement index, it rebuilds only the index pages. The data pages remain untouched, which means datarows are neither sorted nor rewritten to fresh pages. You can rebuild data pages by dropping a placement index, and then re-creating it.
- You can rebuild the index for systabstats, but you cannot run reorg rebuild on the table itself.
- Versions of Adaptive Server earlier than 15.0 restricted you from using reorg rebuild on all-pages locked tables. Adaptive Server versions 15.0 and later allow you to run reorg rebuild on entire tables that uses allpages locking. reorg rebuild rebuilds the entire table, copying the data to new sets of pages, and rebuilds all indexes.
- You cannot use the reorg rebuild sub commands (for example, compact, reclaim_space, and forwarded_rows) on all-pages-locked tables.
- You cannot use reorg rebuild *table_name index_name* on allpages-locked tables.
- reorg has no effect on space allocated to text or image columns.
- You cannot issue reorg within a transaction.
- reorg rebuild requires that you set the database option select into/bulkcopy/pllsort to true and run checkpoint in the database.
- reorg rebuild requires additional disk space equal to the size of the table and its indexes. You can find out how much space a table currently occupies by using sp_spaceused. You can use sp_helpsegment to check the amount of space available.
- After running reorg rebuild, you must dump the database before you can dump the transaction log.
- Requirements for using reorg rebuild on an indexare less stringent than for tables. The following rules apply:
  - You do not need to set select into to rebuild an index.
  - Rebuilding a table requires space for a complete copy of the table. Rebuilding an index works in small transactions, and deallocates pages once they are copied; therefore, the process needs space only for the pages copied on each transaction.
  - You can rebuild the index on a table while transaction level scans (dirty reads) are active.

The *reclaim_space*, *forwarded_rows*, and *compact* parameters

- Minimize interference with other activities by using multiple small transactions of brief duration. Each transaction is limited to eight pages of reorg processing.
- Rewrite space for a single partition.
- Provide resume and time options that allow you to set a time limit on how long a reorg runs and to resume a reorg from the point at which the previous reorg stopped. This allows you to, for example, use a series of partial reorganizations at off-peak times to run the reorg command on a large table.

Garbage collection and locks

- For datarow tables – Adaptive Server performs garbage collection using a latch, and releases the latch on a page before moving to the next page. No locks are obtained until the garbage collection encounters a forwarded row, when it acquires an exclusive table lock, which it holds until the end of that transaction. Subsequent transaction use latches until they encounter forwarded rows.
- For data page tables – Adaptive Server performs garbage collection using a page lock, but releases the page lock before moving to the next page. When the gargage collector encounters a forwarded row, it acquires an exclusive table lock, which it holds until the end of the transaction. Subsequent transactions use page locks until it encounters another forwarded row.
- Use reorg compact if garbage collection encounters OAM pages that are allocated to the object, but do not refer to the allocation (running reorg compact requires a shared table lock).

Using the resume and time parameters

The following considerations apply when using the resume and time parameters:

- If you specify only the resume option, the reorg begins at the point where the previous reorg stopped and continues to the end of the table.
- If you specify only the time option, the reorg starts at the beginning of the table and continues for the specified number of minutes.
- If you specify both options, the reorg starts at the point where the previous reorg stopped and continues for the specified number of minutes.

Running reorg on compressed tables

- reorg rebuild – sorts the rows according to the placement index (if one exists), writing the rows to new data pages according to the space management settings currently in effect. New rows are compressed or decompressed according to individual partition's compression level, regardless of the data compression state in the original table or partition.
- reorg reclaim_space – compresses data rows to save more space if the table is marked for compression.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must be a system administrator or the object owner to issue the reorg command.

See also

Documents See the *System Administration Guide*.

System procedures sp_chgattribute

return

Description

Exits from a batch or procedure unconditionally and provides an optional return status. Statements following return are not executed.

Syntax

return [*integer_expression*] [plan "*abstract_plan*"]

Parameters

integer_expression

is the integer value returned by the procedure. Stored procedures can return an integer value to a calling procedure or an application program.

plan "*abstract_plan*"

specifies the abstract plan to use to optimize the query. The abstract plan can be a full or partial plan specified in the abstract plan language. Plans can be specified only for optimizable SQL statements, that is, queries that access tables. See Chapter 16, "Creating and Using Abstract Plans," in the *Performance and Tuning Guide: Optimizer and Abstract Plans* for more information.

Examples

Example 1 If no user name is given as a parameter, the return command causes the procedure to exit after a message has been sent to the user's screen. If a user name is given, the names of the rules created by that user in the current database are retrieved from the appropriate system tables:

```
create procedure findrules @nm varchar (30) = null as
if @nm is null
begin
    print "You must give a user name"
    return
end
else
begin
    select sysobjects.name, sysobjects.id,
    sysobjects.uid
    from sysobjects, master..syslogins
        where master..syslogins.name = @nm
        and sysobjects.uid = master..syslogins.suid
        and sysobjects.type = "R"
end
```

Example 2 If the updates cause the average price of business titles to exceed $15, the return command terminates the batch before any more updates are performed on titles:

```
print "Begin update batch"
update titles
    set price = price + $3
    where title_id = 'BU2075'
```

```
update titles
    set price = price + $3
    where title_id = 'BU1111'
if (select avg (price) from titles
      where title_id like 'BU%') > $15
begin
      print "Batch stopped; average price over $15"
    return
end
update titles
    set price = price + $2
      where title_id = 'BU1032'
```

Example 3 This procedure creates two user-defined status codes: a value of 1 is returned if the contract column contains a 1; a value of 2 is returned for any other condition (for example, a value of 0 on contract or a title_id that did not match a row):

```
create proc checkcontract @param varchar (11)
as
declare @status int
if (select contract from titles where title_id = @param)
= 1
    return 1
else
    return 2
```

Usage

- The return status value can be used in subsequent statements in the batch or procedure that executed the current procedure, but must be given in the form:

  ```
  execute @retval = procedure_name
  ```

  See execute for more information.

- Adaptive Server reserves 0 to indicate a successful return, and negative values in the range -1 to -99 to indicate different reasons for failure. If no user-defined return value is provided, the Adaptive Server value is used. User-defined return status values cannot conflict with those reserved by Adaptive Server. Numbers 0 and -1 through -14 are currently in use:

Value	Meaning
0	Procedure executed without error
-1	Missing object
-2	Datatype error
-3	Process was chosen as deadlock victim
-4	Permission error

Value	Meaning
-5	Syntax error
-6	Miscellaneous user error
-7	Resource error, such as out of space
-8	Nonfatal internal problem
-9	System limit was reached
-10	Fatal internal inconsistency
-11	Fatal internal inconsistency
-12	Table or index is corrupt
-13	Database is corrupt
-14	Hardware error

Values -15 to -99 are reserved for future Adaptive Server use.

- If more than one error occurs during execution, the status with the highest absolute value is returned. User-defined return values always take precedence over Adaptive Server-supplied return values.
- The return command can be used at any point where you want to exit from a batch or procedure. Return is immediate and complete: statements after return are not executed.
- A stored procedure cannot return a NULL return status. If a procedure attempts to return a null value, for example, using return *@status* where *@status* is NULL, a warning message is generated, and a value in the range of 0 to -14 is returned.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

return permission defaults to all users. No permission is required to use it.

See also

Commands begin...end, execute, if...else, while

revoke

Description

Revokes permissions or roles from users, groups, or roles.

Syntax

Revokes permission to access database objects:

```
revoke [grant option for]
      {all [privileges] | permission_list}
      on {table_name [(column_list)]
            | view_name [(column_list)]
            | stored_procedure_name}
            | keyname}
      from {public | name_list | role_list}
      [cascade]
```

Revokes permission to select built-in functions:

```
revoke select
      on [builtin] builtin
      to {name_list | role_list}
```

Revokes permission to create database objects, execute set proxy, or execute set session authorization:

```
revoke {all [privileges] | command_list}
      from {public | name_list | role_list}
```

Revokes permission to run set proxy or set tracing:

```
[revoke set {proxy | tracing}
      from {public | name_list | role_list
```

Revokes a role from a user or another role:

```
revoke role {role_name [, role_list ...]} from
      {grantee [, grantee ...]}
```

Revokes access on some dbcc commands:

```
revoke dbcc {dbcc_command [on {all | database}]
            [, dbcc_command [on {all | database}], ...]}
      from {user_list | role_list}
```

Revokes permission from other users, groups, and roles to create encryption keys.

```
revoke create encryption key from user | role | group
```

Revokes row-filtering predicates.

```
revoke {all [privileges]
            | [all] permission_list}
      on table_name (column_list)
[with { pred_name | {all |no} predicates}]
      from {public | name_list | role_list}
```

Revokes decrypt permission on a table or a list of columns in a table:

```
revoke decrypt on [owner.] tablename[(columnname [{,columnname}])]
    from user | group | role
```

Revokes the default permissions from public:

```
revoke default permissions on system tables
```

Parameters

all

when used to revoke permission to access database objects (the first syntax format), all revokes all permissions applicable to the specified object. All object owners can use revoke all with an object name to revoke permissions on their own objects.

Only the system administrator or the database owner can revoke permission to revoke create command permissions (the third syntax format). When used by the system administrator, revoke all revokes all create permissions (create database, create default, create procedure, create rule, create table, and create view). When the database owner uses revoke all, Adaptive Server revokes all create permissions except create database, and prints an informational message.

all does not apply to set proxy, set session authorization, create encryption key, and create trigger.

permission_list

is a list of permissions to revoke. If more than one permission is listed, separate them with commas. The following table illustrates the access permissions that can be granted and revoked on each type of object:

Object	**permission_list can include**
Table	select, insert, delete, update references, update statistics, delete statistics, and truncate table, decrypt
View	select, insert, delete, update, decrypt
Column	select, update, references, decrypt Column names can be specified in either *permission_list* or *column_list*.
Stored procedure	execute
Encryption key	select

Permissions can be revoked only by the user who granted them.

builtin
is a built-in function. Specifying built-in functions allows you to differentiate between a table and a revocable built-in function with the same name. The functions are set_appcontext, get_appcontext, list_appcontext, and rm_appcontext.

command_list
is a list of commands. If more than one command is listed, separate them with commas. The command list can include create database, create default, create procedure, create rule, create table, create view, create encryption key, set proxy, or set session authorization. create database permission can be revoked only by a system administrator and only from within the master database.

set proxy and set session authorization are identical; the only difference is that set session authorization follows the SQL standard, and set proxy is a Transact-SQL extension. Revoking permission to execute set proxy or set session authorization revokes permission to become another user in the server. Permissions for set proxy or set session authorization can be revoked only by a system security officer, and only from within the master database.

table_name
is the name of the table on which you are revoking permissions. The table must be in your current database. Only one object can be listed for each revoke statement.

column_list
is a list of columns, separated by commas, to which the privileges apply. If columns are specified, only select and update permissions can be revoked. References permissions also can be revoked on columns.

view_name
is the name of the view on which you are revoking permissions. The view must be in your current database. Only one object can be listed for each revoke statement.

stored _procedure_name
is the name of the stored procedure on which you are revoking permissions. The stored procedure must be in your current database. Only one object can be listed for each revoke statement.

keyname
is the name of the key from which you are revoking permission. The encryption key must be in your current database. Only one object can be listed for each revoke statement. You can revoke only select permission from a key.

public

is all users. For object access permissions, public excludes the object owner. For object creation permissions or set proxy authorizations, public excludes the database owner. You cannot grant permissions with grant option to "public" or to other groups or roles.

name_list

is a list of user and group names, separated by commas.

proxy

Revokes permission from a user to impersonate another user. Only the system security officer can revoke set proxy.

tracing

Revokes permission from a user to enable or disable tracing for the set option, set plan, and dbcc traceon or traceoff. Only the system administrator can revoke set tracing permission, and only from the master database.

role

is the name of a system or user-defined role. Use revoke role to revoke revoked roles from roles or users.

role_name

is the name of a system or user-defined role. This allows you to revoke permissions from all users who have been revoked a specific role. The role name can be either a system role or a user-defined role created by a system security officer with create role. Either type of role can be revoked to a user with the revoke role command. In addition, you can use sp_role to revoke system roles.

grantee

is the name of a system role, user-defined role, or a user, from whom you are revoking a role.

grant option for

revokes with grant option permissions, so that the users specified in *name_list* can no longer grant the specified permissions to other users. If those users have granted permissions to other users, you must use the cascade option to revoke permissions from those users. The user specified in *name_list* retains permission to access the object, but can no longer grant access to other users. grant option for applies only to object access permissions, not to object creation permissions.

cascade

revokes the specified object access permissions from all users to whom the revokee granted permissions. Applies only to object access permissions, not to object creation permissions. When you use revoke without grant option for, permissions granted to other users by the revokee are also revoked: the cascade occurs automatically.

dbcc_command

is the name of the dbcc command you are revoking. It cannot be a variable. Table 1-26 on page 579 lists the valid revoke dbcc commands.

database

is the name of the database on which you are revoking permissions. It is used with database-specific dbcc commands to revoke permission only on the target database. The revokee must be a valid user in the target database. *database* conforms to the rules for identifiers and cannot be a variable.

If there are multiple revoked actions in the same command, *database* must be unique.

See "on all | database parameter and server-level commands" on page 580 for more information.

user_list

is a list of users from whom you are revoking the permission, and cannot be a variable.

role_list

is a list of the name of system or user-defined roles from whom you are revoking the permission, and cannot be a variable.

Note You cannot grant or revoke dbcc commands to public or groups.

---

all [privileges]

uses all or all privileges to revoke all granted and denied privileges. Only select is relevant to a column-filtering predicate.

all *permission_list*

uses all to revoke all predicated and non-predicated grants for a given table and grantee.

column_list

if used with with *pred_name*, the predicated row- or column-level access is removed for the named columns. If there still exist other columns referenced for this row-level privilege, the privilege and its related named predicate remain in sysprotects for the reduced column list.

with
: may be followed by a named predicate, the double keyword all predicates, or the double keyword no predicates.

- all predicates – instructs Adaptive Server to remove any and all privileges with predicates on the named table from the grantee.
- no predicates – is the default behavior, and it instructs Adaptive Server to remove only unpredicated grants for the given access from the named grantee.

pred_name
: if a predicate with the given name that applies to the revoked privilege and grantee does not exist, Adaptive Server returns an error.

default permissions on system tables
: specifies that you revoke the default permissions for the system tables listed in "revoking default permissions on system tables" on page 580.

Examples

Example 1 Revokes insert and delete permissions on the titles table from Mary and the "sales" group:

```
revoke insert, delete
on titles
from mary, sales
```

Example 2 Revokes select permission on the get_appcontext function from "public" (which includes all users):

```
revoke select on builtin get_appcontext from public
```

Compare this to the following, which revokes select permission on a table called get_appcontext, if a table with that name exists:

```
revoke select on get_appcontext from public
```

Example 3 Two ways to revoke update permission on the price and advance columns of the titles table from "public:"

```
revoke update
on titles (price, advance)
from public
```

or:

```
revoke update (price, advance)
on titles
from public
```

Example 4 Revokes permission from Mary and John to use the create database and create table commands. Because create database permission is being revoked, this command must be executed by a system administrator from within the master database. Mary's and John's create table permission is revoked only within the master database:

```
revoke create database, create table from mary, john
```

Example 5 Revokes permission from Harry and Billy to execute either set proxy or set session authorization to impersonate another user in the server:

```
revoke set proxy from harry, billy
```

Example 6 Revokes permission from users with sso_role to execute either set proxy or set session authorization:

```
revoke set session authorization from sso_role
```

Example 7 Revokes permission from users with vip_role to impersonate another user in the server. vip_role must be a role defined by a system security officer with the create role command:

```
revoke set proxy from vip_role
```

Example 8 Revokes all object creation permissions from Mary in the current database (except create encryption key):

```
revoke all from mary
```

Example 9 Revokes all object access permissions on the titles table from Mary (except decrypt permission):

```
revoke all on titles from mary
```

Example 10 Two ways to revoke Tom's permission to create a referential integrity constraint on another table that refers to the price and advance columns in the titles table:

```
revoke references
on titles (price, advance)
from tom
```

or:

```
revoke references (price, advance)
on titles
from tom
```

Example 11 Revokes permission to execute new_sproc from all users who have been granted the "operator" role:

```
revoke execute on new_sproc from oper_role
```

Example 12 Revokes John's permission to grant insert, update, and delete permissions on the authors table to other users. Also revokes from other users any such permissions that John has granted:

```
revoke grant option for
insert, update, delete
on authors
from john
cascade
```

Example 13 Revokes "doctor_role" from "specialist_role":

```
revoke role doctor_role from specialist_role
```

Example 14 Revokes "doctor_role" and "surgeon_role" from "specialist_role" and "intern_role", and from users Mary and Tom:

```
revoke role doctor_role, surgeon_role from
specialist_role, intern_role, mary, tom
```

Example 15 Revokes dbcc privileges from Frank:

```
1> use pubs2
2> go
1> revoke dbcc checkdb on pubs2 from checkdb_role
2> go
1> use master
2> go
1> revoke dbcc checkdb on all from frank
2> go
...
```

Example 16 Revokes truncate table and update statistics privileges from Harry on the authors table:

```
revoke truncate table on authors from harry
revoke update statistics on authors from harry
```

Example 17 Revokes the delete statistics privileges from user Billy on the authors table:

```
revoke delete statistics on authors from billy
```

Example 18 Revokes truncate table and update and delete statistics privileges from all users with the oper_role:

```
revoke truncate table on authors from oper_role
revoke update statistics on authors from oper_role
revoke delete statistics on authors from oper_role
```

Users Billy and Harry can no longer run these commands on authors.

Example 19 Revokes decrypt permissions from public:

```
revoke decrypt on customer from public
```

Example 20 Revokes create encryption key permissions from user joe:

```
revoke create encryption key from joe
```

Example 21 Revokes select on permission for the ssn_key from the database owner.

```
grant select on ssn_key to dbo
```

Example 22 The following examples assume the following grants have been made for selecting from table t1 (columns col1, col2, col3, col4) by user1:

An unconditional grant to see all rows for t1.col1 and t1.col4:

```
grant select on t1 (col1, col4) to user1
```

A row-filtering grant to be applied when selecting t1.col2 or t1.col3:

```
grant select on t1 (col2, col3)
  where col1 = 1 as pred1
  to user1
```

The following examples illustrate the functionality of the revoke command where a single grantee has multiple row- filtering grants on the same object from the same grantor:

- revoking an individual row-filtering privilege that was granted to a grantee. The revoke command specifies a with clause and the predicate name.
- revoking all predicated row-level privileges granted to the grantee. The revoke command uses the keywords all predicates.
- revoking a non-predicated grant while leaving any predicated row-filtering grants in place. The syntax omits the with clause.

Removes select permission on t1.col2 with pred1. Note: If user1 selects t1.col3, then pred1 will still be applied:

```
revoke select on t1 (col2) with pred1
  from user1
```

If the grantor issued either of the following, then all permissions on t1 using pred1 would be revoked from user1:

```
revoke select on t1 (col1, col3) with pred1
  from user1
```

or

```
revoke select on t1 with pred1
```

Example 23 Removes the grant on t1.col2 and t1.col3 with predicate pred1, as all predicates revokes all row-filtering predicated grants for a given access and grantee:

```
revoke select on t1 with all predicates
  from user1
```

Example 24 Removes all select access on t1 from user1; that is, the non-predicated grant and the row filtering grant with pred1:

```
revoke select on t1 from user1
```

Example 25 Applies to only the non-predicated grant:

```
revoke select on t1 with no predicates
```

Usage

- See the grant command for more information about permissions.
- You can revoke permissions only on objects in your current database.
- You can revoke only permissions that were granted by you.
- You cannot revoke a role from a user while the user is logged in.
- grant and revoke commands are order-sensitive. When there is a conflict, the command issued most recently takes effect.
- You can substitute the word to for the word from in the revoke syntax.
- If you do not specify grant option for in a revoke statement, with grant option permissions are revoked from the user along with the specified object access permissions. In addition, if the user has granted the specified permissions to any other users, all of those permissions are revoked. In other words, the revoke cascades.
- A grant statement adds one row to the sysprotects system table for each user, group, or role that receives the permission. If you subsequently revoke the permission from the user or group, Adaptive Server removes the row from sysprotects. If you revoke the permission from only selected group members, but not from the entire group to which it was granted, Adaptive Server retains the original row and adds a new row for the revoke.

- Permission to issue create trigger is granted to users by default. When you revoke permission for a user to create triggers, a revoke row is added in the sysprotects table for that user. To grant permission to issue create trigger, you must issue two grant commands. The first command removes the revoke row from sysprotects; the second inserts a grant row. If you revoke permission to create triggers, the user cannot create triggers even on tables that the user owns. Revoking permission to create triggers from a user affects only the database where the revoke command was issued.

Using the *cascade* option

revoke grant option for revokes the user's ability to grant the specified permission to other users, but does not revoke the permission itself from that user. If the user has granted that permission to others, you must use the cascade option; otherwise, you receive an error message and the revoke fails.

For example, say you revoke the with grant option permissions from the user Bob on titles, with this statement:

```
revoke grant option for select
on titles
from bob
cascade
```

- If Bob has not granted this permission to other users, this command revokes his ability to do so, but he retains select permission on the titles table.
- If Bob has granted this permission to other users, you must use the cascade option. If you do not, you receive an error message and the revoke fails. cascade revokes this select permission from all users to whom Bob has granted it, as well as their ability to grant it to others.

You cannot use revoke with the cascade option to revoke privileges granted by the table owner. For example, the owner of a table (UserA) can grant privileges to another user (UserB) as in this scenario:

```
create table T1 (...)
grant select on T1 to UserB
```

However, the system administrator cannot revoke UserB's privileges using the revoke privileges command with the cascade option as in this statement:

```
revoke select on T1 from UserA cascade
```

This statement revokes the select privileges of the table owner, but does not revoke those privileges from UserB.

By default, all data manipulation language (DML) operations are revoked implicitly for users other than the table owner. Because the sysprotects table contains no records indicating that the table owner has granted and then revoked privileges, the cascade option is not invoked.

You must revoke explicitly the select privilege from UserB.

Revoking *set proxy* and *set session authorization*

- To revoke set proxy or set session authorization permission, or to revoke roles, you must be a system security officer, and you must be in the master database.
- set proxy and set session authorization are identical, with one exception: set session authorization follows the SQL standard. If you are concerned about using only SQL standard commands and syntax, use set session authorization.
- revoke all does *not* include set proxy or set session authorization permissions.

Revoking from roles, users and groups

- Permissions granted to roles override permissions granted to individual users or groups. Therefore, if you revoke a permission from a user who has been granted a role, and the role has that same permission, the user retains it. For example, say John has been granted the system security officer role, and sso_role has been granted permission on the sales table. If John's individual permission on sales is revoked, he can still access sales because his role permissions override his individual permissions.
- Revoking a specific permission from "public" or from a group also revokes it from users who were individually granted the permission.
- Database user groups allow you to grant or revoke permissions to more than one user at a time. A user is always a member of the default group, "public" and can be a member of only one other group. The Adaptive Server installation script assigns a set of permissions to "public."

  Create groups with sp_addgroup and remove groups with sp_dropgroup. Add new users to a group with sp_adduser. Change a user's group membership with sp_changegroup. To display the members of a group, use sp_helpgroup.

revoke dbcc command options

Table 1-26 lists the valid revoke dbcc commands.

Table 1-26: dbcc command options

Command name	Description
checkalloc	Checks the specified database to make sure all of its pages are correctly allocated, and that there are no unused allocated pages.
checkcatalog	Checks for consistency in and between system tables.
checkdb	Runs the same checks as checktable, but on each table in the specified database, including syslogs.
checkindex	Checks the specified index to make sure that: • Index and data pages are correctly linked. • Indexes are correctly sorted. • All pointers are consistent. • Data information on each page is reasonable. • Page offsets are reasonable.
checkstorage	Checks the specified database for: • Allocation • OAM page entries • Page consistency • Text-valued columns • Allocation of text-valued columns • Text-column chains
checktable	Checks the specified table to make sure that: • Index and data pages are correctly linked. • Indexes are correctly sorted. • All pointers are consistent. • Data information on each page is reasonable. • Page offsets are reasonable.
checkverify	Verifies the results of the most recent run of dbcc checkstorage for the specified database.
fix_text	Upgrades text values after any Adaptive Server character set is converted to a new multibyte character set.
indexalloc	Checks the specified index to make sure all pages are correctly allocated, and that there are no unused allocated pages.
reindex	Checks the integrity of indexes on user tables by running a fast version of dbcc checktable.
tablealloc	Checks the specified table to make sure that all pages are correctly allocated, and that there are no unused allocated pages.
textalloc	Checks for a violation of the format of the root page of a text or image index.
tune	Enables or disables tuning flags for special performance situations.

All of the options in Table 1-26 on page 579 are database-level commands except for tune, which is a server-level command.

See Chapter 25, "Checking Database Consistency" in the *System Administration Guide* for more information on these dbcc commands.

on all | *database* parameter and server-level commands

The on *database* parameter specifies the database on which to invoke the database-level revoke dbcc command. Because on master revokes the ability to use dbcc commands on all databases, on master is the same as on all. You must be in the master database to use either the on all and on master parameters.

Neither the on *database* nor on all parameters work when invoking a server-level revoke dbcc command such as dbcc tune, because by doing so, you are forcing a server-level command to restrict itself to individual databases. For this reason, using the server-level revoke dbcc tune on master command raises an error.

revoking default permissions on system tables

default permissions on system tables revokes sysobjects (audflags) permissions from "public."

The system tables you can revoke the default permissions for when you issue the command from any database are:

- sysalternates
- sysattributes
- syscolumns
- syscomments
- sysconstraints
- sysdepends
- sysindexes
- sysjars
- syskeys
- syslogs
- sysobjects
- syspartitions
- sysprocedures
- sysprotects
- sysqueryplans
- sysreferences
- sysroles
- syssegments
- sysstatistics
- systabstats
- systhresholds
- systypes
- sysusermessages
- sysusers
- sysxtypes

The system tables you revoke the default permissions for when you issue this command from the master database are:

- sysdatabases
- sysdevices
- syslocks
- sysmessages
- sysprocesses
- systransactions
- sysusages
- sysconfigures
- syscurconfigs
- syslanguages
- syscharsets
- sysservers
- systimeranges
- sysresourcelimits
- syslogins
- sysremotelogins

Revoking permissions for *update statistics*, *delete statistics*, and *truncate table*

Adaptive Server allows you to revoke permissions for users, roles, and groups for the update statistics, delete statistics, and truncate table commands. Table owners can also provide permissions through an implicit grant by adding update statistics, delete statistics, and truncate table to a stored procedure and then granting execute permissions on that procedure to a user or role.

You cannot revoke permissions for update statistics at the column level. You must have the sso_role to run update statistics or delete statistics on sysroles, syssrvroles, and sysloginroles security tables.

By default, users with the sa_role have permission to run update statistics and delete statistics on system tables other than sysroles, syssrvroles, and sysloginroles, and can transfer this privilege to other users.

You can also issue grant all to grant permissions on update statistics, delete statistics, and truncate table.

Note Once you revoke permission to execute update statistics from a user, they also lose permission to execute variations of this command, such as update all statistics, update partition statistics, update index statistics, update statistics *table*, and so on. For example, the following revokes Billy permission from running all variations of update statistics on the authors table:

```
revoke update statistics on authors to billy
```

If you revoke a user's permission to execute update statistics, you also revoke their ability to execute the variations of this command.

You cannot revoke variants of update statistics (for example, update index statistics) separately. That is, you *cannot* issue:

```
revoke update all statistics from harry
```

You cannot grant and revoke delete statistics permissions at the column level. See the "Usage" section of grant on page 428.

The command fails and generates an error if a user issues update statistics, delete statistics, or truncate table and they:

- Do not own the table.
- Do not have the sa_role.
- Are not a database owner who has successfully used setuser to become the user who is the owner of the table.

- Have not been granted update statistics, delete statistics, or truncate table privileges.

revoke in a clustered environment

revoke fails if you attempt to revoke permissions from user-defined roles in a local temporary database.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

- **Command execution** Only a system administrator can revoke create database permission, and only from the master database. Only a system security officer can revoke create trigger and create encryption key permission.
- **Database consistency checking** Only system administrators can run revoke dbcc commands. Database owners cannot run revoke dbcc.
- **Database object access** revoke permission for database objects defaults to object owners. An object owner can revoke permission from other users on his or her own database objects.
- **Functions** Only system administrators can revoke permissions on built-in functions.
- **Proxy and session authorization** Only a system security officer can revoke set proxy or set session authorization, and only from the master database.
- **Roles** You can revoke roles only from the master database. Only a system security officer can revoke sso_role, oper_role, or a user-defined role from a user or a role. Only system administrators can revoke sa_role from a user or a role. Only a user who has both sa_role and sso_role can revoke a role that includes sa_role.
- **Tables** Database owners can revoke default permissions on system tables.

  Table owners and the system security officer can revoke decrypt permission on a table or a list of columns in a table.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
47	revoke	revoke	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect
85	roles	create role, drop role, alter role, grant role, or revoke role	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands grant, setuser, set

Functions proc_role

System procedures sp_activeroles, sp_adduser, sp_changedbowner, sp_changegroup, sp_displaylogin, sp_displayroles, sp_dropgroup, sp_dropuser, sp_helpgroup, sp_helprotect, sp_helpuser, sp_modifylogin, sp_role

rollback

Description

Rolls back a user-defined transaction to the named savepoint in the transaction or to the beginning of the transaction.

Syntax

rollback [tran | transaction | work]
[*transaction_name* | *savepoint_name*]

Parameters

tran | transaction | work
specifies that you want to roll back the transaction or the work. If you specify tran, transaction, or work, you can also specify the *transaction_name* or the *savepoint_name*.

transaction_name
is the name assigned to the outermost transaction. It must conform to the rules for identifiers.

savepoint_name
is the name assigned to the savepoint in the save transaction statement. The name must conform to the rules for identifiers.

Examples

Rolls back the transaction:

```
begin transaction
delete from publishers where pub_id = "9906"
rollback transaction
```

Usage

- rollback transaction without a *transaction_name* or *savepoint_name* rolls back a user-defined transaction to the beginning of the outermost transaction.
- rollback transaction *transaction_name* rolls back a user-defined transaction to the beginning of the named transaction. Though you can nest transactions, you can roll back only the outermost transaction.
- rollback transaction *savepoint_name* rolls a user-defined transaction back to the matching save transaction *savepoint_name*.

Restrictions

- If no transaction is currently active, the commit or rollback statement has no effect.
- The rollback command must appear within a transaction. You cannot roll back a transaction after commit has been entered.

Rolling back an entire transaction

- rollback without a savepoint name cancels an entire transaction. All the transaction's statements or procedures are undone.

- If no savepoint_name or transaction_name is given with the rollback command, the transaction is rolled back to the first begin transaction in the batch. This also includes transactions that were started with an implicit begin transaction using the chained transaction mode.

Rolling back to a savepoint

To cancel part of a transaction, use rollback with a *savepoint_name*. A savepoint is a marker set within a transaction by the user with the command save transaction. All statements or procedures between the savepoint and the rollback are undone.

After a transaction is rolled back to a savepoint, it can proceed to completion (executing any SQL statements after that rollback) using commit, or it can be canceled altogether using rollback without a savepoint. There is no limit on the number of savepoints within a transaction.

Rollbacks within triggers and stored procedures

- In triggers or stored procedures, rollback statements without transaction or savepoint names roll back all statements to the first explicit or implicit begin transaction in the batch that called the procedure or fired the trigger.
- When a trigger contains a rollback command without a savepoint name, the rollback aborts the entire batch. Any statements in the batch following the rollback are not executed.
- A remote procedure call (RPC) is executed independently from any transaction in which it is included. In a standard transaction (that is, not using Open Client™ DB-Library two-phase commit), commands executed via an RPC by a remote server are not rolled back with rollback and do not depend on commit to be executed.
- For complete information on using transaction management statements and on the effects of rollback on stored procedures, triggers, and batches, see the *Transact-SQL User's Guide*.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

Transact-SQL extensions The rollback transaction and rollback tran forms of the statement and the use of a transaction name.

Permissions

rollback permission defaults to "public." No permission is required to use it.

See also

Commands begin transaction, commit, create trigger, save transaction

rollback trigger

Description

Rolls back the work done in a trigger, including the data modification that caused the trigger to fire, and issues an optional raiserror statement.

Syntax

```
rollback trigger
    [with raiserror_statement]
```

Parameters

with *raiserror_statement*

specifies a raiserror statement, which prints a user-defined error message and sets a system flag to record that an error condition has occurred. This provides the ability to raise an error to the client when rollback trigger is executed so that the transaction state in the error reflects the rollback. For information about the syntax and rules defining raiserror_statement, see the raiserror command.

Examples

Rolls back a trigger and issues the user-defined error message 25002:

```
rollback trigger with raiserror 25002
    "title_id does not exist in titles table."
```

Usage

- When rollback trigger is executed, Adaptive Server aborts the currently executing command and halts execution of the rest of the trigger.
- If the trigger that issues rollback trigger is nested within other triggers, Adaptive Server rolls back all work done in these triggers up to and including the update that caused the first trigger to fire.
- Adaptive Server ignores a rollback trigger statement that is executed outside a trigger and does not issue a raiserror associated with the statement. However, a rollback trigger statement executed outside a trigger but inside a transaction generates an error that causes Adaptive Server to roll back the transaction and abort the current statement batch.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

rollback trigger permission defaults to "public." No permission is required to use it.

See also

Commands create trigger, raiserror, rollback

save transaction

Description

Sets a savepoint within a transaction.

Syntax

save transaction *savepoint_name*

Parameters

savepoint_name
is the name assigned to the savepoint. It must conform to the rules for identifiers.

Examples

After updating the royaltyper entries for the two authors, insert the savepoint percentchanged, then determine how a 10 percent increase in the book's price affects the authors' royalty earnings. The transaction is rolled back to the savepoint with rollback transaction:

```
begin transaction royalty_change

update titleauthor
set royaltyper = 65
from titleauthor, titles
where royaltyper = 75
and titleauthor.title_id = titles.title_id
and title = "The Gourmet Microwave"

update titleauthor
set royaltyper = 35
from titleauthor, titles
where royaltyper = 25
and titleauthor.title_id = titles.title_id
and title = "The Gourmet Microwave"

save transaction percentchanged

update titles
set price = price * 1.1
where title = "The Gourmet Microwave"

select (price * total_sales) * royaltyper
from titles, titleauthor
where title = "The Gourmet Microwave"
and titles.title_id = titleauthor.title_id

rollback transaction percentchanged

commit transaction
```

Usage

- A savepoint is a user-defined marker within a transaction that allows portions of a transaction to be rolled back. rollback *savepoint_name* rolls back to the indicated savepoint; all statements or procedures between the savepoint and the rollback are undone.

  Statements preceding the savepoint are not undone—but neither are they committed. After rolling back to the savepoint, the transaction continues to execute statements. A rollback without a savepoint cancels the entire transaction. A commit allows it to proceed to completion.

- If you nest transactions, save transaction creates a savepoint only in the outermost transaction.
- There is no limit on the number of savepoints within a transaction.
- If no *savepoint_name* or *transaction_name* is given with the rollback command, all statements back to the first begin transaction in a batch are rolled back, and the entire transaction is canceled.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

save transaction permission defaults to "public." No permission is required to use it.

See also

Commands begin transaction, commit, rollback

Documentation *Transact-SQL User's Guide* for using transaction statements.

select

Description

Retrieves rows from database objects.

Syntax

select ::=
select [all | distinct]
[top *unsigned_integer*]
select_list
[*into_clause*]
[*from_clause*]
[*where_clause*]
[*group_by_clause*]
[*having_clause*]
[*order_by_clause*]
[*compute_clause*]
[*read_only_clause*]
[*isolation_clause*]
[*browse_clause*]
[*plan_clause*]
[*for_xml_clause*]

select_list ::=

Note For details on *select_list*, see the "Parameters" section.

---

into_clause ::=
into [[*database*.] *owner*.] *table_name*
[(*colname* encrypt [with [*database*.[*owner*].]*keyname*] [,
colname encrypt_clause ...])]
| [compressed = *compression_level* | not compressed]
[in row [(*length*)] | off row]
[{[external table at]
'*server_name*.[*database*].[*owner*].*object_name*'
| external directory at '*pathname*'
| external file at '*pathname*' [column delimiter '*string*']}]
[on *segment_name*]
dml_logging = (full | minimal)
[*partition_clause*]
[lock {datarows | datapages | allpages}]
[with [, *into_option*[, *into_option*] ...]]]

| into existing table *table_name*

partition_clause ::=
partition by range (*column_name*[, *column_name*]...)
([*partition_name*] values <= ({constant | MAX}
[, {constant | MAX}] ...) [on *segment_name*]
[*compression_clause*] [on *segment_name*]
[, [*partition_name*] values <= ({constant | MAX}
[, {constant | MAX}] ...) [on *segment_name*]]...)

```
                    [compression_clause] [on segment_name]

        | partition by hash (column_name[, column_name]...)
            { (partition_name [on segment_name]
                    [compression_clause] [on segment_name]
                [, partition_name [on segment_name]]...)
                    [compression_clause] [on segment_name]
            | number_of_partitions
                [on (segment_name[, segment_name] ...)]}

        | partition by list (column_name)
            ([partition_name] values (constant[, constant] ...)
                [compression_clause] [on segment_name]
                [, [partition_name] values (constant[, constant] ...)
                    [compression_clause] [on segment_name]

        | partition by roundrobin
            { (partition_name [on segment_name]
                [, partition_name [on segment_name]]...)
                [compression_clause] [on segment_name]
            | number_of_partitions
                [on (segment_name [, segment_name]...)]}

    into_option ::=
        | max_rows_per_page = num_rows
        | exp_row_size = num_bytes
        | reservepagegap = num_pages
        | identity_gap = gap
        | compression = {none | page | row}
        | lob_compression = off | compression_level]

from_clause ::=
    from table_reference [,table_reference]...

    table_reference ::=
        table_view_name | ANSI_join

        table_view_name ::=
            [[database.]owner.] {{table_name | view_name}
            [as] [correlation_name]
            [(index {index_name | table_name})]
            [parallel [degree_of_parallelism]]
            [prefetch size][lru | mru]}
        [holdlock | noholdlock]
        [readpast]
        [shared]

        ANSI_join ::=
            table_reference join_type join table_reference
                    join_conditions
                join_type ::= inner | left [outer] | right [outer]
                join_conditions ::= on search_conditions
```

compression_clause::=
with compression = {none | page | row}

where_clause ::=
where *search_conditions*
for update [of *column_list*

group_by_clause ::=
group by [all] *aggregate_free_expression*
[, *aggregate_free_expression*]...

having_clause ::=
having *search_conditions*

order_by_clause ::=
order by *sort_clause* [, *sort_clause*]...

sort_clause ::=
{[[[*database*.]*owner*.]{*table_name*.|*view_name*.}]*column_name*
| *select_list_number*
| *expression* }
[asc | desc]

compute_clause ::=
compute *row_aggregate* (*column_name*)
[, *row_aggregate* (*column_name*)]...
[by *column_name* [, *column_name*]...]

read_only_clause ::=
for {read only | update [of *column_name_list*]}

isolation_clause ::=
at isolation
{read uncommitted | 0}
| {read committed | 1}
| {repeatable read | 2}
| {serializable | 3}

browse_clause ::=
for browse

plan_clause ::=
plan "abstract plan"

Note See the *XML Services* book for syntax, examples, and usage information for the select...for_xml_clause.

Parameters

all

includes all rows in the results. all is the default.

distinct
: includes only unique rows in the results. distinct must be the first word in the select list. distinct is ignored in browse mode.

Null values are considered equal for the purposes of the keyword distinct: only one NULL is selected, no matter how many are encountered.

top *unsigned_integer*
: is used with select...into statements to limit the number of rows inserted in the target table. This is different from set rowcount, which is ignored during a select...into.

- When used with delete, update, or in a view, you cannot specify ordering. If there is an implied order on the table from a clustered index, that order applies; otherwise, the results are unpredictable, as they can be in any order.
- *n* is an unsigned 32-bit value between 0 through 2^{32}-1 (4GB-1 or 4,294,967,295). Zero indicates “no” rows.
- When used with cursors, top n limits the overall size of the result set. Specifying set cursor rowcount limits the results of a single fetch.
- When a view definition contains select top *n* and a query with a where clause uses it, the results may be inconsistent.

select_list
: consists of one or more of the following items:

- “*”, representing all columns in create table order.
- A list of column names in the order in which you want to see them. When selecting an existing IDENTITY column, you can substitute the syb_identity keyword, qualified by the table name, where necessary, for the actual column name.
- A specification to add a new IDENTITY column to the result table:

  column_name = identity (int | smallint | tinyint | precision)

  If you specify int, smallint, or tinyint, the resulting column is an integer. If you specify precision, the result is numeric datatype.
- A replacement for the default column heading (the column name), in one of these forms:

```
column_heading = column_name
column_name column_heading
```

```
column_name as column_heading
```

The column heading can be enclosed in quotation marks for any of these forms. The heading must be enclosed in quotation marks if it is not a valid identifier (that is, if it is a reserved word, if it begins with a special character, or if it contains spaces or punctuation marks).

- An expression (a column name, constant, function, or any combination of column names, constants, and functions connected by arithmetic or bitwise operators, or a subquery).
- A built-in function or an aggregate.
- Any combination of the items listed above.

The *select_list* can also assign values to variables, in the form:

```
@variable = expression
    [, @variable = expression ...]
```

You cannot combine variable assignment with any other *select_list* option.

into
: except when used with existing table, creates a new table based on the columns specified in the select list and the rows chosen in the where clause. See "Using select into" on page 614.

colname encrypt
: Specifies encryption on *colname* in the target table. By default, Adaptive Server decrypts data selected from the source table. You must use the encrypt keyword to preserve the data encryption or to encrypt a column in the target database that was not encrypted in the source database.

compression = *compression_level* | not compressed
: indicates if the large object (LOB) data in the row is compressed and to what level.

compression_level | not compressed

indicates the compression level of the row:

- 0 – the row is not compressed.
- 1 through 9 – Adaptive Server uses ZLib compression. Generally, the higher the compression number, the more Adaptive Server compresses the LOB data, and the greater the ratio between compressed and uncompressed data (that is the greater the amount of space savings, in bytes, for the compressed data versus the size of the uncompressed data).

  However, the amount of compression depends on the LOB content, and the higher the compression level , the more CPU-intensive the process. That is, level 9 provides the highest compression ratio but also the heaviest CPU usage.
- 100 – Adaptive Server uses FastLZ compression. The compression ratio that uses the least CPU usage; generally used for shorter data.
- 101 – Adaptive Server uses FastLZ compression. A value of 101 uses slightly more CPU than a value of 100, but uses a better compression ratio than a value of 100.

The compression algorithm ignores rows that do not use LOB data.

column_list

is a list of columns separated by commas.

with database...key

specifies the key used on the source data, or a different key.

in row [(*length*)]

sets or changes the in-row chracteristics for the LOB columns in the target table. If you do not specify *length*, Adaptive Server uses the configured default in-row length.

By default, a LOB column in the target table inherits the storage property of the corresponding LOB column in the select list. If the target table's LOB column is produced as a result of an expression, such as the convert(text, *column*) built-in function, the column then automatically uses off-row storage unless you change the setting by specifying in row [(*length*)].

off row

changes the storage format of the column from in-row to off-row.

external [[*table*] | *directory* | *file*]
: indicates that the type of the external object is a table, directory, or file. If you do not indicate a file, directory, or table, select into assumes that you are using a table.

Note You cannot specify an external location when using any part of the *partition_clause*. Partitions can be created only on tables on the current server and database.

'*server_name*.[*database*].[*owner*].*object_name*'
: indicates that you are selecting into a table or view found on the remote *server_name*.

dml_logging
: determines the amount of logging for insert, update and delete operations, and for some forms of bulk inserts. One of

- full – Adaptive Server logs all transactions
- minimal – Adaptive Sever does not log row or page changes

at '*path_name*'
: indicates the full, operating system-specific path name of the external file or directory you are selecting into. All directories in *path_name* must be accessible to Adaptive Server.

column delimeter '*string*'
: indicates the delimiter that you are using to separate columns after converting the column's data to string format. *string* can have as many as 16 characters. If you do not specify a delimiter, select into uses the tab character.

existing table *table_name*
: indicates that you are selecting data into a proxy table. You cannot use this select into with any other table type except proxy. The column list in the select list must match the type, length, and number in the proxy table.

on *segment_name*
: specifies that the table is to be created on the named segment. Before the on *segment_name* option can be used, the device must be initialized with disk init, and the segment must be added to the database with sp_addsegment. See your system administrator or use sp_helpsegment for a list of the segment names available in your database.

partition by range
: specifies records are to be partitioned according values in the partitioning column or columns. Each partitioning column value is compared with sets of user-supplied upper and lower bounds to determine partition assignment.

column_name
: when used in the *partition_clause*, specifies a partition key column.

partition_name
: specifies the name of a new partition on which table records are to stored. Partition names must be unique within the set of partitions on a table or index. Partition names can be delimited identifiers if set quoted_identifier is on. Otherwise, they must be valid identifiers.

If *partition_name* is omitted, Adaptive Server creates a name in the form *table_name_partition_id*. Adaptive Server truncates partition names that exceed the allowed maximum length.

values <= *constant* | MAX
: specifies the inclusive upper bound of values for a named partition. Specifying a constant value for the highest partition bound imposes an implicit integrity constraint on the table. The keyword MAX specifies the maximum value in a given datatype.

on *segment_name*
: when used in the *partition_clause*, specifies the name of the segment on which to place the partition. When using on *segment_name*, the logical device must already have been assigned to the database with create database or alter database, and the segment must have been created in the database with sp_addsegment. See your system administrator or use sp_helpsegment for a list of the segment names available in your database.

partition by hash
: specifies records are to be partitioned by a system-supplied hash function. The function computes the hash value of the partition keys that specify the partition to which records are assigned.

partition by list
: specifies records are to be partitioned according to literal values specified in the named column. The partition key contains only one column. You can list up to 250 constants as the partition values for each list partition.

partition by roundrobin
: specifies records are to be partitioned in a sequential manner. A round-robin-partitioned table has no partitioning key. Neither the user nor the optimizer knows in which partition a particular record resides.

lock datarows | datapages | allpages
specifies the locking scheme to be used for a table created with a select into command. The default is the server-wide setting for the configuration parameter lock scheme.

max_rows_per_page
limits the number of rows on data pages for a table created with select into. Unlike fillfactor, the max_rows_per_page value is maintained when data is inserted or deleted. max_rows_per_page is not supported on data-only-locked tables.

exp_row_size = *num_bytes*
specifies the expected row size for a table created with the select into command. Valid only for datarows and datapages locking schemes and only for tables that have variable-length rows. Valid values are 0, 1, and any value greater than the minimum row length and less than the maximum row length for the table. The default value is 0, which means that a server-wide default is used.

reservepagegap = *num_pages*
specifies a ratio of filled pages to empty pages that is to be left as select into allocates extents to store data. This option is valid only for the select into command. For each specified *num_pages*, one empty page is left for future expansion of the table. Valid values are 0 – 255. The default value is 0.

readpast
specifies that the query should silently skip rows with exclusive locks, without waiting and without generating a message.

identity_gap
specifies the identity gap for the table. This value overrides the system identity gap setting for this table only.

compression =
: indicates the level of compression to be applied to the table or partition. The new compression level applies to the newly inserted or updated data:

- none – the data in this table or partition is not compressed. For partitions, none indicates that data in this partition remains uncompressed even if the table compression is altered to row or page compression.
- row – compresses one or more data items in an individual row. Adaptive Server stores data in a row-compressed form only if the compressed form saves space compared to an uncompressed form. Set row compression at the partition or table level.
- page – when the page fills, existing data rows that are row-compressed are then compressed using page-level compression to create page-level dictionary, index, and character-encoding entries. Set page compression at the partition or table level.

  Adaptive Server compresses data at the page level only after it has compressed data at the row level, so setting the compression to page implies both page and row compression.

lob_compression = *compression_level*
: determines the compression level for the table.

value
: is the identity gap amount.

  If you are creating a table in a select into statement from a table that has a specific identity gap setting, the new table does not inherit the identity gap setting from the parent table. Instead, the new table uses the identity burning set factor setting. To give the new table a specific identity_gap setting, specify the identity gap in the select into statement. You can give the new table an identity gap that is the same as or different from the parent table.

from
: indicates which tables and views to use in the select statement. from required except when the select list contains no column names (that is, it contains constants and arithmetic expressions only):

```
select 5 x, 2 y, "the product is", 5*2 Result

x       y                          Result
------- ------- ------------------ -----------
        5       2 the product is   10
```

At most, a query can reference 50 tables and 14 worktables (such as those created by aggregate functions). The 50-table limit includes:

- Tables (or views on tables) listed in the from clause
- Each instance of multiple references to the same table (self-joins)
- Tables referenced in subqueries
- Tables being created with into
- Base tables referenced by the views listed in the from clause

view_name, *table_name*

lists tables and views used in the select statement. Specify the database name if the table or view is in another database, and specify the owner's name if more than one table or view of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

If there is more than one table or view in the list, separate their names by commas. The order of the tables and views following the keyword from does not affect the results.

You can query tables in different databases in the same statement.

Table names and view names can be given correlation names (aliases), either for clarity or to distinguish the different roles that tables or views play in self-joins or subqueries. To assign a correlation name, give the table or view name, then a space, then the correlation name, like this:

```
select pub_name, title_id
    from publishers pu, titles t
    where t.pub_id = pu.pub_id
```

All other references to that table or view (for example, in a where clause) must use the correlation name. Correlation names cannot begin with a numeral.

index *index_name*

specifies the index to use to access *table_name*. You cannot use this option when you select from a view, but you can use it as part of a select clause in a create view statement.

parallel

specifies a parallel partition or index scan, if Adaptive Server is configured to allow parallel processing.

degree_of_parallelism

specifies the number of worker processes that will scan the table or index in parallel. If set to 1, the query executes serially.

prefetch *size*

specifies the I/O size, in kilobytes, for tables bound to caches with large I/Os configured. You cannot use this option when you select from a view, but you can use it as part of a select clause in a create view statement. sp_helpcache shows the valid sizes for the cache an object is bound to or for the default cache. To configure the data cache size, use sp_cacheconfigure.

When using prefetch and designating the prefetch size (*size*), the minimum is 2K and any power of two on the logical page size up to 16K. prefetch size options in kilobytes are:

Logical page size	Prefetch size options
2	2, 4, 8 16
4	4, 8, 16, 32
8	8, 16, 32, 64
16	16, 32, 64, 128

The prefetch size specified in the query is only a suggestion. To allow the size specification, configure the data cache at that size. If you do not configure the data cache to a specific size, the default prefetch size is used.

If CIS is enabled, you cannot use prefetch for remote servers.

lru | mru

specifies the buffer replacement strategy to use for the table. Use lru to force the optimizer to read the table into the cache on the MRU/LRU (most recently used/least recently used) chain. Use mru to discard the buffer from cache and replace it with the next buffer for the table. You cannot use this option when you select from a view, but you can use it as part of a select clause in a create view statement.

holdlock

makes a shared lock on a specified table or view more restrictive by holding it until the transaction completes (instead of releasing the shared lock as soon as the required data page is no longer needed, whether or not the transaction has completed).

The holdlock option applies only to the table or view for which it is specified, and only for the duration of the transaction defined by the statement in which it is used. Setting the transaction isolation level 3 option of the set command implicitly applies a holdlock for each select statement within a transaction. The keyword holdlock is not permitted in a select statement that includes the for browse option. You cannot specify both a holdlock and a noholdlock option in a query.

If CIS is enabled, you cannot use holdlock for remote servers.

noholdlock

prevents the server from holding any locks acquired during the execution of this select statement, regardless of the transaction isolation level currently in effect. You cannot specify both a holdlock and a noholdlock option in a query.

shared

instructs Adaptive Server to use a shared lock (instead of an update lock) on a specified table or view. This allows other clients to obtain an update lock on that table or view. You can use the shared keyword only with a select clause included as part of a declare cursor statement. For example:

```
declare shared_crsr cursor
for select title, title_id
from titles shared
where title_id like "BU%"
```

You can use the holdlock keyword in conjunction with shared after each table or view name, but holdlock must precede shared.

ANSI join

an inner or outer join that uses the ANSI syntax. The from clause specifies the tables to be joined.

inner

includes only the rows of the inner and outer tables that meet the conditions of the on clause. The result set of a query that includes an inner join does not include any null-supplied rows for the rows of the outer table that do not meet the conditions of the on clause.

outer

includes all the rows from the outer table whether or not they meet the conditions of the on clause. If a row does not meet the conditions of the on clause, values from the inner table are stored in the joined table as null values. The where clause of an ANSI outer join restricts the rows that are included in the query result.

left

left joins retain all the rows of the table reference listed on the left of the join clause. The left table reference is referred to as the outer table or row-preserving table.

In the queries below, `T1` is the outer table and `T2` is the inner table:

```
T1 left join T2
T2 right join T1
```

right

right joins retain all the rows of the table reference on the right of the join clause (see example above).

search_conditions

used to set the conditions for the rows that are retrieved. A search condition can include column names, expressions, arithmetic operators, comparison operators, the keywords not, like, is null, and, or, between, in, exists, any, and all, subqueries, case expressions, or any combination of these items. See where clause on page 731 for more information.

group by

finds a value for each group. These values appear as new columns in the results, rather than as new rows.

When group by is used with standard SQL, each item in the select list must either have a fixed value in every row in the group or be used with aggregate functions, which produce a single value for each group. Transact-SQL has no such restrictions on the items in the select list. Also, Transact-SQL allows you to group by any expression (except by a column alias); with standard SQL, you can group by a column only.

You can use the aggregates listed in Table 1-27 with group by (*expression* is almost always a column name):

Table 1-27: Results of using aggregates with group by

Aggregate function	Result
sum ([all | distinct] *expression*)	Total of the values in the numeric column.
avg ([all | distinct] *expression*)	Average of the values in the numeric column.
count ([all | distinct] *expression*)	Number of (distinct) non-null values in the column returned as an integer.

Aggregate function	Result
count_big ([all | distinct] *expression*)	Number of distinct non-null values in the column returned as a bigint.
count (*)	Number of selected rows returned as an integer.
count_big (*)	Number of selected rows returned as a bigint.
max (*expression*)	Highest value in the column.
min (*expression*)	Lowest value in the column.

See group by and having clauses on page 461 for more information.

A table can be grouped by any combination of columns—that is, groups can be nested within each other. You cannot group by a column heading; you must use a column name, an expression, or a number representing the position of the item in the select list.

group by all
: includes all groups in the results, even those that do not have any rows that meet the search conditions. See group by and having clauses on page 461 for an example.

aggregate_free_expression
: is an expression that includes no aggregates.

having
: sets conditions for the group by clause, similar to the way that where sets conditions for the select clause. There is no limit on the number of conditions that can be included.

You can use a having clause without a group by clause.

If any columns in the select list do not have aggregate functions applied to them and are not included in the query's group by clause (illegal in standard SQL), the meanings of having and where are somewhat different.

In this situation, a where clause restricts the rows that are included in the calculation of the aggregate, but does not restrict the rows returned by the query. Conversely, a having clause restricts the rows returned by the query, but does not affect the calculation of the aggregate. See group by and having clauses on page 461 for examples.

order by
: sorts the results by columns. In Transact-SQL, you can use order by for items that do not appear in the select list. You can sort by a column name, a column heading (or alias), an expression, or a number representing the position of the item in the **select list** (the *select_list_number*). If you sort by select list number, the columns to which the order by clause refers must be included in the select list, and the select list cannot be * (asterisk).

asc

sorts results in ascending order (the default).

desc

sorts results in descending order.

compute

used with row aggregates (sum, avg, min, max, count, and count_big) to generate control break summary values. The summary values appear as additional rows in the query results, allowing you to see detail and summary rows with one statement.

You cannot use a select into clause with compute.

If you use compute by, you must also use an order by clause. The columns listed after compute by must be identical to or a subset of those listed after order by, and must be in the same left-to-right order, start with the same expression, and not skip any expressions.

For example, if the order by clause is `order by a, b, c`, the compute by clause can be any (or all) of these:

```
compute by a, b, c
compute by a, b
compute by a
```

The keyword compute can be used without by to generate grand totals, grand counts, and so on. order by is optional if you use compute without by. See compute clause on page 95 for details and examples.

If CIS is enabled, compute is not forwarded to remote servers.

for {read only | update}

specifies that a cursor result set is read-only or updatable.

With Adaptive Server versions earlier than 15.7, you can use this option only within a stored procedure, and only when the procedure defines a query for a cursor. In this case, the select is the only statement allowed in the procedure. It defines the for read only or for update option (instead of the declare cursor statement). This method of declaring cursors provides the advantage of page-level locking while fetching rows.

Also, with Adaptive Server versions earlier than 15.7, if the select statement in the stored procedure is not used to define a cursor, Adaptive Server ignores the for read only | update option. See the Embedded SQL™ documentation for more information about using stored procedures to declare cursors.

With Adaptive Server 15.7 and later, if select for update is set, you can use the for update option at the language level outside of a stored procedure, but within a transaction. Such a select need not refer to a cursor. When you use select for update in datarows-locked tables, the selected rows are exclusively locked for the duration of the transaction.

For information about read-only or updatable cursors, see the *Transact-SQL User's Guide*.

of *column_name_list*

is the list of columns from a cursor result set defined as updatable with the for update option.

at isolation

specifies the isolation level (0, 1, 2 or 3) of the query. If you omit this clause, the query uses the isolation level of the session in which it executes (isolation level 1 by default). The at isolation clause is valid only for single queries or within the declare cursor statement. Adaptive Server returns a syntax error if you use at isolation:

- With a query using the into clause
- Within a subquery
- With a query in the create view statement
- With a query in the insert statement
- With a query using the for browse clause

If there is a union operator in the query, you must specify the at isolation clause after the last select. If you specify holdlock, noholdlock, or shared in a query that also specifies at isolation read uncommitted, Adaptive Server issues a warning and ignores the at isolation clause. For the other isolation levels, holdlock takes precedence over the at isolation clause. For more information about isolation levels, see the *Transact-SQL User's Guide*.

If CIS is enabled, you cannot use at isolation for remote servers.

read uncommitted | 0

specifies isolation level 0 for the query.

read committed | 1

specifies isolation level 1 for the query.

repeatable read | 2

specifies transaction isolation level 2 for the query.

serializable | 3

specifies isolation level 3 for the query.

for browse

must be attached to the end of a SQL statement sent to Adaptive Server in a DB-Library browse application. See the *Open Client DB-Library Reference Manual* for details.

plan "*abstract plan*"

specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. See Chapter 30, "Creating and Using Abstract Plans," in the *Performance and Tuning Guide* for more information.

Examples

Example 1 Selects all rows and columns from the publishers table:

```
select * from publishers

pub_id pub_name                   city                 state
------ -------------------------- -------------------- -----
0736    New Age Books             Boston               MA
0877    Binnet & Hardley          Washington           DC
1389    Algodata Infosystems      Berkeley             CA
```

Example 2 Selects all rows from specific columns of the publishers table:

```
select pub_id, pub_name, city, state from publishers
```

Example 3 Selects all rows from specific columns of the publishers table, substituting one column name and adding a string to the output:

```
select "The publisher's name is",
Publisher = pub_name, pub_id
from publishers

                       Publisher                      pub_id
----------------------- ----------------------------- ------
The publisher’s name is New Age Books                 0736
The publisher’s name is Binnet & Hardley              0877
The publisher’s name is Algodata Infosystems          1389
```

Example 4 Selects all rows from specific columns of the titles table, substituting column names:

```
select type as Type, price as Price
from titles
```

Example 5 Specifies the locking scheme and the reserve page gap for select into:

```
select title_id, title, price
into bus_titles
lock datarows with reservepagegap = 10
from titles
where type = "business"
```

Example 6 Encrypts the creditcard column when selecting into the bigspenders table:

```
select creditcard, custid, sum(amount)
     into #bigspenders (creditcard
     encrypt with cust.database.new_cc_key) from daily_xacts
     group by creditcard having sum(amount) > $5000
```

Example 7 Selects only the rows that are not exclusively locked. If any other user has an exclusive lock on a qualifying row, that row is not returned:

```
select title, price
from titles readpast
    where type = "news"
    and price between $20 and $30
```

Example 8 Selects specific columns and rows, placing the results into the temporary table #advance_rpt:

```
select pub_id, total = sum (total_sales)
    into #advance_rpt
from titles
where advance < $10000
    and total_sales is not null
group by pub_id
having count (*) > 1
```

Example 9 Selects the top 3 rows from au_lname from the authors table:

```
select top 3 au_lname from authors
```

Example 10 Concatenates two columns and places the results into the temporary table #tempnames:

```
select "Author_name" = au_fname + " " + au_lname
    into #tempnames
    from authors
```

Example 11 Selects specific columns and rows, returns the results ordered by type from highest to lowest, and calculates summary information:

```
select type, price, advance from titles
order by type desc
compute avg (price), sum (advance) by type
compute sum (price), sum (advance)
```

Example 12 Selects specific columns and rows, and calculates totals for the price and advance columns:

```
select type, price, advance from titles compute sum (price), sum (advance)
```

Example 13 Creates the coffeetabletitles table, a copy of the titles table which includes only books priced over $20:

```
select * into coffeetabletitles from titles
where price > $20
```

Example 14 Creates the newtitles table, an empty copy of the titles table:

```
select * into newtitles from titles
```

```
where 1 = 0
```

Example 15 Gives an optimizer hint:

```
select title_id, title
    from titles (index title_id_ind prefetch 16)
    where title_id like "BU%"
```

Example 16 Selects the IDENTITY column from the sales_east and sales_west tables by using the syb_identity keyword:

```
select sales_east.syb_identity,
sales_west.syb_identity
from sales_east, sales_west
```

Example 17 Creates the newtitles table, a copy of the titles table with an IDENTITY column:

```
select *, row_id = identity (10)
into newtitles from titles
```

Example 18 Specifies a transaction isolation level for the query.

```
select pub_id, pub_name
from publishers
at isolation read uncommitted
```

Example 19 Selects from titles using the repeatable read isolation level. No other user can change values in or delete the affected rows until the transaction completes:

```
begin tran
select type, avg (price)
    from titles
    group by type
at isolation repeatable read
```

Example 20 Gives an optimizer hint for the parallel degree for the query:

```
select ord_num from salesdetail
     (index salesdetail parallel 3)
```

Example 21 Joins the titleauthor and the titles tables on their title_id columns. The result set only includes those rows that contain a price greater than 15:

```
select au_id, titles.title_id, title, price
from titleauthor inner join titles
on titleauthor.title_id = titles.title_id
and price > 15
```

Example 22 The result set contains all the authors from the authors table. The authors who do not live in the same city as their publishers produce null values in the pub_name column. Only the authors who live in the same city as their publishers, Cheryl Carson and Abraham Bennet, produce a non-null value in the pub_name column:

```
select au_fname, au_lname, pub_name
from authors left join publishers
on authors.city = publishers.city
```

Example 23 Create a new table (newtable) from the existing table (oldtable) with an identity gap, you specify it in the select into statement:

```
select identity into newtable
with identity_gap = 20
from oldtable
```

For more information about identity gaps, see "Managing Identity Gaps in Tables" in Chapter 7, "Creating Databases and Tables" in the *Transact-SQL Users Guide*.

Example 24 Creates a new table, bay_area_authors with row-level compression, and populates it with information about authors that live in the San Francisco Bay Area:

```
select * into bay_area_authors
with compression = row
from authors
where postalcode like '94%'
```

Example 25 Creates a new table named titles_2 that compresses all columns except title and advance:

```
select * into titles_2
(title not compressed,
advance not compressed)
with compression = page
from titles
```

Example 26 Set the select for update configuration parameter, perform a select for update, then an update within the same transaction:

```
sp_configure 'select for update', 1
Parameter Name              Default  Memory Used  Config Value  Run Value
    Unit             Type
--------------------------- --------  ----------  -----------  ----------
    ------------------- --------------------
select for update       0           0           1             1
    not applicable   dynamic
```

```
(1 row affected)
Resulting configuration value and memory use have not changed from previous
values: new configuration value 1, previous value 1.
(return status = 0)

begin tran
select c_int, c_bigdatetime from basetbl1 where c_int > 90 for update of
c_bigint

c_int           c_bigdatetime
-----------     -----------------------------
91              Sep 14 2009  9:00:00.000000PM
92              Sep 15 2009  9:00:00.000000PM
93              Sep 16 2009  9:00:00.000000PM
94              Sep 17 2009  9:00:00.000000PM
95              Sep 18 2009  9:00:00.000000PM
96              Sep 19 2009  9:00:00.000000PM
97              Sep 20 2009  9:00:00.000000PM
98              Sep 21 2009  9:00:00.000000PM
99              Sep 22 2009  9:00:00.000000PM
100             Sep 23 2009  9:00:00.000000PM
(10 rows affected)

update basetbl1 set c_bigint = 5000 where c_int > 90
(10 rows affected)
commit tran
go
```

Example 27 Creates a new table sales_report from an existing table sales_detail. The new table is partitioned by range on the qty column.

```
select * into sales_report partition by range (qty)
 (smallorder values <= (500) on seg1,
bigorder values <= (5000) on seg2)
from sales_detail
```

Example 28 Use this query to find the statements that incur too many IOs as the candidates for tuning.

```
select lio_avg, qtext from sysquerymetrics order by
lio_avg
```

Example 29 Selects the titles table into the pubs3 database:

```
select title_id, title, price
into bus_titles
with dml_logging = minimal
from titles
```

Usage

- The keywords in the select statement, as in all other statements, must be used in the order shown in the syntax statement.
- The maximum number of expressions in a select statement is 4096.
- The keyword all can be used after select for compatibility with other implementations of SQL. all is the default. Used in this context, all is the opposite of distinct. All retrieved rows are included in the results, whether or not some are duplicates.
- Except in create table, create view, and select into statements, column headings may include any characters, including blanks and Adaptive Server keywords, if the column heading is enclosed in quotes. If the heading is not enclosed in quotes, it must conform to the rules for identifiers.
- The character string indicated by like cannot be longer than 255 bytes.
- You cannot use the select...for browse option on tables containing more than 255 columns.
- Column headings in create table, create view, and select into statements, as well as table aliases, must conform to the rules for identifiers.
- To insert data with select from a table that has null values in some fields into a table that does not allow null values, you must provide a substitute value for any NULL entries in the original table. For example, to insert data into an advances table that does not allow null values, this example substitutes "0" for the NULL fields:

  ```
  insert advances
  select pub_id, isnull (advance, 0) from titles
  ```

  Without the isnull function, this command would insert all the rows with non-null values into the advances table, andproduce error messages for all rows where the advance column in the titles table contained NULL.

  If you cannot make this kind of substitution for your data, you cannot insert data containing null values into the columns with the NOT NULL specification.

  Two tables can be identically structured, and yet be different as to whether null values are permitted in some fields. Use sp_help to see the null types of the columns in your table.

- The default length of the text, unitext, or image data returned with a select statement is 32K. Use set textsize to change the value. The size for the current session is stored in the global variable *@@textsize*. Certain client software may issue a set textsize command on logging in to Adaptive Server.
- Data from remote Adaptive Servers can be retrieved through the use of remote procedure calls. See create procedure and execute for more information.
- A select statement used in a cursor definition (through declare cursor) must contain a from clause, but it cannot contain a compute, for browse, or into clause. If the select statement contains any of the following constructs, the cursor is considered read-only and not updatable:
  - distinct option
  - group by clause
  - Aggregate functions
  - union operator

  If you declare a cursor inside a stored procedure with a select statement that contains an order by clause, that cursor is also considered read-only. Even if it is considered updatable, you cannot delete a row using a cursor that is defined by a select statement containing a join of two or more tables. See declare cursor for more information.
- If select statement that assigns a value to a variable returns more than one row, the last returned value is assigned to the variable. For example:

```
declare @x varchar (40)
select @x = pub_name from publishers
print @x
 (3 rows affected)
Algodata Infosystems
```

Using ANSI join syntax

- Before you write queries using the ANSI inner and outer join syntax, read "Outer Joins" in Chapter 4, "Joins: Retrieving Data From Several Tables," in the *Transact-SQL User's Guide*.

Using *select into*

- select into is a two-step operation. The first step creates the new table, and the second step inserts the specified rows into the new table.

  Note You can select into a CIS existing table.

  Because the rows inserted by select into operations are not logged, select into commands cannot be issued within user-defined transactions, even if the ddl in tran database option is set to true. Page allocations during select into operations are logged, so large select into operations may fill the transaction log.

  If a select into statement fails after creating a new table, Adaptive Server does *not* automatically drop the table or deallocate its first data page. This means that any rows inserted on the first page before the error occurred remain on the page. Check the value of the *@@error* global variable after a select into statement to be sure that no error occurred. Use the drop table statement to remove the new table, then reissue the select into statement.

- The name of the new table must be unique in the database and must conform to the rules for identifiers. You can also select into temporary tables (see Examples 7, 8, and 11).
- Any rules, constraints, or defaults associated with the base table are not carried over to the new table. Bind rules or defaults to the new table using sp_bindrule and sp_bindefault.
- select into does not carry over the base table's max_rows_per_page value, and it creates the new table with a max_rows_per_page value of 0. Use sp_chgattribute to set the max_rows_per_page value.
- The select into/bulkcopy/pllsort option must be set to true (by executing sp_dboption) in order to select into a permanent table. You do not have to set the select into/bulkcopy/pllsort option to true in order to select into a temporary table, since the temporary database is never recovered.

  After you have used select into in a database, you must perform a full database dump before you can use the dump transaction command. select into operations log only page allocations and not changes to data rows. Therefore, changes are not recoverable from transaction logs. In this situation, issuing the dump transaction statement produces an error message instructing you to use dump database instead.

By default, the select into/bulkcopy/pllsort option is set to false in newly created databases. To change the default situation, set this option to true in the model database.

- select into can be used with an archive database.
- select into runs more slowly while a dump database is taking place.
- You can use select into to create a duplicate table with no data by having a false condition in the where clause (see Example 12).
- You must provide a column heading for any column in the select list that contains an aggregate function or any expression. The use of any constant, arithmetic or character expression, built-in functions, or concatenation in the select list requires a column heading for the affected item. The column heading must be a valid identifier or must be enclosed in quotation marks (see Examples 7 and 8).
- Datatypes and nullability are implicitly assigned to literal values when select into is used, such as:

  ```
  select x = getdate () into mytable
  ```

  This results in a non-nullable column, regardless of whether allow nulls by default is on or not It depends upon how the select commands are used and with what other commands within the syntax.

  The convert syntax allows you to explicitly specify the datatype and nullability of the resulting column, not the default.

  Wrap getdate with a function that does result in a null, such as:

  ```
  select x = nullif (getdate (), "1/1/1900") into
  mytable
  ```

  Or, use the convert syntax:

  ```
  select x = convert (datetime null, getdate ()) into
  mytable
  ```

- You cannot use select into inside a user-defined transaction or in the same statement as a compute clause.
- To select an IDENTITY column into a result table, include the column name (or the syb_identity keyword) in the select statement's *column_list*. The new column observes the following rules:
  - If an IDENTITY column is selected more than once, it is defined as NOT NULL in the new table. It does not inherit the IDENTITY property.

- If an IDENTITY column is selected as part of an expression, the resulting column does not inherit the IDENTITY property. It is created as NULL if any column in the expression allows nulls; otherwise, it is created as NOT NULL.
- If the select statement contains a group by clause or aggregate function, the resulting column does not inherit the IDENTITY property. Columns that include an aggregate of the IDENTITY column are created NULL; others are NOT NULL.
- An IDENTITY column that is selected into a table with a union or join does not retain the IDENTITY property. If the table contains the union of the IDENTITY column and a NULL column, the new column is defined as NULL. Otherwise, it is defined as NOT NULL.

- You cannot use select into to create a new table with multiple IDENTITY columns. If the select statement includes both an existing IDENTITY column and a new IDENTITY specification of the form *column_name* = identity *(precision)*, the statement fails.
- If CIS is enabled, and if the into table resides on Adaptive Server, Adaptive Server uses bulk copy routines to copy the data into the new table. Before doing a select into with remote tables, set the select into/bulkcopy database option to true.
- For information about the Embedded SQL command select into *host_var_list*, see the *Open Client Embedded SQL Reference Manual*.

Converting the NULL properties of a target column with *select...into*

- Use the convert command to change the nullability of a target column into which you are selecting data. For example, the following selects data from the titles table into a target table named temp_titles, but converts the total_sales column from null to not null:

```
select title, convert (char (100) not null,
total_sales)
total_sales
into #tempsales
from titles
```

Specifying a compression level

- Destination tables you create with select into do not inherit any configuration from the source table. That is, if the table from which you pull data is configured for row-level compression, the table that results from the select into is not configured for compression unless you explicitly state the compression level.

- You can indicate column-, partition-, and table-level compression for the destination table (the compression level of the partition overrides the compression level of the table).
- When you compress the target table, Adaptive Server selects the compression level for columns (if they qualify), regardless of the compression level of the corresponding columns in the source table.
- The select into command can include a list of columns that are not compressed on the target table.
- You cannot encrypt compressed columns on a target table.

Parameter interactions with data compression

- max_rows_per_page applies only to allpages-locked compressed tables; you cannot use it on data-only-locked tables.
- You can use exp_row_size on allpages- and data-only-locked tables with variable-length columns. However, the table must be able to expand updates on the same page without causing page splits on allpages-locked tables or or row forwarding on data-only-locked tables.

  exp_row_size computes space limits identically for compressed and uncompressed tables. However, because compression results in a page with a lot of free space, the space set aside for exp_row_size may cause far fewer rows to fit on the page than would fit on this page if you did not set exp_row_size.

  You cannot use exp_row_size on tables with fixed-length columns, even though Adaptive Server may convert some fixed-length columns to variable-length columns during the compression process.
- fillfactor applies determines the space used on the data pages after compression. This is relevant only when you are creating clustered indexes, an operation which requires a sort of the data pages.

Using *select for update*

- For Adaptive Server 15.7 and later, if the configuration parameter select for update is set to 1, the rows selected by select for update will be exclusively locked provided that the command is executed on a datarows-locked table within a transaction context, or in chained mode. If select for update is run within a cursor context, the cursor open and fetch statements must be within the context of a transaction.
- Rows selected with select for update, within or outside of a cursor context, retain an exclusive lock until the transaction is complete.

- Limitations of select for update:
  - select for update is not valid in a sub-query block.
  - select for update is applicable only when the select returns rows directly from a base table and not from a work table. You cannot use select for update with queries that have aggregates or group by, computed, union, having, or distinct clauses.
  - More rows may qualify for the actual transaction update than with select for update. These rows may appear in the updated set. Prevent such “phantom” rows by using isolation level 3.
  - During select processing, concurrent select for update tasks may attempt to lock the the same set of rows in different order, causing application deadlocks. However, once select for update completes, subsequent updates to the set of rows are not blocked, and encounter no deadlocks.
  - All existing restrictions on updateable cursors apply to select for update both within and outside of the cursor context. The only difference is that with select for update, the order by clause is supported with an updateable cursor. The limitations and restrictions on updateable cursors apply to both language and execute cursors.
  - All tables referenced by select for update must be from the same database.
  - select for update is supported only on tables with datarows locked.

Specifying in-row LOB columns

- By default, LOB columns in the target table inherit the storage property of the corresponding LOB columns in the select list. If the target table’s LOB column is produced as a result of an expression, such as the convert(text, *column*) built-in function, then the column automatically uses off-row storage.

Specifying a lock scheme using *select...into*

- The lock option, used with select...into, allows you to specify the locking scheme for the table created by the command. If you do not specify a locking scheme, the default locking scheme, as set by the configuration parameter lock scheme, is applied.
- When you use the lock option, you can also specify the space management properties max_rows_per_page, exp_row_size, and reservepagegap.

You can change the space management properties for a table created with select into, using sp_chgattribute.

Specifying a partition strategy using *select...into*

- The partitions_clause, when used with select...into, allows you to specify the partition properties of the table created by the command. (See create table for more information.) If you do not specify a partition type, Adaptive Server creates an unpartitioned table. If any row to be inserted does not satisfy the criteria for any partition in the target table, select...into fails.

Using *index*, *prefetch*, and *lru* | *mru*

- The index, prefetch and lru | mru options specify the index, cache and I/O strategies for query execution. These options override the choices made by the Adaptive Server optimizer. Use them with caution, and always check the performance impact with set statistics io on. For more information about using these options, see the *Performance and Tuning Guide*.

Using encrypted columns

- If you use the encrypt clause without specifying a key name, Adaptive Server uses the database default key to encrypt the data in the target column.
- If a column in the source table is encrypted and you do not specify the encrypt clause for the target column, Adaptive Server decrypts the data in the source table and inserts plain text data in the target column.
- If you specify encryption for the target column with the same key used for the source column data, and if the key does not use an initialization vector or random padding, then Adaptive Server copies the data from the source column to the target column as cipher text, without intermediate decryption and reencryption operations.
- If, however, you specify encryption for the target column using a different key from that used for the source column, or if the key uses an initialization vector or padding during encryption, Adaptive Server performs a decryption and encryption operation for each selected row of the encrypted column.

Using *parallel*

- The parallel option reduces the number of worker threads that the Adaptive Server optimizer can use for parallel processing. The *degree_of_parallelism* cannot be greater than the configured max parallel degree. If you specify a value that is greater than the configured max parallel degree, the optimizer ignores the parallel option.

- When multiple worker processes merge their results, the order of rows that Adaptive Server returns may vary from one execution to the next. To get rows from partitioned tables in a consistent order, use an order by clause, or override parallel query execution by using parallel 1 in the from clause of the query.
- A from clause specifying parallel is ignored if any of the following conditions is true:
    - The select statement is used for an update or insert.
    - The from clause is used in the definition of a cursor.
    - parallel is used in the from clause within any inner query blocks of a subquery.
    - The select statement creates a view.
    - The table is the inner table of an outer join.
    - The query specifies min or max on the table and specifies an index.
    - An unpartitioned clustered index is specified or is the only parallel option.
    - The query specifies exists on the table.
    - The value for the configuration parameter max scan parallel degree is 1 and the query specifies an index.
    - A nonclustered index is covered. For information on index covering, see Chapter 9, "How Indexes Work" in the *Performance and Tuning Guide*.
    - The table is a system table or a virtual table.
    - The query is processed using the OR strategy. For an explanation of the OR strategy, see the *Performance and Tuning Guide*.
    - The query returns a large number of rows to the user.

Using *readpast*

- The readpast option allows a select command to access the specified table without being blocked by incompatible locks held by other tasks. readpast queries can only be performed on data-only-locked tables.

- If the readpast option is specified for an allpages-locked table, the readpast option is ignored. The command operates at the isolation level specified for the command or session. If the isolation level is 0, dirty reads are performed, and the command returns values from locked rows and does not block. If the isolation level is 1 or 3, the command blocks when pages with incompatible locks must be read.
- The interactions of session-level isolation levels and readpast on a table in a select command are shown in Table 1-28.

Table 1-28: Effects of session-level isolation levels and readpast

Session isolation level	Effects
0, read uncommitted (dirty reads)	readpast is ignored, and rows containing uncommitted transactions are returned to the user. A warning message is printed.
1, read committed	Rows or pages with incompatible locks are skipped; no locks are held on the rows or pages read Using readpast may produce duplicates and adding the distinct clause does not clear this problem. To resolve this, when using readpast, use a group by clause *in addition to* a distinct clause to avoid duplicates.
2, repeatable read	Rows or pages with incompatible locks are skipped; shared locks are held on all rows or pages that are read until the end of the statement or transaction; holds locks on all pages read by the statement until the transaction completes.
3, serializable	readpast is ignored, and the command executes at level 3. The command blocks on any rows or pages with incompatible locks.

- select commands that specify readpast fail with an error message if they also include any of the following:
  - An at isolation clause, specifying 0 or read uncommitted
  - An at isolation clause, specifying 3 or serializable
  - The holdlock keyword on the same table
- If at isolation 2 or at isolation repeatable read is specified in a select query that specifies readpast, shared locks are held on the readpast tables until the statement or transaction completes.
- If a select command with the readpast option encounters a text column that has an incompatible lock on it, readpast locking retrieves the row, but returns the text column with a value of null. No distinction is made, in this case, between a text column containing a null value and a null value returned because the column is locked.

Expanded *select* * syntax

When the source text of a stored procedure or trigger is stored in the system table syscomments, a query using select * is stored in syscomments expanding the column list referenced in the select *.

For example, a select * from a table containing the columns col1 and col2 is stored as:

```
select <table>.col1, <table>.col2 from <table>
```

In Adaptive Server version 12.5.4, the expanding of the column-list has been enhanced to check whether identifiers (table-names, column-names and so on) comply with the rules for identifiers.

For example, if a table includes the columns col1 and 2col, the second column-name starts with a number, which can only be included by using brackets in the create table statement.

When performing a select * in a stored procedure or trigger from this table, the text in syscomments looks similar to:

```
select <table>.col1, <table>[2col] from <table>
```

For all identifiers used in the text that exands a select *, brackets are added when the identifier does not comply with the rules for identifiers.

You must add brackets around identifiers to make sure Adaptive Server can use the SQL-text while performing an upgrade to a more recent release.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

Transact-SQL extensions include:

- select into to create a new table
- lock clauses
- compute clauses
- Global and local variables
- index clause, prefetch, parallel and lru | mru
- holdlock, noholdlock, and shared keywords
- "*column_heading = column_name*"
- Qualified table and column names
- select in a for browse clause

- The use, within the select list, of columns that are not in the group by list and have no aggregate functions
- at isolation repeatable read | 2 option

Permissions

select permission defaults to the owner of the table or view, who can transfer it to other users.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
62	select	select from a table	• *Roles* – current active roles • *Keywords or options* – select, select into, or readtext • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect
63	select	select from a view	• *Roles* – current active roles • *Keywords or options* – select, select into, or readtext • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands compute clause, create index, create trigger, delete, group by and having clauses, insert, order by clause, set, union operator, update, where clause

Functions avg, count, isnull, max, min, sum

System procedures sp_cachestrategy, sp_chgattribute, sp_dboption

set

Description

Sets Adaptive Server query-processing options for the duration of the user's work session; sets some options inside a trigger or stored procedure.

Syntax

set advanced_aggregation on/off

set *@variable* = *expression* [, *@variable* = *expression*...]

set ansinull {on | off}

set ansi_permissions {on | off}

set arithabort [arith_overflow | numeric_truncation] {on | off}

set arithignore [arith_overflow] {on | off}

set bulk array size *number*

set bulk batch size *number*

set builtin_date_strings *number*

set {chained, close on endtran, nocount, noexec, parseonly,
self_recursion, showplan, sort_resources} {on | off}

set char_convert {off | on [with {error | no_error}] |
charset [with {error | no_error}]}

set cis_rpc_handling {on | off}

set [clientname *client_name* | clienthostname *host_name*
| clientapplname *application_name*]

set compression {on | off | default}

set cursor rows *number* for *cursor_name*

set {datefirst *number*, dateformat *format*, language *language*}

set delayed_commit {on | off | default}

set deferred_name_resolution { on | off }

set dml_logging {minimal | default}

set encryption passwd '*password_phrase*'
for {key | column} {*keyname* | *column_name*}

set export_options [on | off]

set fipsflagger {on | off}

set flushmessage {on | off}

set fmtonly {on | off}

set forceplan {on | off}

set identity_insert [*database*.[*owner*.]]*table_name* {on | off}

set identity_update *table_name* {on | off}

set index_union on | off

set literal_autoparam on | off

set lock {wait [*numsecs*] | nowait}

set metrics_capture on | off

set offsets {select, from, order, compute, table,
procedure, statement, param, execute} {on | off}

set option *show*

set opttimeoutlimit

set parallel_degree *number*

set plan {dump | load} [*group_name*] {on | off}

set plan exists check {on | off}

set plan for *show*

set plan optgoal {allrows_mix | allrows_dss}

set plan opttimeoutlimit *number*

set plan replace {on | off}

set prefetch [on|off]

set print_minlogged_mode_override

set proc_output_params {on | off}

set proc_return_status {on | off}

set process_limit_action {abort | quiet | warning}

set proxy *login_name*

set quoted_identifier {on | off}

set repartition_degree *number*

set repthreshold *number*

set resource_granularity *number*

set role {"sa_role" | "sso_role" | "oper_role" |
role_name [with passwd "*password*"]} {on | off}

set {rowcount *number*, textsize *number*}

set scan_parallel_degree *number*

set send_locator {on | off }

set session authorization *login_name*

set switch [serverwide] {on | off} *trace_flag* ,[*trace_flag*,] [with *option* [, *option*]

set show_exec_info [“on” | “off”]

set show_sqltext {on | off}

set show_transformed_sql, {on|off}

set statement_cache on | off

set statistics {io, subquerycache, time, plancost} {on | off}

set statistics simulate {on | off}

set strict_dtm_enforcement {on | off}

set string_rtruncation {on | off}

set system_view {instance | cluster | clear}

set textsize {*number*}

set tracefile [*filename*] [off] [for *spid*]

set transaction isolation level {
    [read uncommitted | 0] |
    [read committed | 1] |
    [repeatable read | 2] |
    [serializable | 3]}

set transactional_rpc {on | off}

Parameters

set advanced_aggregation
enables and disables advanced aggregation at the session level.

set @*variable* = *expression*
allows multiple variable assignments in one statement. The set @*variable* = *expression* command is an identical—and an alternative—command to select @*variable* = *expression* in Transact-SQL.

expression includes constant, function, any combination of constants, and functions connected by arithmetic or bitwise operators, or a subquery.

set ansinull {on | off}
impacts on both aggregate and comparison behaviors. See “Aggregate behavior” on page 665 for more information on aggregate and comparison behaviors.

set ansi_permissions {on | off}
determines whether ANSI SQL permission requirements for delete and update statements are checked. The default is off. Table 1-29 summarizes permission requirements:

Table 1-29: Permissions required for update and delete

	Permissions required with set ansi_permissions:	
Command	**Off**	**On**
update	• update permission on columns where values are being set	• update permission on columns where values are being set • select permission on all columns appearing in where clause • select permission on all columns on right side of set clause
delete	• delete permission on table	• delete permission on table • select permission on all columns appearing in where clause

set arithabort [arith_overflow | numeric_truncation] {on | off}

determines how Adaptive Server behaves when an arithmetic error occurs. The two arithabort options, arithabort arith_overflow and arithabort numeric_truncation, handle different types of arithmetic errors. You can set each option independently or set both options with a single set arithabort on or set arithabort off statement.

- arithabort arith_overflow – specifies the Adaptive Server behavior following a divide-by-zero error, range overflow during an explicit or implicit datatype converson, or a domain error. This type of error is serious. The default setting, arithabort arith_overflow on, rolls back the entire transaction in which the error occurs. If the error occurs in a batch that does not contain a transaction, arithabort arith_overflow on does not roll back earlier commands in the batch; however, Adaptive Server does not execute any statements in the batch that follow the error-generating statement.

  Setting arith_overflow to on refers to the execution time, not to the level of normalization to which Adaptive Server is set.

  If you set arithabort arith_overflow off, Adaptive Server aborts the statement that causes the error, but continues to process other statements in the transaction or batch.

- arithabort numeric_truncation – specifies the Adaptive Server behavior following a loss of scale by an exact numeric type during an implicit datatype conversion. (When an explicit conversion results in a loss of scale, the results are truncated without warning.) The default setting, arithabort numeric_truncation on, aborts the statement that causes the error, but Adaptive Server continues to process other statements in the transaction or batch. If you set arithabort numeric_truncation off, Adaptive Server truncates the query results and continues processing.

set arithignore [arith_overflow] {on | off}

determines whether Adaptive Server displays a message after a divide-by-zero error or a loss of precision. By default, the arithignore option is set to off. This causes Adaptive Server to display a warning message after any query that results in numeric overflow. To have Adaptive Server ignore overflow errors, use set arithignore on. You can omit the optional arith_overflow keyword without any effect.

set bulk array size *number*

establishes the number of rows that are buffered in local server memory before being transferred using the bulk copy interface.

Use this option only with CIS for transferring rows to a remote server using select into.

View your current setting using the *@@bulkarraysize* global variable.

number – indicates the number of rows to buffer. If the rows being transferred contain text, unitext , image or java ADTs, then the bulk copy interface ignores the current setting for array size and uses a value of 1. Also, the array size actually used will never exceed the value of *@@bulkbatchzise*. If *@@bulkbatchsize* is smaller than array size, then the smaller value is used.

The initial value of the array size is inherited by new connections from the current setting of the configuration property cis bulk insert array size, which defaults to 50. Setting this value to 0 will reset the value to the default.

set bulk batch size *number*

establishes the number of rows transferred to a remote server via select into *proxy_table* when the bulk interface is used. The bulk interface is available to all Adaptive Servers, as well as DirectConnect for Oracle version 12.5.1.

Use this option only with CIS for transferring rows to a remote server using select into.

View your current setting using the *@@bulkbatchsize* global variable.

The bulk interface allows a commit after a specified number of rows. This allows the remote server to free any log space being consumed by the bulk transfer operation, and enables the transfer of large data sets from one server to another without filling the transaction log.

The initial value of the batch size is inherited by new connections from the current setting of the configuration property cis bulk insert batch size, which by default is 0. A value of 0 indicates that no rows should be committed until after the last row is transferred.

set builtin_date_strings *number*

If a string is given as an argument in place of the chronological value the server interprets it as a datetime value regardless of its apparent precision. This is the default behavior and indicated by a builtin_date_strings value of 0.

Changing the builtin_date_strings value to 1 makes the server interpret the argument strings as bigdatetimes. This will affect the result of chronological builtins.

set {chained, close on endtran, nocount, noexec, parseonly, self_recursion, showplan, sort_resources} {on | off}

- chained – begins a transaction just before the first data retrieval or data modification statement at the beginning of a session and after a transaction ends. In chained mode, Adaptive Server implicitly executes a begin transaction command before the following statements: delete, fetch, insert, lock table, open, select, and update. You cannot execute set chained within a transaction.

- close on endtran – causes Adaptive Server to close all cursors opened within a transaction at the end of that transaction. A transaction ends by the use of either the commit or rollback statement. However, only cursors declared within the scope that sets this option (stored procedure, trigger, and so on) are affected. For more information about cursor scopes, see the *Transact-SQL User's Guide*.

  For more information about the evaluated configuration, see the *System Administration Guide*.

- nocount – controls the display of rows affected by a statement. set nocount on disables the display of rows; set nocount off reenables the count of rows.

- noexec – compiles each query but does not execute it. noexec is often used with showplan. After you set noexec on, no subsequent commands are executed (including other set commands) until you set noexec off.

- parseonly – checks the syntax of each query and returns any error messages without compiling or executing the query. Do not use parseonly inside a stored procedure or trigger.

- self_recursion – determines whether Adaptive Server allows triggers to cause themselves to fire again(this is called **self recursion**). By default, Adaptive Server does not allow self recursion in triggers. You can turn this option on only for the duration of a current client session; its effect is limited by the scope of the trigger that sets it. For example, if the trigger that sets self_recursion on returns or causes another trigger to fire, this option reverts to off. This option works only within a trigger and has no effect on user sessions.

- showplan – generates a description of the processing plan for the query. The results of showplan are of use in performance diagnostics. showplan does not print results when it is used inside a stored procedure or trigger. For parallel queries, showplan output also includes the adjusted query plan at runtime, if applicable. See the *Performance and Tuning Guide*.

- sort_resources – generates a description of the sorting plan for a create index statement. The results of sort_resources are of use in determining whether a sort operation is done serially or in parallel. When sort_resouces is on, Adaptive Server prints the sorting plan but does not execute the create index statement. See Chapter 24, “Parallel Sorting,” in the *Performance and Tuning Guide*.

set char_convert {off | on [with {error | no_error}] | *charset* [with {error | no_error}]}
enables or disables character set conversion between Adaptive Server and a client. If the client is using Open Client DB-Library release 4.6 or later, and the client and server use different character sets, conversion is turned on during the login process and is set to a default based on the character set the client is using. You can also use set char_convert *charset* to start conversion between the server character set and a different client character set.

charset can be either the character set’s ID or a name from syscharsets with a type value of less than 2000.

set char_convert off turns conversion off so that characters are sent and received unchanged. set char_convert on turns conversion on if it is turned off. If character set conversion was not turned on during the login process or by the set char_convert command, set char_convert on generates an error message.

If you request character set conversion with set char_convert *charset*, and Adaptive Server cannot perform the requested conversion, the conversion state remains the same as it was before the request. For example, if conversion is set to off prior to the set char_convert *charset* command, conversion remains turned off if the request fails.

When the with no_error option is included, Adaptive Server does not notify an application when characters from Adaptive Server cannot be converted to the client’s character set. Error reporting is initially turned on when a client connects with Adaptive Server: if you do not want error reporting, you must turn it off for each session with set char_convert {on | charset} with no_error. To turn error reporting back on within a session, use set char_convert {on | charset} with error.

Whether or not error reporting is turned on, the bytes that cannot be converted are replaced with ASCII question marks (?).

See the *System Administration Guide* for a more complete discussion of error handling in character set conversion.

set cis_rpc_handling {on | off}
makes CIS the remote procedure call (RPC) handling mechanism the default mechanism for Shared Disk Cluster (SDC) handling

set [clientname *client_name* | clienthostname *host_name* | clientapplname *application_name*]
assigns names to the client.

- clientname *client_name* – assigns a client an individual name. This is useful for differentiating among clients in a system where many clients connect to Adaptive Server using the same client name. After you assign a new name to a user, they appear in thesysprocesses table under the new name.

  client_name is the new name you assign to the user.

- clienthostname *host_name* – assigns a host an individual name. This is useful for differentiating among clients in a system where many clients connect to Adaptive Server using the same host name. After you assign a new name to a host, it appears in the sysprocesses table under the new name.

  host_name is the new name you assign to the host.

- clientapplname *application_name* – assigns an application an individual name. This is useful for differentiating among clients in a system where many clients connect to Adaptive Server using the same application name. After you assign a new name to an application, it appears in the sysprocesses table under the new name.

  application_name is the new name you assign to the application.

set compression {on | off | default}

enables or disables compression for the session:

- on – enables data compression on new data for tables and partitions on which compression is configured. Adaptive Server compresses all rows that qualify.
- off – inserts and updates all new data as uncompressed. Inserts that trigger a page compression ignore the uncompressed rows. Updated rows remain uncompressed. Uncompressed rows that are compressed during an update (rows inserted as uncompressed remain uncompressed until explicitly compressed).
- default – resets the compression level to the default setting (inserts and updates are compressed according to the table or partition setting).

Note Unlike most set parameters, if you execute set export_options before issuing set compression in a nested procedure, Adaptive Server does not export the compression level to the parent procedure's context.

set cursor rows *number* for *cursor_name*

causes Adaptive Server to return the *number* of rows for each cursor fetch request from a client application. The *number* can be a numeric literal with no decimal point or a local variable of type integer. If the *number* is less than or equal to zero, the value is set to 1. You can set the cursor rows option for a cursor, whether it is open or closed. However, this option does not affect a fetch request containing an into clause. *cursor_name* specifies the cursor for which to set the number of rows returned.

set {datefirst *number*, dateformat *format*, language *language*}
specifies the following settings:

- datefirst *number* – uses numeric settings to specify the first day of the week. The us_english language default is Sunday. To set the first day of the week, use the following:

To set the first day of the week as	Use this setting
Monday	1
Tuesday	2
Wednesday	3
Thursday	4
Friday	5
Saturday	6
Sunday (us_english language default)	7

Note Regardless of which day you set as the first day of the week, the value of that first day becomes 1. This value is not the same as the numeric setting you use in set datefirst *n*. For example, if you set Sunday as your first day of the week, its value is 1. If you set Monday as your first day of the week, Monday's value becomes 1. If you set Wednesday as your first day of the week, Wednesday's value becomes 1, and so on.

- dateformat *format* – sets the order of the date parts *month*/*day*/*year* for entering datetime, smalldatetime, date or time data. Valid arguments are *mdy*, *dmy*, *ymd*, *ydm*, *myd*, and *dym*. The us_english language default is *mdy*.
- language *language* – is the official name of the language that displays system messages. The language must be installed on Adaptive Server. The default is us_english.

set deferred_name_resolution
sets deferred name resolution on for the current session only.

set delayed_commit {on | off | default}

determines when log records are written to disk. With the delayed_commit parameter set to true, the log records are asynchronously written to the disk and control is returned to the client without waiting for the IO to complete.

The session-level setting overrides any existing the database-level setting. Change delayed_commit to its default to revert back to the database-level setting.

Note Use delayed_commit only after careful consideration of your application.

---

set dml_logging

determines the amount of logging for insert, update, and delete (DML) operations. Valid values are:

- minimal – Adaptive Server attempts to log no changes for the DML statements. In most cases, Adaptive Server generates little or no logging to syslogs.
- default – Adaptive Server disables session-specific minimal logging and uses the logging mode you enabled for individual tables based on table-specific and database-wide logging levels.

set encryption passwd '*password_phrase*'
for {key | column} {*keyname* | *column_name*}

creates the encryption key's password to encrypt or decrypt data on an insert, update, delete, select, alter table, or select into statement.

- *password_phrase* – is the explicit password specified with the create encryption key or alter encryption key command to protect the key.
- key – indicates that Adaptive Server uses this password to decrypt the key when accessing any column encrypted by the named key
- *keyname* – may be supplied as a fully qualified name. For example:

  [[*database*.][*owner*].]*keyname*
- column – specifies that Adaptive Server use this password only in the context of encrypting or decrypting the named column. End users do not necessarily know the name of the key that encrypts a given column.
- *column_name* – name of the column on which you are setting an encryption password. Supply *column_name* as:

  [[*database*.][*owner*].]*table_name*.*column_name* set export_options [on | off]

Adaptive Server's default behavior is to reset any set parameter changes that are set by a trigger or system procedure after they finish running. Enabling set export_options allows you to retain the session settings that are set by a system procedure or trigger for the duration of the session.

For example, this enables set export_options:

```
set export_options on
```

This disables set export_options and returns Adaptive Server to the default behavior:

```
set export_options off
```

set fipsflagger {on | off}

determines whether Adaptive Server displays a warning message when Transact-SQL extensions to entry-level ANSI SQL are used. By default, Adaptive Server does not tell you when you use nonstandard SQL. This option does not disable SQL extensions. Processing completes when you issue the non-ANSI SQL command.

set flushmessage {on | off}

determines when Adaptive Server returns messages to the user. By default, messages are stored in a buffer until the query that generated them is completed or the buffer is filled to capacity. Use set flushmessage on to return messages to the user immediately, as they are generated.

set fmtonly {on | off}

captures plans in stored procedures without actually executing them.

set forceplan {on | off}

causes the query optimizer to use the order of the tables in the from clause of a query as the join order for the query plan. forceplan is generally used when the optimizer fails to choose a good plan. Forcing an incorrect plan can have severely bad effects on I/O and performance. See the *Performance and Tuning Guide*.

Note The query optimizer ignores attempts to force illegal join orders with outer joins, such as in the following:

```
1> set forceplan on
2> select * from table1, table2
    where table2.id *= table1.id
```

---

set identity_insert [*database*.[*owner*.]]*table_name* {on | off}

determines whether explicit inserts into a table's IDENTITY column are allowed. (Updates to an IDENTITY column are never allowed.) This option can be used only with base tables. It cannot be used with views or set within a trigger.

After setting identity_insert on for the table, the table owner, database owner, or system administrator can manually insert any legal value greater than 5. For example, inserting a value of 55 would create a large gap in IDENTITY column values:

```
insert stores_cal
 (syb_identity, stor_id, stor_name)
values (55, "5025", "Good Reads")
select syb_identity from stores_cal
id_col
-------
      1
      5
     55
```

```
(3 rows affected)
```

If identity_insert is then set to off, Adaptive Server assigns an IDENTITY column value of 55 + 1, or 56, for the next insertion. If the transaction that contains the insert statement is rolled back, Adaptive Server discards the value 56 and uses a value of 57 for the next insertion.

Unless you have created a unique index on the IDENTITY column, Adaptive Server does not verify the uniqueness of the inserted value; you can insert any positive integer.

The table owner, database owner, or system administrator can use the set identity_insert *table_name* on command on a table with an IDENTITY column to enable the manual insertion of a value into an IDENTITY column. However, only the following users can actually insert a value into an IDENTITY column, when identity_insert is on:

- Table owner
- Database owner:
  - If granted explicit insert permission on the column by the table owner
  - Impersonating the table owner by using the setuser command

Setting identity_insert *table_name* off restores the default behavior by prohibiting explicit inserts to IDENTITY columns. At any time, you can use set identity_insert *table_name* on for a single database table within a session.

set identity_update *table_name* {on | off}

With set identity_update on, you can explicitly update the value of the IDENTITY column on a table. identity_update changes the identity column value for the qualified rows. When identity_update is enabled, you can update the identity value to any value greater than 0. However, if the input value is greater than the identity burn max value, a new set of ID values is allocated, and the identity burn max value on the OAM page is updated accordingly. If update is included in a transaction, the new identity burn max value cannot be rolled back. You can use syb_identity to point to the identity column for update. For example:

```
update table_name set syb_identity = value
where clause
```

Adaptive Server does not check for duplicates entries or verify that entries are unique. You can update an existing value to any positive integer within the range allowed by the column's declared precision. You can check for duplicate entries by creating a unique index on the identity column set index_union on | off

when enabled, sets limits the scan of a table with an or clause.

Index unions (also known as an or strategy) are used for queries that contain or clauses. For example:

```
select * from titleauthor where au_id = "409-56-7008" or title_id = "PC8888"
```

If index_union is:

- Enabled – this example uses an index on au_id to find the row IDs (RIDs) of all titleauthor tuples with `au_id = "409-56-7008"`, and uses an index on title_id to find the RIDs of all titleauthor tuples with `title_id = "PC8888"`. Adaptive Server then performs a union on all RIDs to eliminate duplicates. The resulting RIDs are joined with a RidJoin to access the data tuples.
- Disabled – Adaptive Server does not use an index union strategy in a query to limit the table scan. Instead, it uses other access paths on the table (in the example above, it would use a table scan for table titleauthor), and applies the or clause as a filter in the scan operator.

set literal_autoparam on | off

is on by default. If the server-level setting for literal_autoparam is on, this option enables and disables use of that feature. If the server level setting is off, this setting has no effect.

set lock {wait [*numsecs*] | nowait}

specifies the settings for a lock.

- wait – specifies the length of time that a command waits to acquire locks before aborting and returning an error.
- *numsecs* – specifies the number of seconds a command is to wait to acquire a lock. Valid values are from 0 to 2147483647, the maximum value for an integer.
- lock nowait – specifies that if a command cannot acquire a lock immediately, it returns an error and fails. set lock nowait is equivalent to set lock wait 0.

set metrics_capture {on | off}

enables the capture of QP metrics at the session level, set the capture to “on”. Query processing (QP) metrics identify and compare empirical metric values in query execution. When a query is executed, it is associated with a set of defined metrics that are the basis for comparison in QP metrics.

set offsets {select, from, order, compute, table, procedure, statement, param, execute} {on | off}

returns the position of specified keywords (with relation to the beginning of the query) in Transact-SQL statements. The keyword list is a comma-separated list that can include any of the following Transact-SQL constructs: select, from, order, compute, table, procedure, statement, param, and execute. Adaptive Server returns offsets if there are no errors.

This option is used in Open Client DB-Library only.

set option *show_option* {normal | brief | long | on | off}

generates diagnostics output in text format.

The valid values for *show_option* are:

- show – shows the basic syntax common to all modules
- show_lop – shows the logical operators (scans, joins, etc.) used
- show_managers – shows data structure managers used during optimization.
- show_log_props – shows the logical properties (row count, selectivity, etc.) evaluated.
- show_parallel – shows details of parallel query optimization
- show_histograms – shows the processing of histograms associated with SARG/Join columns
- show_abstract_plan – shows the details of an abstract plan
- show_search_engine – shows the details of the join ordering algorithm
- show_counters – shows the optimization counters
- show_best_plan – shows the details of the best query plan selected by the optimizer
- show_pio_costing – shows estimates of physical input/output (reads/writes from/to the disk)
- show_lio_costing – shows estimates of logical input/output (reads/writes from/to memory)
- show_elimination – shows partition elimination
- show_missing_stats – shows details of useful statistics missing from SARG/Join columns

See Chapter 4, “Displaying Query Optimization Strategies And Estimates,” in *Query Optimizer* for more information.

set opttimeoutlimit

sets the timeout limit for the optimizer. The valid range of values for opttimeoutlimit 0 to 4000 ms, with 0 indicating no optimization limit.

set parallel_degree *number*

specifies an upper limit for the number of worker processes used in the parallel execution of a query. This number must be less than or equal to the number of worker processes per query, as set by the max parallel degree configuration parameter. The *@@parallel_degree* global variable stores the current setting.

set plan {dump | load} [*group_name*] {on | off}

introduces an abstract plan command.

- dump – enables or disables capturing abstract plans for the current connection. If a *group_name* is not specified, the plans are stored in the default group, ap_stdout.
- load – enables or disables loading abstract plans for the current connection. If a *group_name* is not specified, the plans are loaded from the default group, ap_stdin.
- *group_name* – is the name of the abstract plan group to use for loading or storing plans.

See Chapter 30, “Creating and Using Abstract Plans,” in the *Performance and Tuning Guide*.

set plan exists check {on | off}

when used with set plan load, stores hash keys for up to 20 queries from an abstract plan group in a per-user cache.

set plan for *show*

generates an XML document for the diagnostic output. The valid values for *show* are:

- show_exec_xml – gets the compiled plan output in XML, showing each of the query plan operators.
- show_execio_xml – gets the plan output along with estimated and actual IOs. This also includes the query text.
- show_opt_xml – gets optimizer diagnostic output, which shows all of the different components like logical operators, output from the managers, some of the search engine diagnostics, and the best query plan.
- show_lop_xml – gets the output logical operator tree in XML.
- show_managers_xml – shows the output of the different component managers during the preparation phase of the query optimizer.
- show_log_props_xml – shows the logical properties for a given equivalence class (one or more group of relations in the query).
- show_parallel_xml – shows the diagnostics related to the optimizer while generating parallel query plans.
- show_histograms_xml – shows diagnostics related to histograms and the merging of histograms.
- show_abstract_plan_xml – shows the AP generation/application.
- show_search_engine_xml – shows the search engine related diagnostics.
- show_counters_xml – shows plan object construction/destruction counters.
- show_best_plan_xml – shows the best plan in XML.
- show_pio_costing_xml – shows actual PIO costing in XML.
- show_lio_costing_xml – shows actual LIO costing in XML.
- show_elimination_xml – shows partition elimination in XML.
- client – when specified, output goes to the client.
- message – when specified, output goes to an internal message buffer.

See Chapter 4, “Displaying Query Optimization Strategies And Estimates,” in *Query Processor* for more information.

set plan optgoal {allrows_mix | allrows_dss}
sets the optimization goal.

- allrows_mix – is the default optmization goal, and the most useful goal in a mixed-query environment. It balances the needs of OLTP and DSS query environments.
- allrows_dss – is the most useful goal for operational DSS queries of medium to high complexity. Currently, this goal is provided on an experimental basis.

See Chapter 1, “Understanding Query Processing in Adaptive Server” in *Query Processor* for more information about optimization plans.

set plan opttimeoutlimit *number*
sets the timeout at the session level, where *n* is any integer between 0 and 1000. See Chapter 1, “Understanding Query Processing in Adaptive Server” in *Query Processor* for more information about optimization plans.

set plan replace {on | off}
enables or disables replacing existing abstract plans during plan capture mode. By default, plan replacement is off.

set prefetch {on | off}
enables or disables large I/Os to the data cache.

set print_minlogged_mode_override
generates trace information to session output, reporting on the statement for which the minimally logged mode of a table was overridden by some other rules, such as presence of referential integrity constraints, deferred mode choice, name of the table affected and a description of the affecting rules, and so on.

set proc_output_params {on | off}
controls sending of output parameters that a stored procedure generates back to the client. set proc_output_params off suppresses sending the output parameters back to the client. The default for this parameter is on.

set proc_return_status {on | off}

controls sending of a return status TDS token back to the client. set proc_return_status off suppresses sending the return status token to the client, and isql client does not display the `(return status = 0)` message. The default for this parameter is on.

Warning! If the client application that executes a procedure relies on the success or failure of the procedure based on the return status, then do not use the set proc_return_status off option.

---

set process_limit_action {abort | quiet | warning}

specifies whether Adaptive Server executes parallel queries when an insufficient number of worker processes is available. Under these circumstances, if:

- process_limit_action is set to quiet, Adaptive Server silently adjusts the plan to use a degree of parallelism that does not exceed the number of available processes.
- process_limit_action is set to warning when an insufficient number of worker processes are available, Adaptive Server issues a warning message when adjusting the plan
- process_limit_action is set to abort, Adaptive Server aborts the query and issues an explanatory message an insufficient number of worker processes are available.

set proxy *login_name*

allows you to assume the permissions, login name, and suid (server user ID) of *login_name*. For *login_name*, specify a valid login from master..syslogins, enclosed in quotation marks. To revert to your original login name and suid, use set proxy with your original *login_name*.

Note Without explicit permission, neither the "sa_role" nor the "sso_role" can issue the set proxy login_name command. To use set proxy login_name, any user, including the system security officer, must have permission explicitly granted by the system security officer.

See "Using proxies" on page 670 for more information.

set quoted_identifier {on | off}
determines whether Adaptive Server recognizes delimited identifiers within double quotation marks. By default, quoted_identifier is off and all identifiers must either:

- Conform to the rules for valid identifiers.
- Be enclosed in brackets.

If you use set quoted_identifier on, double quotation marks behave the way brackets do, and you can use table, view, and column names that begin with a nonalphabetic character, including characters that would not otherwise be allowed, or are reserved words, by enclosing the identifiers within double quotation marks. Delimited identifiers cannot exceed 28 bytes, may not be recognized by all front-end products, and may produce unexpected results when used as parameters to system procedures.

When quoted_identifier is on, all character strings enclosed within double quotes are treated as identifiers. Use single quotes around character or binary strings.

set repartition_degree *number*
is the maximum degree to which any intermediate data stream is re-partitioned for semantic purposes. See Chapter 2, “Parallel Query Processing” in *Query Processor* for more information about setting the value of max repartition degree for a session.

set repthreshold *number*
sets the SQL replication threshold at the session level. If set repthreshold is invoked in a stored procedure, its scope is that of the procedure. If it is invoked in a user session, its scope is that of the session.

A user can alter the scope of the threshold and set the session threshold using a login trigger, in which case you need not explicitly set the session threshold at login.

For example,

```
create proc myproc
as
    set repthreshold 777
---------------------

alter login sa modify login script 'myproc'
----------------------
option changed.
```

```
(Return status = 0
```

The procedure ’myproc’ is invoked each time the user sa logs in, and ensures that the replication threshold is set at 777 for the whole session.

Another way to alter the scope of the threshold is to use set export_options:

```
create proc p2
as
    set repthreshold222
    set export_options on
---------------------------
```

After p2 is executed the threshold remains set at 222.The hierarchy of thresholds is:

```
Session > Table > Database
```

When you set the session threshold to 0, the only replication thresholds that still matter are table and database thresholds, if they have been specified, in that order. If you set no threshold, the threshold defaults to 50 rows.

To set the table level threshold, see sp_setrepdbmode; to set the database level threshold, see sp_setrepdefmode, both in the *Reference Manual: Procedures*.

The session threshold is exportable; a stored procedure can set the threshold and turn the export options setting ON. Adaptive Server enforces the new threshold in the invoking procedure or session.

set resource_granularity *number*
overrides the global value max resource granularity and sets it to a session specific value, which influences whether Adaptive Server uses memory-intensive operation or not. See Chapter 2, “Parallel Query Processing” in *Query Processor* for more information.

set role {"sa_role" | "sso_role" | "oper_role" | *role_name* [with passwd "*password*"]} {on | off}

turns the specified role on or off during the current session. When you log in, all system roles that have been granted to you are turned on.

Use set role *role_name* off to turn a role off, and set role *role_name* on to turn it back on again, as needed.

- "sa_role" | "sso_role" | "oper_role" are system roles. If you are not a user in the current database, and if there is no "guest" user, you cannot set sa_role off, because there is no server user ID for you to assume.
- *role_name* – is the name of any user-defined role created by the system security officer. User-defined roles are not turned on by default. To set user-defined roles to activate at login, the user or the system security officer must use set role on.
- with *passwd* – specifies the password to activate the role. If a user-defined role has an attached password, you must specify the password to activate the role.

set {rowcount *number*, textsize *number*}

causes Adaptive Server to stop processing the query (select, insert, update, or delete) after the specified number of rows are affected. The *number* can be a numeric literal with no decimal point or a local variable of type integer. To turn this option off, use:

```
set rowcount 0
```

You can determine the current value for set rowcount with the *@@setrowcount* global variable. For example:

```
select @@setrowcount

-----------
         37
```

set scan_parallel_degree *number*

specifies the maximum session-specific degree of parallelism for hash-based scans (parallel index scans and parallel table scans on nonpartitioned tables). This number must be less than or equal to the current value of the max scan parallel degree configuration parameter. The *@@scan_parallel_degree* global variable stores the current setting.

set send_locator {on | off }

specifies whether Adaptive Server sends the LOB or the locator that references the LOB in a result set sent to the client. When the option is off (the default), Adaptive Server sends the LOB.

set session authorization *login_name*

is identical to set proxy, with this exception: set session authorization follows the SQL standard, while set proxy is a Transact-SQL extension.

set show_exec_info

generates additional information when a command executes.

- on – generates extra diagnostics about the logging mode for a DML statement. Displays the selected logging mode for the current statement and session, and the user executing the DML.
- off – disables show_exec_info.

set show_sqltxt {on | off}

allows you to print the SQL text for ad-hoc queries, stored procedures, cursors, and dynamic prepared statements.

You do not need to enable the set show_sqltext before you execute the query (as you do with commands like set showplan on) to collect diagnostic information for a SQL session. Instead you can enable it while the commands are running to help determine which query is performing poorly and diagnose their problems.

Before you enable show_sqltext, you must first enable dbcc traceon to display the output to standard out:

```
dbcc traceon(3604)
```

The syntax for set show_sqltext is:

set show_sqltext {on | off}

For example, this enables show_sqltext:

```
set show_sqltext on
```

Once set show_sqltext is enabled, Adaptive Server prints all SQL text to standard out for each command or system procedure you enter. Depending on the command or system procedure you run, this output can be extensive.

To disable show_sqltext, enter:

```
set show_sqltext off
```

set statement_cache on | off

is on by default. If the server-level setting for statement_cache is on, this option enables and disables use of that feature. If the server level setting is off, this setting has no effect.

set statistics {io, subquerycache, time, plancost, simulate} {on | off}
displays various types of statistics information

- io – displays statistics for each table referenced in the statement:
  - The number of times the table is accessed (scan count)
  - The number of logical reads (pages accessed in memory)
  - The number of physical reads (database device accesses)

  For each command, statistics io displays the number of buffers written.

  If Adaptive Server has been configured to enforce resource limits, statistics io also displays the total I/O cost.
- subquerycache – displays the number of cache hits, misses, and the number of rows in the subquery cache for each subquery.
- time – displays the amount of time Adaptive Server used to parse and compile for each command. For each step of the command, statistics time displays the amount of time Adaptive Server used to execute the command. Times are given in milliseconds and timeticks, the exact value of which is machine-dependent.
- plancost – displays the query statistics in a tree format.

Note When you enable set statistics plancost, Adaptive Server abbreviates the names for `lio`, `pio`, and `row` to `l`, `p`, and `r`, respectively.

- simulate – specifies that the optimizer should use simulated statistics to optimize the query.

See Chapter 34, “Using the set statistics Commands” in the *Performance and Tuning Guide*.

set strict_dtm_enforcement {on | off}
determines whether the server propagates transactions to servers that do not support Adaptive Server transaction coordination services. The default value is inherited from the value of the strict dtm enforcement configuration parameter.

set string_rtruncation {on | off}

determines whether Adaptive Server raises a SQLSTATE exception when an insert or update command truncates a char, unichar, varchar or univarchar string. If the truncated characters consist only of spaces, no exception is raised. The default setting, off, does not raise the SQLSTATE exception, and the character string is silently truncated.

set system_view {instance | cluster | clear}

(clusters only) specifies the system view for a session, and controls the materialization of fake tables, which impact the output of stored procedures such as sp_who.

- instance – sets the system view for the current instance.
- cluster – sets the system view for the cluster.
- clear – clears any session-level setting, reverting to the system_view setting for the logical cluster hosting that spid. Enter `select @@system_view` to check the current value.

set switch [serverwide] {on | off} *trace_flag*[,*trace_flag*] [,with *option* [, *option*]>

allows you to set trace flags and switch names locally and server-wide.

- serverwide – optional and will set a switch serverwide ON or OFF. The default is session-specific.
- on – trace flags are switched on.
- off – trace flags are switched off.
- *trace_flag* – a sequence of numbers (the old traceflag numbers) and/or switch names.
- *option* – an optional sequence of switch options. Valid values are:
  - override – this option is necessary to enable a non-documented switch names or trace flags
  - no_info – this option is used to surpress any informational warnings

set textsize [*number*]

specifies the maximum size in bytes of text, unitext, or image type data that is returned with a select statement. The *@@textsize* global variable stores the current setting.

The default setting is 32K in isql. Some client software sets other default values. To reset textsize to the default size (32K), use:

```
set textsize 0
```

set tracefile [*filename*] [off] [for *spid*]

once enabled, saves all SQL text for the current session to the specified file, each SQL text batch appending to the previous batch.

The syntax to enable tracing is:

set tracefile *file_name* [off] [for *spid*

The syntax to disable tracing is:

set tracefile off [for *spid*]

Where:

- *file_name* – is the full path to the file in which you are saving the SQL text. If you do not specify a directory path, Adaptive Server creates the file in *$SYBASE*.

Note If *file_name* contains special characters (":", "/", and so on) other than numbers and letters, you must include *file_name* in quotes. For example, this *file_name* must be in quotes because of the "/" for the directory structure:

```
set tracefile '/tmp/mytracefile.txt' for 25
```

If *file_name* does not contain special characters and you want to save it to *$SYBASE*, it does not require quotes. For example, this *file_name* does not need to be in quotes:

```
set tracefile mytracefile.txt
```

- off – disables the tracing for this session or spid.
- *spid* – server process ID whose SQL text you want saved to a trace file. Only the users with the SA or systems security officer role can enable tracing for other spids. You cannot save the SQL text for system tasks (such as the housekeeper or the port manager).

Note After you use set tracefile for a particular session, the diagnostic output of all successive set commands or DBCC traces are then redirected to a tracefile.

Make sure to switch off all the diagnostic commands you turned on before issuing set tracefile off, or else the output that should go to the tracefile will instead go to the client.

---

set transaction isolation level {[read uncommitted | 0] | [read committed | 1] | [repeatable read | 2] | [serializable | 3]}

sets the transaction isolation level for your session. After you set this option, any current or future transactions operate at that isolation level.

- read uncommitted | 0 – scans at isolation level 0 do not acquire any locks. Therefore, the result set of a level 0 scan may change while the scan is in progress. If the scan position is lost due to changes in the underlying table, a unique index is required to restart the scan. In the absence of a unique index, the scan may be aborted.

  By default, a unique index is required for a level 0 scan on a table that does not reside in a read-only database. You can override this requirement by forcing the Adaptive Server to choose a nonunique index or a table scan, as follows:

  ```
  select * from table_name (index table_name)
  ```

  Activity on the underlying table may cause the scan to be aborted before completion.

- read committed | 1 – by default, the Adaptive Server transaction isolation level is read committed or 1, which allows shared read locks on data.
- repeatable read | 2 – prevents nonrepeatable reads.
- serializable | 3 – specifies isolation level 3, Adaptive Server applies a holdlock to all select and readtext operations in a transaction, which holds the queries' read locks until the end of that transaction. If you also set chained mode, that isolation level remains in effect for any data retrieval or modification statement that implicitly begins a transaction.

set transactional_rpc {on | off}

controls the handling of remote procedure calls. If this option is set to on, when a transaction is pending, the RPC is coordinated by Adaptive Server. If this option is set to off, the remote procedure call is handled by the Adaptive Server site handler. The default value is inherited from the value of the enable xact coordination configuration parameter.

Examples

Example 1 Tells Adaptive Server to evaluate NULL-valued operands of equality (=) and inequality (!=) comparisons and aggregate functions in compliance with the entry level ANSI SQL standard:

```
set ansinull on
```

When you use set ansinull on, aggregate functions and row aggregates raise the following SQLSTATE warning when Adaptive Server finds null values in one or more columns or rows:

```
Warning - null value eliminated in set function
```

If the value of either the equality or the inequality operands is NULL, the comparison's result is UNKNOWN. For example, the following query returns no rows in ansinull mode:

```
select * from titles where price = null
```

If you use set ansinull off, the same query returns rows in which price is NULL.

Example 2 Activates character set conversion, setting it to a default based on the character set the client is using. Adaptive Server also notifies the client or application when characters cannot be converted to the client's character set:

```
set char_convert on with error
```

Example 3 Specifies that CIS handles outbound RPC requests by default:

```
set cis_rpc_handling on
```

Example 4 Assigns this user the client name alison, the host name money1, and the application name webserver2:

```
set clientname 'alison'
set clienthostname 'money1'
set clientapplname 'webserver2'
```

Example 5 Returns five rows for each succeeding fetch statement requested by a client using test_cursor:

```
set cursor rows 5 for test_cursor
```

Example 6 Tells Adaptive Server to retain the session settings that are set by a system procedure or trigger for the duration of the session:

```
set export_options on
```

To disable set export_options and return Adaptive Server to the default behavior, use:

```
set export_options off
```

You can export these optimization settings using set export_options on.

Note By default, set export_options are enabled for login triggers.

Example 7 Tells Adaptive Server to display a warning message if you use a Transact-SQL extension:

```
set fipsflagger on
```

Then, if you use nonstandard SQL, like this:

```
use pubs2
go
```

Adaptive Server displays:

```
SQL statement on line number 1 contains Non-ANSI text.
The error is caused due to the use of use database.
```

Example 8 Inserts a value of 100 into the IDENTITY column of the stores_south table, then prohibits further explicit inserts into this column. Note the use of the syb_identity keyword; Adaptive Server replaces the keyword with the name of the IDENTITY column:

```
set identity_insert stores_south on
go
insert stores_south (syb_identity)
values (100)
go
set identity_insert stores_south off
go
```

Example 9 Enables idenity_update and updates tables with values 1 and 10, respectively, then disables identity_update:

```
set identity_update t1 on
update t1 set c2 = 10 where c1 =1
select * from t1
c1              c2
--------     -------
1                 10


set identity_update t1 off
```

Example 10 Subsequent commands in the session or stored procedure return an error and fail if they cannot get requested locks immediately:

```
set lock nowait
```

Example 11 Subsequent commands in the current session or stored procedure wait indefinitely long to acquire locks:

```
set lock wait
```

Example 12 Subsequent commands in the session or stored procedure wait 5 seconds to acquire locks before generating an error message and failing:

```
set lock wait 5
```

Example 13 Enables capturing abstract plans to the dev_plans group:

```
set plan dump dev_plans on
```

Example 14 Enables loading of abstract plans from the dev_plans group for queries in the current session:

```
set plan load dev_plans on
```

Example 15 Suppresses the output of parameter information:

```
1> create procedure sp_pout (@x int output) as select
    @x = @x + 1
2> go

1> set proc_output_params off
2> go
1> declare @x int
2> select @x = 1
3> exec sp_pout @x output
4> print "Value of @x returned from sproc is: %1!", @x
5> go

 (1 row affected)
 (return status = 0)

Value of @x returned from sproc is: 1
```

If you do not perform set proc_output_params off, the output after `(return status = 0)` includes the following:

```
Return parameters:

 -----------
            2
```

Example 16 Suppresses the output of both parameters and the return status TDS token:

```
set proc_output_params OFF
go

set proc_return_status OFF
go
```

```
declare @x int
select @x = 2
exec sp_pout @x output
print "Value of @x returned from sproc is: %1!", @x
go
```

```
 (1 row affected)
Value of @x returned from sproc is: 2
 (1 row affected)
```

In addition, you can also suppress the lines reporting the number of rows affected to generate output with no extra messages using the set nocount on option before running this batch.

Example 17 The user executing this command now operates within the server as the login "mary" and Mary's server user ID:

```
set proxy "mary"
```

Example 18 For each insert, update, delete, and select statement, Adaptive Server stops processing the query after it affects the first four rows. For example:

```
select title_id, price from titles
title_id  price
--------  ----------
BU1032         19.99
BU1111         11.95
BU2075          2.99
BU7832         19.99

 (4 rows affected)
```

```
set rowcount 4
```

Example 19 Tells Adaptive Server to treat any character string enclosed in double quotes as an identifier. The table name "!*&strange_table" and the column name "emp's_name" are legal identifier names while quoted_identifier is on:

```
set quoted_identifier on
go
create table "!*&strange_table"
      ("emp's_name" char (10), age int)
go
set quoted_identifier off
go
```

Example 20 Treats a character string enclosed in brackets as an identifier. The table name [!*&strange_table] and the column name [emp's_name] are legal identifier names because they are enclosed in brackets, even though quoted_identifier is off:

```
set quoted_identifier off
go
create table [!*&strange_table]
      ([emp’s_name] char (10), age int)
go
```

See “Delimited identifiers” on page 666 for usage information about bracket identifiers.

Example 21 Activates the “doctor” role. This command is used by users to specify the roles they want activated:

```
set role doctor_role on
```

Example 22 Deactivates the user’s system administrator role for the current session:

```
set role "sa_role" off
```

Example 23 Activates the “doctor” role when the user enters the password:

```
set role doctor_role with passwd "physician" on
```

Example 24 Deactivates the “doctor” role:

```
set role doctor_role off
```

Example 25 Specifies a maximum degree of parallelism of 4 for parallel index scans and parallel table scans on nonpartitioned tables:

```
set scan_parallel_degree 4
```

Example 26 An alternative way of stating example 5:

```
set session authorization "mary"
```

Example 27 For each query, returns a description of the processing plan, but does not execute it:

```
set showplan, noexec on
go
select * from publishers
go
```

Example 28 Displays the statistics for the query in a tree format:

```
set statistics plancost on
```

```
select * from authors

au_id       au_lname     au_fname     phone        address
city    state       country         postalcode
----------- -----------  -----------  ------------ ---------------------
------------ -----  ----------      ------------------------------------
172-32-1176  White        Johnson      408 496-7223 10932 Bigge Rd.
Menlo Park      CA     USA         94025
213-46-8915  Green        Marjorie     415 986-7020  309 63rd St. #411
Oakland         CA     USA          94618

. . .

998-72-3567  Ringer        Albert       801 826-0752   67 Seventh Av.
Salt Lake City  UT      USA          84152

==================== Lava Operator Tree ====================

            Emit
            (VA = 1)
            23 rows est: 23
            cpu: 0

/
TableScan
authors
 (VA = 0)
23 rows est: 23
lio: 1 est: 2
pio: 0 est: 2

============================================================

 (23 rows affected)
```

Example 29 Causes Adaptive Server to generate an exception when truncating a char, unichar, or nchar string:

```
set string_rtruncation on
```

If an insert or update statement would truncate a string, Adaptive Server displays:

```
string data, right truncation
```

Example 30 Sets the limit on text, unitext, or image data returned with a select statement to 100 bytes:

```
set textsize 100
```

Example 31 Sets the serverwide switch on to set traceflags for 110, an undocumented traceflag, with no additional informational warnings:

```
set switch serverwide on 110 with override, no_info
```

Example 32 Opens a trace file named *sql_text_file* for the the current session:

```
set tracefile '/var/sybase/REL1502/text_dir/sql_text_file'
```

Subsequent outputs from set showplan, set statistics io, and dbcc traceon(100) are saved in *sql_text_file*.

Example 33 Does not specify a directory path, so the trace file is saved in *$SYBASE/sql_text_file*:

```
set tracefile 'sql_text_file' for 11
```

Any SQL run on spid 11 is saved to this tracefile.

Example 34 Saves the SQL text for spid 86:

```
set tracefile '/var/sybase/REL1502/text_dir/sql_text_file' for 86
```

Example 35 Specifies that when a transaction is pending, the RPC is handled by the CIS access methods rather than by the Adaptive Server site handler:

```
set transactional_rpc on
```

Example 36 All subsequent queries in the session run at the repeatable reads transaction isolation level:

```
set transaction isolation level 2
```

Example 37 Implements read-locks with each select statement in a transaction for the duration of that transaction:

```
set transaction isolation level 3
```

Example 38 This example shows how the DML logging mode for multiple statements on the same table remains unchanged if the table was initially operated with minimal logging in a transaction.

1. Begin the transaction and set the DML logging to minimal:

   ```
   begin tran
   set dml_logging minimal
   ```

2. Run an insert command:

   ```
   insert into tab1 values(1)
   ```

3. Set DML logging back to the default:

   ```
   set dml_logging default
   ```

Even though you reset DML logging to the default, because t1 was previously run with minimal logging in this transaction, this insert is executed with minimal logging:

```
insert into tab1 values(1)
```

The error log includes reasons the logging mode choice was overridden.

Example 39 This example changes the show_exec_info from minimal to full within the same session:

1. Log in to Adaptive Server:

   ```
   isql -Ubob -Pbob123
   use myimdb
   ```

2. Create table tab1:

   ```
   create table tab1(col1 int)
   ```

3. Enable show_exec_info and set DML logging to minimal:

   ```
   set show_exec_info on
   set dml_login minimal
   ```

4. Insert values into tab1:

   ```
   insert into tab1 values(1)
   ```

5. Adaptive Server displays the name of the table and database, the user ID running the command, and the logging mode used:

```
Operating on the table 'tab1', database 'myimdb' (owner ID 3) in
'minimal' logging mode by user ID 3.
```

6. Set the DML logging back to default:

   ```
   set dml_logging default
   ```

7. Insert more values into tab1:

   ```
   insert into tab1 values(1)
   ```

8. Adaptive Server displays the name of the table and database, the user ID running the command, and the logging mode used:

```
Operating on the table 'tab1', database 'myimdb' (owner ID 3) in 'full'
logging mode by user ID 3.
```

Usage

fipsflagger, string_rtruncation, ansinull, ansi_permissions, arithabort, and arithignore affect aspects of Adaptive Server error handling and compliance to SQL standards.

- You can use the cis_rpc_handling and transactional_rpc options only when CIS is enabled.
- The async log service option and delayed_commit are mutually exclusive. delayed_commit will not work if async log service is set to "true."
- parallel_degree and scan_parallel_degree limit the degree of parallelism for queries, if Adaptive Server is configured for parallelism. When you use these options, you give the optimizer a hint to limit parallel queries to use fewer worker processes than allowed by the configuration parameters. Setting these parameters to 0 restores the server-wide configuration values.

  If you specify a number that is greater than the numbers allowed by the configuration parameters, Adaptive Server issues a warning message and uses the value set by the configuration parameter.
- If you use the set command inside a trigger or stored procedure, most set options revert to their former settings after the trigger or procedure executes.

  The following options do not revert to their former settings after the procedure or trigger executes, but remain for the entire Adaptive Server session or until you explicitly reset them:

  - datefirst
  - dateformat
  - identity_insert
  - language
  - quoted_identifier
- If you specify more than one set option, the first syntax error causes all following options to be ignored. However, the options specified before the error are executed, and the new option values are set.
- If you assign a user a client name, host name, or application name, these assignments are only active for the current session. You must reassign these the next time the user logs in. Although the new names appear in sysprocesses, they are not used for permission checks, and sp_who still shows the client connection as belonging to the original login. For more information about setting user processes, see the *System Administration Guide*.

- All set options except showplan and char_convert take effect immediately. showplan takes effect in the following batch. Here are two examples that use set showplan on:

```
set showplan on
select * from publishers
go

pub_id  pub_name               city        state
------- --------------------   ----------- ---
0736    New Age Books          Boston      MA
0877    Binnet & Hardley       Washington  DC
1389    Algodata Infosystems   Berkeley    CA

 (3 rows affected)
```

But:

```
set showplan on
go
select * from publishers
go
QUERY PLAN FOR STATEMENT 1 (at line 1).
    STEP 1
        The type of query is SELECT

        FROM TABLE
            publishers
        Nested iteration
        Table Scan
        Ascending Scan.
        Positioning at start of table.

pub_id  pub_name              city        state
------  --------------------  ----------  ----
0736    New Age Books         Boston      MA
0877    Binnet & Hardley      Washington  DC
1389    Algodata Infosystems  Berkeley    CA

 (3 rows affected)
```

- Adaptive Server automatically stores one or more spaces in clientname, clienthostname, and clientapplname columns. For this reason, a query using any of these three columns that includes "`is null`" does not return an expected result set.
- set proxy issue the following warning when they are issued while set fipsflagger option is enabled:

```
SQL statement on line number 1 contains Non-ANSI
text. The error is caused due to the use of DBCC.
```

- If you use a login trigger to set current execution properties, any exportable set option that you enable or disable inside a login trigger takes affect in the current process.
- Some set options can be grouped together:
  - parseonly, noexec, prefetch, showplan, rowcount, and nocount control the way a query is executed. It does not make sense to set both parseonly and noexec on. The default setting for rowcount is 0 (return all rows); the default for the others is off.
  - The statistics options display performance statistics after each query. The default setting for the statistics options is off. For more information about noexec, prefetch, showplan and statistics, see the *Performance and Tuning Guide*.
  - You can update up to 1024 columns in the set clause using literals, variables, or expressions returned from a subquery.
  - offsets is used in DB-Library to interpret results from Adaptive Server. The default setting for this option is on.
  - datefirst, dateformat, and language affect date functions, date order, and message display. If used within a trigger or stored procedure, these options do not revert to their previous settings.

    In the default language, us_english, datefirst is 1 (Sunday), dateformat is *mdy*, and messages are displayed in us_english. Some language defaults (including us_english) produce Sunday=1, Monday=2, and so on; others produce Monday=1, Tuesday=2, and so on.

    set language implies that Adaptive Server should use the first weekday and date format of the language it specifies, but does not override an explicit set datefirst or set dateformat command issued earlier in the current session.
  - cursor rows and close on endtran affect the way Adaptive Server handles cursors. The default setting for cursor rows with all cursors is 1. The default setting for close on endtran is off.
  - chained and transaction isolation level allow Adaptive Server to handle transactions in a way that is compliant with the SQL standards.

Compile-time changes for some set parameters

In version 15.0.2 and later, Adaptive Server changes the compile-time behavior for some abstract plan set parameters when you use them to create stored procedures or run them in Transact-SQL batches.

In earlier versions of Adaptive Server, the set parameters took effect after the stored procedure was executed or recompiled. Adaptive Server 15.0.2 allows you to use optimizer set parameters at compile time to affect the optimizer in stored procedures or batches.

Note This changed behavior may effect the composition of the result set. Sybase recommends that you review the result set created by the 15.0.2 versions of the set parameters before using them in your production systems.

You must reset the set parameter before returning from the stored procedure or the execution of subsequent stored procedures may be affected. If you intend to propogate this change to subsequent stored procedures, use export_options parameter.

Table 1-30 shows the optimizer options that you can export when you use set export_options on.

Table 1-30: Optimizer options that can be exported with set export_options on

optgoal	store_index	showmanagers
opttimeout	bushy_space_search	showlogprops
merge_join	parallel_query	showparallel
hash_join	replicated_partitioning	showhistograms
nl_join	basic_optimization	showabstractplan
distinct_sorted	index_intersection	showsearchengine
distinct_sorting	index_union	showcounters
distinct_hashing	multi_gt_store_index	showbestplan
group_sorted	opportunistic_grouping	showfinalplan
group_hashing	opportunistic_distinct	showcodegen
group_inserting	auto_query_tuning	showpiocosting
order_sorting	streaming_sort	showliocosting
addend_union_all	nary_nl_join	showelimination
merge_union_all	query_tuning_mem_limit	showpllcosting
merge_union_distinct	query_tuning_time_limit	shownostats
hash_union_distinct	showlop	showexecio

Aggregate behavior

ansinull determines whether evaluation of NULL-valued operands in aggregate functions is compliant with the ANSI SQL standard. If you use set ansinull on, Adaptive Server generates a warning when an aggregate function eliminates a null-valued operand from the calculation.

For example, if you perform the following query on the titles table with set ansinull off (the default value):

```
select avg (total_sales) from titles
```

Adaptive Server returns:

```
-----------
       6090
```

However, if you perform the same query with set ansinull on, Adaptive Server returns the following:

```
1> use pubs2
2> go
1> select avg (total_sales) from titles
2> go

 -----------
        6090
 (1 row affected)

1> set ansinull on
2> go
1> select avg (total_sales) from titles
2> go

 -----------
        6090
Warning - null value eliminated in set function
(1 row affected)
```

This message indicates that some entries in total_sales contain NULL instead of a real amount, so you do not have complete data on total sales for all books in this table. However, of the available data, the value returned is the highest.

Comparison behavior

The SQL standard requires that if either one of the two operands of an equality comparison is NULL, the result is UNKNOWN. Transact-SQL treats NULL values differently. If one of the operands is a column, parameter, or variable, and the other operand is the NULL constant or a parameter or variable whose value is NULL, the result is either TRUE or FALSE:

- Sybase NULL mode – "`val = NULL`" is true when "`val`" is NULL
- ANSI NULL mode – "`val = NULL`" is unknown when "`val`" is NULL

The ANSI rule for the where and on clauses return rows that are true, and rejects rows that are both false and unknown.

The ANSI rule for a check constraint rejects values that are false. For this reason, unknown or true results are not rejected.

If you:

- Enable ansinull mode – do not use the Sybase NULL comparisons (`val = NULL` or `val != NULL`).
- Expect to use ANSI-null mode during insert and update – do not use the Sybase NULL comparisons in check constraints.

Instead, use the ANSI IS NULL or IS NOT NULL syntax to prevent from having unexpected results.

Delimited identifiers

When the quoted_identifier option is set to on, you do not need to use double quotes around an identifier if the syntax of the statement requires that a quoted string contain an identifier. For example:

```
set quoted_identifier on
create table "1one" (c1 int)
```

However, object_id requires a string, so you must include the table name in quotes to select the information:

```
select object_id ('1one')
-----------------------
  896003192
```

You can include an embedded double quote in a quoted identifier by doubling the quote:

```
create table "embedded""quote" (c1 int)
```

However, there is no need to double the quote when the statement syntax requires the object name to be expressed as a string:

```
select object_id ('embedded"quote')
```

Bracketed identifiers Adaptive Server supports an alternative to quoted identifiers that uses brackets to surround an identifier. The behavior of bracketed identifiers is identical to that of quoted identifiers, with the exception that you do not have to use set quoted_identifier on to use them.

When you use bracketed identifiers instead of quoted identifiers to create objects, your objectname should have at least one valid character, such as:

```
create table [table name]
```

```
create database [database name]
```

All trailing spaces are removed from the objectname, so the following are all treated identically:

```
[tab1<space><space>]
[tab1<space><space>]
[tab1]
[tab1<space><space><space>]
tab1
```

This applies to all objects that can be created using bracketed identifiers.

The following are restrictions when using delimited identifiers in Adaptive Server:

- A dot (.) cannot appear in an identifier name, however delimited
- Object names as stored procedure parameters – Adaptive Server stored procedure object names can be treated as strings, and do not need delimiters. For example, the following gives correct results if a table named table actually exists:

  ```
  exec sp_help 'dbo.table'
  ```

  However, the brackets are not stripped from the object name in the following:

  ```
  exec sp_help 'dbo.[table]'
  ```

Roles and *set* options

- When you log in to Adaptive Server, all system-defined roles granted to you are automatically activated. User-defined roles granted to you are not automatically activated. To automatically activate user-defined roles granted to you, use sp_modifylogin. See sp_modifylogin in *Reference Manual: Procedures*. Use set role *role_name* on or set role *role_name* off to turn roles on and off.

  For example, if you have been granted the system administrator role, you assume the identity (and user ID) of database owner in the current database. To assume your real user ID, execute this command:

  ```
  set role "sa_role" off
  ```

  If you are not a user in the current database, and if there is no "guest" user, you cannot set sa_role off.

- If the user-defined role you intend to activate has an attached password, you must specify the password to turn the role on. Thus, you would enter:

```
set role "role_name" with passwd "password" on
```

- During set role, Adaptive Server locks the role if your failed role activation attempts reach the number you set in max failed_logins. When this happens, locksuid, locdate, and lockreason in are updated in syssrvroles.

In-memory and relaxed-durability databases

- Setting the logging level to minimal affects the logging mode only on objects owned by the current user. However, if the user has system administrator privileges, setting the logging to minimal affects the logging mode for all objects in the user's session.
- Data copied into the table created with select into is minimally logged. with dml_logging = minimal specifies the logging mode for future DML operations on this table
- show_exec_info does not display the reason Adaptive Server overrides a minimally logged mode selected by a user. Use set switch print_minlogged_mode_override to view the reasons for this override.
- Session-specific settings for the logging mode override the logging options set at the table and database level, and include these restrictions:
    - Database-wide settings
    - Disabling DML logging for the current session based on the logging mode:
        - Database-wide logging mode settings
        - Table-specific logging mode settings
        - The ownership of the tables being updated
- If you set the session-specific DML logging to minimal, running set dml_logging default returns the logging mode for the affected tables to their default logging mode, based on the table and database-wide settings.
- You cannot use set dml_logging to perform fully logged DML if the database or table owner has already configured the table to run with minimal logging.

Setting compression for the session

- Enabling or disabling compression for the session does not change the compression level for existing data.

- Updated rows remain uncompressed. Adaptive Server uncompresses any compressed rows during the update.
- If set compression is set to off, commands that require a data copy (for example, reorg rebuild and alter table) uncompress data rows.
- After you configure set compression on, subsequent updates use the partition or tables' compression level.

Distributed transactions, CIS, and *set* options

- The behavior of the cis rpc handling configuration property and the set transactional_rpc commands changed with the introduction of ASTC. In versions earlier than 12.0, enabling cis rpc handling caused *all* RPCs to be routed through CIS's Client-Library connection. As a result, whenever cis rpc handling was enabled, transactional_rpc behavior occurred whether or not it had been specifically set. As of Adaptive Server 12.0, this behavior has changed. If cis rpc handling is enabled and transactional_rpc is off, RPCs within a transaction are routed through the site handler. RPCs executed outside a transaction are sent via CIS's Client-Library connection.
- When Adaptive Server distributed transaction management services are enabled, you can place RPCs within transactions. These RPCs are called **transactional RPCs**. A transactional RPC is an RPC whose work can be included in the context of a current transaction. This remote unit of work can be committed or rolled back along with the work performed by the local transaction.

  To use transactional RPCs, enable CIS and distributed transaction management with sp_configure, then issue the set transactional_rpc command. When set transactional_rpc is on and a transaction is pending, the Adaptive Server (as opposed to the Adaptive Server site handler) coordinates the RPC.

  The set transactional_rpc command default is off. The set cis_rpc_handling command overrides the set transactional_rpc command. If you set cis_rpc_handling on, all outbound RPCs are handled by CIS.
- See the *Component Integration Services User's Guide* for a discussion of using set transactional_rpc, set cis_rpc_handling, and sp_configure.

Using proxies

Note Without explicit permission, neither the “sa_role” nor the “sso_role” can issue the set proxy login_name command. To use set proxy login_name, any user, including the system security officer, must have permission explicitly granted by the system security officer.

- Before you can use the set proxy or set session authorization command, a system security officer must grant permission to execute set proxy or set session authorization from the master database.
- You can switch your server user identity to any other server login and limit its use based on the target login roles by using:

  grant set proxy to *user_or_role_list*
  [restrict role *role_list* | all | system]

  See grant on page 428 for more information.
- Executing set proxy or set session authorization with the original *login_name* reestablishes your previous identity.
- You cannot execute set proxy or set session authorization from within a transaction.
- Adaptive Server permits only one level of login identity change. Therefore, after you use set proxy or set session authorization to change identity, you must return to your original identity before changing it again. For example, assume that your login name is “ralph”. To create a table as “mary”, create a view as “joe”, then return to your own login identity. Use the following statements:

```
set proxy "mary"
    create table mary_sales
     (stor_id  char (4),
    ord_num   varchar (20),
    date      datetime)
grant select on mary_sales to public
set proxy "ralph"
set proxy "joe"
    create view joes_view (publisher, city,
        state)
    as select stor_id, ord_num, date
    from mary_sales
set proxy "ralph"
```

- If a user issues set proxy to assume the permissions, login name, and suid of another user, Adaptive Server checks the proxy user's access to database objects, rather than the original user's access.

  Adaptive Server uses the name and password information of the user who logged in to check for automatic access to encryption keys using login credentials. Adaptive Server does not have access to the proxy user's password. Access to keys through the login password is on behalf of the user who logs in, not on behalf of the user assumed through an alias, set proxy, or setuser. Access to copies of encryption keys that were set up for login association, but which are still encrypted by the system encryption password, is treated similarly.

Using *lock wait*

- By default, an Adaptive Server task that cannot immediately acquire a lock waits until incompatible locks are released, then continues processing. This is equivalent to set lock wait with no value specified in the *numsecs* parameter.
- You can set a server-wide lock wait period by using sp_configure with the lock wait period option.
- lock wait period, with the session-level setting set lock wait nnn, is only applicable for user-defined tables. These settings have no influence on system tables.
- A lock wait period defined at the session level or in a stored procedure with the set lock command overrides a server-level lock-wait period.
- If set lock wait is used by itself, with no value for *numsecs*, all subsequent commands in the current session wait indefinitely to acquire requested locks.
- sp_sysmon reports the number of times that tasks waiting for a lock could not acquire the lock within the waiting period.

Repeatable-reads transaction isolation level

- The repeatable-reads isolation level, also known as transaction isolation level 2, holds locks on all pages read by the statement until the transaction completes.

- A nonrepeatable read occurs when one transaction reads rows from a table and a second transaction can modify the same rows and commit the changes before the first transaction completes. If the first transaction rereads the rows, they now have different values, so the initial read is not repeatable. Repeatable reads hold shared locks for the duration of a transaction, blocking transactions that update the locked rows or rows on the locked pages.

Using simulated statistics

You can load simulated statistics into a database using the simulate mode of the optdiag utility program. If set statistics simulate on has been issued in a session, queries are optimized using simulated statistics, rather than the actual statistics for a table.

Global variables affected by *set* options

Table 1-31 lists the global variables that contain information about the session options controlled by the set command.

Table 1-31: Global variables containing session options

Global variable	Description
@@char_convert	Contains 0 if character set conversion not in effect. Contains 1 if character set conversion is in effect.
@@client_csexpansion	Returns the expansion factor used when converting from the server character set to the client character set. For example, if *@@client_csexpansion* contains a value of 2, a character in the server character set could take up to twice the number of bytes after translation to the client character set.
@@cursor_rows	A global variable designed specifically for scrollable cursors. Displays the total number of rows in the cursor result set. Returns the value -1:
@@datefirst	Set using set datefirst n where n is a value between 1 and 7. Returns the current value of *@@datefirst*, indicating the specified first day of each week, expressed as tinyint. The default value in Adaptive Server is Sunday (based on the us_language default), which you set by specifying `set datefirst 7`. See the datefirst option of the set command for more information on settings and values.
@@isolation	Contains the current isolation level of the Transact-SQL program. *@@isolation* takes the value of the active level (0, 1, or 3).
@@lock_timeout	Set using set lock wait n. Returns the current *lock_timeout* setting, in milliseconds. *@@lock_timeout* returns the value of n. The default value is no timeout. If no set lock wait n is executed at the beginning of the session, *@@lock_timeout* returns -1.
@@options	Contains a hexadecimal representation of the session's set options.
@@parallel_degree	Contains the current maximum parallel degree setting.

Global variable	Description
@@rowcount	Contains the number of rows affected by the last query. *@@rowcount* is set to 0 by any command that does not return rows, such as an if, update, or delete statement. With cursors, *@@rowcount* represents the cumulative number of rows returned from the cursor result set to the client, up to the last fetch request. *@@rowcount* is updated even when nocount is on.
@@scan_parallel_degree	Contains the current maximum parallel degree setting for nonclustered index scans.
@@textsize	Contains the limit on the number of bytes of text, unitext or image data a select returns. Default limit is 32K bytes for isql; the default depends on the client software. Can be changed for a session with set textsize. If you use enable surrogate processing, Unicode surrogates (two 16-bit values) are returned as single characters, even though the actual return size may be less than the *@@text* size value.
@@tranchained	Contains the current transaction mode of the Transact-SQL program. *@@tranchained* returns 0 for unchained or 1 for chained.

Table 1-32 lists set options and values that work with *@@options*.

Table 1-32: set options and values for @@options

Numeric value	Hexidecimal value	*set* option
4	0x04	showplan
5	0x05	noexec
6	0x06	arithignore
8	0x08	arithabort
13	0x0D	control
14	0x0E	offsets
15	0x0F	statistics io and statistics time
16	0x10	parseonly
18	0x12	procid
20	0x14	rowcount
23	0x17	nocount
77	0x4D	opt_sho_fi
78	0x4E	select
79	0x4F	set tracefile

Using *fipsflagger* with Java in the database

- When fipsflagger is on, Adaptive Server displays a warning message when these extensions are used:
  - The installjava utility

- The remove java command
- Column and variable declarations that reference Java classes as datatypes
- Statements that use Java-SQL expressions for member references

- The status of fipsflagger does not affect arithmetic expressions performed by Java methods.
- For more information about Java in the database, see *Java in Adaptive Server Enterprise*.

Restrictions using set tracefile

- You cannot save the SQL text for system tasks (such as the housekeeper or the port manager).
- You must have the sa or sso roles, or be granted set tracing permission, to run enable or disable tracing.
- set tracefile is not allowed to open an existing file as a tracefile.
- During an SA or systems security officer session, if you enable set tracfile for a specific spid, all subsequent tracing commands executed take effect on that spid, not the system administrator or systems security officer spid.
- If Adaptive Server runs out of file space while writing the tracefile, it closes the file and disables the tracing.
- If an isql session starts tracing for a spid, but the isql session quits without disabling the tracing, another isql session can begin tracing this spid.
- Tracing occurs for the session for which it is enabled only, not for the session that enabled it.
- You cannot trace more than one session at a time from a single sa or sso session. If you attempt to open a tracefile for a session for which there is already a trace file open, Adaptive Server issues this error message: `tracefile is already open for this session.`
- You cannot trace the same session from multiple sa or sso sessions.
- The file storing the trace output is closed when the session being traced quits or when you disable tracing.
- Before you allocate resources for tracing, keep in mind that each tracing requires one file descriptor per engine.

Set options that save diagnostic information to a trace file

You can use set tracefile in combination with other set commands and options that provide diagnostic information for a better understanding of slow-running queries. These are the set commands and options that save diagnostic information to a file:

- set show_sqltext [on | off]
- set showplan [on | off]
- set statistics io [on | off]
- set statistics time [on | off]
- set statistics plancost [on | off]

These are the set options:

- set option show [normal | brief | long | on | off]
- set option show_lop [normal | brief | long | on | off]
- set option show_parallel [normal | brief | long | on | off]
- set option show_search_engine [normal | brief | long | on | off]
- set option show_counters [normal | brief | long | on | off]
- set option show_managers [normal | brief | long | on | off]
- set option show_histograms [normal | brief | long | on | off]
- set option show_abstract_plan [normal | brief | long | on | off]
- set option show_best_plan [normal | brief | long | on | off]
- set option show_code_gen [normal | brief | long | on | off]
- set option show_pio_costing [normal | brief | long | on | off]
- set option show_lio_costing [normal | brief | long | on | off]
- set option show_log_props [normal | brief | long | on | off]
- set option show_elimination [normal | brief | long | on | off]

Restrictions for show_sqltext

- You must have the sa or sso roles to run show_sqltext.
- You cannot use show_sqltext to print the SQL text for triggers.
- You cannot use show_sqltext to show a binding variable or a view name.

Exporting *set* options from a login trigger

Adaptive Server enables set options inside login triggers to remain valid for the entire user session. The following set options are automatically exported:

- altnames
- ansi_permissions
- ansinull
- arithabort [overflow | numeric_truncation]
- arithignore [overflow]
- cis_rpc_handling
- close on endtran
- colnames
- command_status_reporting
- dup_in_subquery
- explicit_transaction_required
- fipsflagger
- flushmessage
- fmtonly
- forceplan
- format
- nocount
- or_strategy
- prefetch
- proc_output_params
- proc_return_status
- procid
- quoted_identifier
- raw_object_serialization
- remote_indexes
- replication
- rowcount
- self_recursion
- showplan
- sort_resources
- statistics io
- statement_cache
- strict_dtm_enforcement
- string_rtruncation
- textptr_parameters
- transactional_rpc
- triggers

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

The ANSI SQL standard specifies behavior that differs from Transact-SQL behavior in versions of Adaptive Server earlier than 15.7. Compliant behavior is enabled, by default, for all Embedded-SQL precompiler applications. Other applications needing to match this standard of behavior can use these set options:

Table 1-33: Options to set for entry level ANSI SQL compliance

Option	Setting
ansi_permissions	on
ansinull	on
arithabort	off
arithabort numeric_truncation	on
arithignore	off
chained	on
close on endtran	on
fipsflagger	on
quoted_identifier	on
string_rtruncation	on
transaction isolation level	3

Permissions

In general, set permission defaults to all users and no special permissions are required to use it. Exceptions include set role, set proxy, and set session authorization.

To use set role, a system administrator or system security officer must have granted you the role. If you gain entry to a database only because you have a certain role, you cannot turn that role off while you are using the database. For example, if you are not normally authorized to use a database info_plan, but you use it as a system administrator, Adaptive Server returns an error message if you try to set sa_role off while you are still in info_plan.

To use set proxy or set session authorization, you must have been granted permission by a system security officer.

Changes to logging apply only to objects owned by the user in this session, when applicable. In addition, only the tables owned by the session owner are affected by set dml_logging:

- Any user can execute set dml_logging for minimal logging and for returning to the default mode of logging. Once this set succeeds, DML on all tables owned by the user executing the statement in any database is minimally logged for the current session, until set dml_logging default is executed.
- DML logging defaults to the database- and table-level settings when minimal logging is enabled for the session but the DML operates on tables not owned by the session's user.
- The DML logging setting in a session or procedure is inherited by procedures, however, only the tables owned by the user running the session are affected.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
88	security	set proxy or set session authorization	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – Previous suid • *Current value* – New suid • *Other information* – NULL • *Proxy information* – original login name, if set proxy or set session authorization had no parameters; otherwise, NULL.

See also

Commands create trigger, fetch, grant, insert, lock table, revoke, set

Functions convert

Utilities isql, optdiag

Stored procedures sp_setrepdbmode, sp_setrepdefmode

setuser

Description

Allows a database owner to impersonate another user.

Syntax

setuser ["*user_name*"]

Examples

The database owner temporarily adopts Mary's identity in the database in order to grant Joe permissions on authors, a table owned by Mary:

```
setuser "mary"
go
grant select on authors to joe
setuser
go
```

Usage

- The database owner uses setuser to adopt the identity of another user in order to use another user's database object, to grant permissions, to create an object, or for some other reason.
- When the database owner uses the setuser command, Adaptive Server checks the permissions of the user being impersonated instead of the permissions of the database owner. The user being impersonated must be listed in the sysusers table of the database.
- setuser affects permissions only in the local database. It does not affect remote procedure calls or accessing objects in other databases.
- setuser remains in effect until another setuser command is given or until the current database is changed with the use command.
- setuser has no effect when creating a database.
- Executing setuser with no user name reestablishes the database owner's original identity.
- system administrators can use setuser to create objects that are owned by another user. However, since a system administrator operates outside the permissions system, she or he cannot use setuser to acquire another user's permissions.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

setuser permission defaults to the database owner and is not transferable.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
84	setuser	setuser	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – Name of the user being set • *Proxy information* – original login name, if a set proxy is in effect

See also **Commands** grant, revoke, use

shutdown

Description

Shuts down the Adaptive Server from which the command is issued, its local Backup Server, or a remote Backup Server.

Syntax

shutdown [*srvname*] [with {wait [="*hh:mm:ss*"] | nowait}]]

Syntax for clusters:

shutdown {cluster | [*instance_name*]} [with {wait | nowait}]

Parameters

srvname
is the logical name by which the Backup Server is known in the Adaptive Server sysservers system table. This parameter is not required when shutting down the local Adaptive Server.

with wait
is the default. This shuts down the Adaptive Server or Backup Server gracefully.

hh:mm:ss
is an optional setting that specifies the maximum time the server waits for all running or sleeping processes to finish their job.

with nowait
shuts down the Adaptive Server or Backup Server immediately, without waiting for currently executing statements to finish.

Note Use of shutdown with nowait can lead to gaps in IDENTITY column values.

---

cluster
shared disk clusters only – specifies that all instances in the cluster are to shut down.

instance_name
shared disk clusters only – is the name of a specific instance to shut down.

Examples

Example 1 Shuts down the Adaptive Server from which the shutdown command is issued:

```
shutdown
```

Example 2 Shuts down the Adaptive Server immediately:

```
shutdown with nowait
```

Example 3 Shuts down the local Backup Server:

```
shutdown SYB_BACKUP
```

Example 4 Shuts down the remote Backup Server REM_BACKUP:

```
shutdown REM_BACKUP
```

Example 5 Shuts down the current cluster:

```
shutdown cluster
```

Example 6 Shuts down the instance "ase1", but leaves the cluster running:

```
shutdown ase1
```

Usage

- Unless you use the nowait option, shutdown attempts to bring Adaptive Server down gracefully by:
  - Disabling logins (except for the system administrator)
  - Performing a checkpoint in every database
  - Waiting for currently executing SQL statements or stored procedures to finish

  Shutting down the server without the nowait option minimizes the amount of work that must be done by the automatic recovery process.
- Unless you use the nowait option, shutdown *backup_server* waits for active dumps and loads to complete. Once you issue a shutdown command to a Backup Server, no new dumps or loads that use this Backup Server can start.
- Use shutdown with nowait only in extreme circumstances. In Adaptive Server, issue a checkpoint command before executing a shutdown with nowait.
- You can halt only the local Adaptive Server with shutdown; you cannot halt a remote Adaptive Server.
- You can halt a Backup Server only if:
  - It is listed in your sysservers table. Use sp_addserver to add entries to sysservers.
  - It is listed in the interfaces file for the Adaptive Server where you execute the command.
- Use sp_helpserver to determine the name by which a Backup Server is known to the Adaptive Server. Specify the Backup Server's name— not its *network_name*—as the *srvname* parameter. For example:

```
sp_helpserver
name        network_name   status                                 id
----------  -------------  ------------------------------------   --
```

```
REM_BACKUP  WHALE_BACKUP   timeouts, no net password encryption 3
SYB_BACKUP  SLUG_BACKUP    timeouts, net password encryption    1
eel         eel                                                 0
whale       whale          timeouts, no net password encryption 2
```

To shut down the remote Backup Server named WHALE_BACKUP, use:

```
shutdown REM_BACKUP
```

Specifying a wait time

When the server prepares to down, it:

1. Performs checkpoint on all the databases
2. Prevents any new user from logging in
3. Waits for all running or sleeping processes to finish their job
4. Performs another checkpoint on the databases, this time with a flag that informs you that you need to flush:
    - All the dynamic thresholds in mixed log-data databases
    - All the object statistics
    - The values of the identity fields to avoid holes after recovery

When you use with wait with the *hh:mm:ss* option, the time you specify is not the meximum total time Adaptive Server takes to shut itself down. Instead, Adaptive Server takes into account the time it takes to perform the first checkpoint, and automatically subtracts this from the time you specified.

For example, if you specify a maximum wait time of 20 minutes and the first checkpoint takes 3 minutes, Adaptive Server allows up to 17 minutes for the processes to finish. If for some reason the second checkpoint takes longer, however, this is not calculated into the with wait *hh:mm:ss* parameter you specify.

Adaptive Server also accommodates a checkpoint that takes longer than the time you specify in with wait *hh:mm:ss*. For example, if you specify a wait time of 10 minutes but the first checkpoint takes 20 minutes to complete, Adaptive Server does not interrupt checkpoint midway, but instead waits for checkpoint to complete. When this occurs, Adaptive Server immediately begins to shut down after checkpoint is complete, since the time you specified has passed, and runs the last checkpoint with the flag informing you of the flushes you must perform.

shutdown in a clustered environment

- The shutdown command with no options is invalid in a clustered environment, as for example:

```
shutdown
go
```

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

shutdown permission defaults to system administrators and is not transferable.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
51	security	Server shutdown	• *Roles* – current active roles • *Keywords or options* – shutdown • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter database

System procedures sp_addserver, sp_helpserver

transfer table

Description

Initiates an incremental table transfer.

Syntax

```
transfer table [[db.]owner.]table [to | from] destination_file
        [ for { ase | bcp | iq | csv } ]
        [ with {column_separator=string}, {column_order=option},
        {encryption=option}, {row_separator=string},
        {resend=id}, {progress=sss}, {tracking_id=nnn}
        {sync = true | false]}, {fixed_length = true | false}
            , null_byte = true | false}]
```

Parameters

table

any valid table within Adaptive Server. transfer table requires sa_role, or ownership of the table. Table owners can grant transfer table privileges for tables they own.

to | from

indicates the direction of the transfer. You cannot use all the parameters for the transfer table...from that you use with transfer table. . .to. The parameters for the from parameter are:

- column_order=*option* (does not apply to a load using for ase; reserved for future use)
- column_separator=*string* (does not apply to a load using for ase; reserved for future use)
- encryption={true | false} (does not apply to a load using for ase; reserved for future use)
- progress=*nnn*
- row_separator=*string* (does not apply to a load using for ase; reserved for future use)

destination_file

any file or path name that is valid for the operating system, and that Adaptive Server can access. If the file is a relative file path, Adaptive Server provides its absolute path. If Adaptive Server cannot open *destination_file*, it issues an error message.

Adaptive Server removes a destination file if all these conditions apply:

- The file is a regular file, not a named pipe, symbolic link, or other special file.
- Adaptive Server opens the file as part of this transfer.
- The transfer fails, or sends no rows.

for clause

Names one of the destination data formats. If you omit the for clause, the default value of the first transfer of a specified table is for ase. Subsequent transfers default to the format used by the previous successful transfer, unless the command specifies format with resend = id, in which case the default is the specified prior transfer format.

- ase – a format for importing data into Adaptive Server. This output format is a licensed feature, available to RAP customers and to customers with licenses for in-memory databases. No data transformations are applied. This file format includes a header that describes the table, including the source computer's byte order, character set, and default sort order. This is the default value for tables that have had no successful prior transfers.
- bcp – a format for importing data as bcp binary-formatted data. Rows are output as binary data that can be loaded using bcp. No data transformations are applied. As part of the transfer, Adaptive Server creates a format file that bcp uses to describe the data and appears in the same directory as the output file.

  You cannot use for bcp to transfer to a named pipe.

  If the output file is any file type other than a named pipe, Adaptive Server uses this naming convention for the format file:

{*table_name*},{*database_id*},{*object_id*}.fmt

- iq – writes data in a form suitable for loading into Sybase IQ using IQ’s load table command. Adaptive Server writes data to the file in a binary format, and applies any necessary data transformations to convert its datatypes to versions that are compatible with IQ. Unless you include the with fixed_length='true' or with null_byte='true' modifiers, for iq writes data in a default format:
  - Default format – nullable data includes a following “null byte,” a one-byte indicator containing a:
    - 0 if the column is not null
    - 1 if the column is null

    Non-nullable data does not include this null byte (see IQ’s documentation for load table). Variable-length strings are preceded by one or two bytes indicating the length of the string, where the number of prefix bytes is determined by the column’s maximum length: one byte for strings up to 255 bytes, or two bytes for strings 256 bytes or longer (Adaptive Server supports strings up to about 16000 bytes). Except for strings, every column is transmitted as a fixed width, padded if necessary to expand it to this fixed-width size.
  - Use these modifiers to determine the data’s format:
    - with fixed_length='true' – all columns, including strings, are padded to their full width. Strings are padded with blanks; other columns are padded with `<NUL>` or `0x00`. No column has a length indicator
    - with null_byte='true' – all columns must have a null byte, whether or not the column is nullable. This qualifier forces for iq to use the fixed_length='true' modifier, regardless of what the command specifies
- csv – a format of character-coded values. Rows are output as character-coded data. Columns are separated by a designated column separator, and rows are terminated by a designated row terminator. Separators and terminators are user-defined.

with clause
: Provides options that modify the command’s operation.

column_separator = *string*

declares a string written between output columns in csv format, replacing the default. The string written for subsequent transfers defaults to the previously specified column_separator.

column_order = *option*

declares the order in which column data is written to the output. These options are:

- id – order by column ID, as given in syscolumns. This is the only acceptable column order when the transfer is for bcp, and is the default value for those transfers.
- name – order by column name as given in syscolumns, using the Adaptive Server current character set and sort order.
- name_utf8 – order by column name as given in syscolumns, translating the column name to UTF8 characters before sorting.
- offset – order by column offset within the data row. This is the only acceptable column order when the transfer is for ase, and is the default value for those transfers.

Adaptive Server issues an error message if you use a column_order that does not match the for clause format. The column orders are:

- for ase – use the offset column order
- for bcp – use the id column order

encryption = *option*

Specifies how the command handles encrypted columns. Options are:

- true – decrypt columns before transmission. This is the default value. The user must have permission to decrypt any encrypted columns.
- false – transmit columns encrypted exactly as they appear in the data row.

Note To recover the data, the receiver must know the encryption key and algorithm used to encrypt it. If Adaptive Server writes encrypted data to a file, it writes the data as it was encrypted when it was first stored in the table. Transferring the data does not alter it. To recover that data, the receiver must know the key that encrypted the data, and any special features of the encryption algorithm (for example, whether it used an initialization vector).

---

progress = *sss*

indicates that the transfer should generate progress messages every *sss* seconds during its operation. The default is to omit progress messages.

row_separator = *string*

Declares a string to be written at the end of each output row in csv format, replacing the default. This option has no effect unless the transfer is for csv. As with column_separator, the default for all transfers in csv mode after the first is the default value of the most recent successful transfer.The default row separator is platform-dependent: a line feed (Ctrl+J) on Linux and UNIX, or a carriage return and line feed (Ctrl+M Ctrl+J) on Windows.

resend =*id*

identifies a history entry from a table whose sequence ID column obtains the starting timestamp for this data transfer.This option resends previously sent data. resend =*id* is ignored unless the table named in the command is marked for incremental transfer. If the specified sequence ID does not exist for this table, Adaptive Server resends the entire table.

Adaptive Server selects the indicated entry's starting timestamp as the starting timestamp for this transfer, and the indicated entry's destination type (ase, bcp, and so on) as the transfer's default destination type.

Negative values for id retrieve history entries for previously completed successful transfers of the specified table. -1 names the most recently complete successful transfer, -2 the next most recent, and so forth. The transfer history table stores entries for both successful and failed transfers.

tracking_id =*nnn*

specifies an optional integer identifier that helps track a given transfer. Use the spt_TableTransfer.tracking_id column to determine the value for *nnn* and use the value in queries. This example returns the ending status and sequence ID of tracking ID number 123, along with the complete path to the output data file (returns NULL if these values do not exist):

```
select end_code, sequence_id, pathname from spt_TableTransfer
where id = object_id('mytable') and tracking_id = 123
```

Adaptive Server does not control the tracking_id or require that it be unique.

Note This tracking ID is not the sequence ID used for resend =*id*.

sync = true | false

determines how the transfer reacts with transactions. Option are:

- true – the transfer is synchronized so that rows from the table included in the transfer are captured as a group. transfer waits until all transactions affecting this table end before it starts. New transactions that affect this table cannot modify the table while transfer waits to start. Instead, they wait until transfer begins. While transfer is in progress, transactions cannot modify rows in this table until they are inspected by transfer.
- false – the transfer is not synchronized. transfer sends rows that are within the selected timestamp range, regardless of whether it can send other rows from the table. This is the default behavior.

Note sync affects only the tables you are transferring. transfer does not consider cross-table constraints.

fixed_length = true | false

determines whether transfer. . .for iq transfers all columns as fixed-length fields in the output file. Typically, Adaptive Server transfers varying-length strings with a 1- or 2-byte prefix length. Setting fixed_length to true causes Adaptive Server to pad strings with blanks until they reach column's maximum width. You must use the parameter with the for iq parameter. Setting fixed_length to:

- true – Adaptive Server pads strings to their full width instead of using a prefix length.
- false – Adaptive Server sends the string using the default behavior—sending the string with the prefix length.

null_byte = true | false

determines whether transfer. . .for iq appends a byte to the end of each transmitted column, indicating whether the column is null. Typically, Adaptive Server provides this byte only for nullable columns. Options are:

- true – Adaptive Server includes a null byte at the end of all columns—0 if the column is null, 1 if it is not—whether or not the column is nullable. true forces for iq to use the fixed_length='true' modifier, regardless of what you specified with the transfer command.
- false – Adaptive Server provides a null byte only for nullable columns.

Note Regardless of whether it is set to true or false, null_byte only applies to transfers that include for iq clause.

Examples

Example 1 Grants permission for user "john" to transfer table mytable:

```
grant transfer table on mytable to john
```

Example 2 Transfers mytable to an output file, formatted for loading into Sybase IQ. If this example did not include name_utf8, the default order would default to the column ID order:

```
transfer table mytable to '/path/to/file' for iq
with column_order = 'name_utf8'
```

Example 3 Transfers mytable, formatted for the Adaptive Server file format, which uses a column output order of offset. This example requests resend from a history entry that does not exist; therefore, the entire table is transferred:

```
transfer table mytable to '/path/to/file3/'for ase
with resend=10
```

The example changes the default column order for a for ase transfer. After the transfer, the default receiver is ase, the column order is offset, and column and row separators are null.

Usage

- transfer table sends only committed data that has changed since the previous transfer.
- The *string* argument to column_separator and row_separator in the with clause may be up to 64 bytes long, and may contain formatting instructions:
  - "\b"indicates a backspace, <BS> (Ctrl+H).
  - "\n" indicates a newline, <LF> (Ctrl+J).
  - "\r" indicates a carriage return, <CR> (Ctrl+M).

- "\t" indicates a <TAB> (Ctrl+I).
- "\\" indicates a backslash.
- Any "\" in the string that is not part of one of these sequences is an actual backslash, and appears as such in the string.

- transfer table .. from does not fire triggers during updates or inserts.
- When transfer table runs into an error (such as a duplicate key), Adaptive Server displays just an error number, making it difficult to understand the cause of the error. For example:

```
Msg 2633, Level 20, State 1
Server 'SYB155', Line 1
TRANSFER TABLE failed to insert a row to table 'my_tab'.
The indicated error was 2601.
Msg 16025, Level 16, State 1
Server 'SYB155', Line 1
TRANSFER TABLE my_tab: command failed with status 2633.
```

To retrieve the error message, manually query master..sysmessages. For example, if 2601 is your error number, enter:

```
select * from master..sysmessages where error = 2601
```

See the *Troubleshooting Guide* for more information about error 2601.

Transferring tables not marked for incremental transfer

You can use transfer table for tables that are not marked for incremental transfer, with these restrictions:

- Not all rows are always transferred. If a user updates the table while the transfer is in progress, the updated rows may not be transferred.
- The transfer is not incremental; you can transfer only the entire table, and later transfers are not notified of this transfer.
- No history entry is written to spt_TableTransfer. The transfer appears in monTableTransfer for the duration of the transfer, but once the transfer is complete the record vanishes.

Permissions

transfer table is available to the table owner and sa_role users. Table owners may grant or revoke transfer table to other users., using the grant or revoke commands.

Permission to transfer a table does not automatically grant permission to decrypt data within that table. To decrypt any encrypted columns, you must gain specific permission from the table owner.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
136	transfer table	transfer table	

See also

Commands create table, alter table

truncate lob

Description

Truncates a LOB to a specified length.

Syntax

truncate lob *locator_descriptor* [(*result_length*)]

Parameters

locator_descriptor

is a valid locator: a host variable, a local variable, or the literal binary value of a locator.

result_length

is a length, in characters, for text and unitext locators, and in bytes for image locators.

Examples

Truncates the LOB referenced by text locator *@w* to 20 characters:

```
truncate lob @w (20)
```

Usage

If *result_length* is not specified or is 0 (zero), Adaptive Server deallocates the LOB memory, and points the locator to a null LOB.

Permissions

Any user can execute truncate lob.

See also

Commands deallocate locator

Transact-SQL functions locator_valid, return_lob, create_locator

truncate table

Description

Removes all rows from a table or partition.

Syntax

truncate table [[*database*.]*owner*.]*table_name*
    [partition *partition_name]*

Parameters

table_name

is the name of the table to truncate. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

partition_name

specifies the name of the partition to truncate.

Examples

Example 1 Removes all data from the authors table:

```
truncate table authors
```

Example 2 Removes all data from the smallsales partition of the titles table:

```
truncate table titles partition smallsales
```

Usage

- truncate table deletes all rows from a table. The table structure and all the indexes continue to exist until you issue a drop table command. The rules, defaults, and constraints that are bound to the columns remain bound, and triggers remain in effect.
- Adaptive Server no longer uses distribution pages; statistical information is now stored in the tables sysstatistics and systabstats.

  During truncate table, statistical information is no longer deleted (deallocated), so you need not run update statistics after adding data.

  truncate table does not delete statistical information for the table.
- truncate table is equivalent to—but faster than—a delete command without a where clause. delete removes rows one at a time and logs each deleted row as a transaction; truncate table deallocates whole data pages and makes fewer log entries. Both delete and truncate table reclaim the space occupied by the data and its associated indexes.
- Truncating a partition does not affect the data in other partitions.
- You can truncate only one partition at a time.
- Truncating a table locks the entire table until the truncation process is complete.

- Because the deleted rows are not logged individually, truncate table cannot fire a trigger.
- You cannot use truncate table if another table has rows that reference it. Delete the rows from the foreign table, or truncate the foreign table, then truncate the primary table.
- You can grant and revoke permissions to users and roles to use truncate table on tables with the grant and revoke commands.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

Permissions

truncate table permission defaults to the table owner. Table owners can grant permissions for truncate table to other users. To truncate a system audit table (sysaudits_01, sysaudits_02, sysaudits_03, and so on, through sysaudits_08), you must have the a system security officer role.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
64	truncate	truncate table	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter table, create table, create trigger, delete, drop table, grant, revoke

union operator

Description

Returns a single result set that combines the results of two or more queries. Duplicate rows are eliminated from the result set unless the all keyword is specified.

Syntax

select [top *unsigned_integer*] *select_list*
    [into *clause*] [from *clause*] [where *clause*]
    [group by *clause*] [having *clause*]
    [union [all]
    select [top *unsigned_integer*] *select_list*
    [from *clause*] [where *clause*]
    [group by *clause*] [having *clause*]]...
    [order by *clause*]
    [compute *clause*]

Parameters

top *unsigned_integer*
: The top limit applies to the individual selects that form a union, not to the union as a whole.

into
: creates a new table based on the columns specified in the select list and the rows chosen in the where clause. The first query in the union operation is the only one that can contain an into clause.

union
: creates the union of data specified by two select statements.

all
: includes all rows in the results; duplicates are not removed.

Examples

Example 1 The result set includes the contents of the stor_id and stor_name columns of both the sales and sales_east tables:

```
select stor_id, stor_name from sales
union
select stor_id, stor_name from sales_east
```

Example 2 The into clause in the first query specifies that the results table holds the final result set of the union of the specified columns of the publishers, stores, and stores_east tables:

```
select pub_id, pub_name, city into results
from publishers
union
select stor_id, stor_name, city from stores
union
select stor_id, stor_name, city from stores_east
```

Example 3 First, the union of the specified columns in the sales and sales_east tables is generated. Then, the union of that result with publishers is generated. Finally, the union of the second result and authors is generated:

```
select au_lname, city, state from authors
union
 ((select stor_name, city, state from sales
union
select stor_name, city, state from sales_east)
union
select pub_name, city, state from publishers)
```

Example 4 Returns six rows. The top limit applies to the individual selects that form a union, not to the union as a whole:

```
select top 3 au_lname from authors
union all
select top 3 title from titles
```

Usage

- The maximum number of subqueries within a single side of a union is 50.
- The total number of tables that can appear on all sides of a union query is 256.
- You can use union in select statements, for example:

  ```
  create view
  select * from Jan1998Sales
  union all
  select * from Feb1998Sales
  union all
  ```

- The order by and compute clauses are allowed only at the end of the union statement to define the order of the final results or to compute summary values.
- The group by and having clauses can be used only within individual queries and cannot be used to affect the final result set.
- The default evaluation order of a SQL statement containing union operators is left-to-right.
- Since union is a binary operation, parentheses must be added to an expression involving more than two queries to specify evaluation order.
- The first query in a union statement may contain an into clause that creates a table to hold the final result set. The into statement must be in the first query, or you receive an error message (see Example 2).

- The union operator can appear within an insert...select statement. For example:

```
insert into sales.overall
  select * from sales
  union
  select * from sales_east
```

- All select lists in a SQL statement must have the same number of expressions (column names, arithmetic expressions, aggregate functions, and so on). For example, the following statement is invalid because the first select list contains more expressions than the second:

```
/* Example of invalid command--shows imbalance */ /*
in select list items */
select au_id, title_id, au_ord from titleauthor
union
select stor_id, date from sales
```

- Corresponding columns in the select lists of union statements must occur in the same order, because union compares the columns one-to-one in the order given in the individual queries.

- The column names in the table resulting from a union are taken from the *first* individual query in the union statement. To define a new column heading for the result set, do it in the first query. Also, to refer to a column in the result set by a new name (for example, in an order by statement), refer to it by that name in the first select statement. For example, the following query is correct:

```
select Cities = city from stores
union
select city from stores_east
order by Cities
```

- The descriptions of the columns that are part of a union operation do not have to be identical. Table 1-34 lists the rules for the datatypes and the corresponding column in the result table.

Table 1-34: Resulting datatypes in union operations

Datatype of columns in union operation	Datatype of corresponding column in result table
Not datatype-compatible (data conversion is not handled implicitly by Adaptive Server)	Error returned by Adaptive Server.
Both are fixed-length character with lengths L1 and L2	Fixed-length character with length equal to the greater of L1 and L2.
Both are fixed-length binary with lengths L1 and L2	Fixed-length binary with length equal to the greater of L1 and L2.

Datatype of columns in union operation	Datatype of corresponding column in result table
Either or both are variable-length character	Variable-length character with length equal to the maximum of the lengths specified for the column in the union.
Either or both are variable-length binary	Variable-length binary with length equal to the maximum of the lengths specified for the columns in the union.
Both are numeric datatypes (for example, smallint, int, float, money)	A datatype equal to the maximum precision of the two columns. For example, if a column in table A is of type int and the corresponding column in table B is of type float, then the datatype of the corresponding column of the result table is float, because float is more precise than int.
Both column descriptions specify NOT NULL	Specifies NOT NULL.

Restrictions

- You cannot use the union operator in a subquery.
- You cannot use the union operator with the for browse clause.

Standards

ANSI SQL – Compliance level: Entry-level compliant

The following are Transact-SQL extensions:

- The use of union in the select clause of an insert statement
- Specifying new column headings in the order by clause of a select statement when the union operator is present in the select statement

See also

Commands compute clause, declare, group by and having clauses, order by clause, select, where clause

Functions convert

unmount

Description

Shuts down the database and drops it from the Adaptive Server. The devices are also deactivated and dropped. The database and its pages are not altered when they are unmounted. The database pages remain on the OS devices. Once the unmount command completes, you can disconnect and move the devices at the source Adaptive Server if necessary. Use the *manifest_file* extension to create the manifest file for use at the secondary Adaptive Server.

The unmount command limits the number of databases to eight in a single command.

Warning! The unmount command removes a database and all its information from the Adaptive Server. Use the unmount command only when you want to remove the database from one Adaptive Server to another Adaptive Server.

Syntax

unmount database *dbname_list* to *manifest_file*

Parameters

dbname_list
the database being unmounted. You can unmount more than one database.

manifest_file
the binary file that describes the databases that are present on a set of database devices. It can be created only if the set of databases that occupy those devices are isolated and self-contained on those devices.

Since the manifest file is a binary file, operations that perform character translations of the file contents (such as ftp) will corrupt the file unless done in binary mode.

Examples

Example 1 unmount databases from an Adaptive Server and create the manifest file for the database:

```
unmount database pubs2 to "/work2/Devices/Mpubs2_file"
```

Example 2 The encryption key created in key_db has been used to encrypt columns in col_db. These commands successfully unmount the named databases:

```
unmount database key_db, col_db
unmount database key_db with override
unmount database col_db with override
```

Usage

You cannot:

- Unmount system databases. However, you can unmount sybsystemprocs.
- Unmount proxy databases or user created temporary databases.

- Use the unmount command in a transaction.
- Unmount a database on an HA-configured server.

Cluster Edition

mount database and unmount database are supported in the Cluster Edition. If an instance fails while one of these commands is in progress, the command may abort. In this case, the user must re-issue mount database or unmount database when the instance failover recovery is complete.

Encrypted columns and *unmount database*

- When columns are encrypted by keys from other databases, unmount all related databases as a set. The interdependency of the databases containing the encrypted columns and the databases containing the keys is similar to the interdependency of databases that use referential integrity.
- Use the override option to unmount a database containing columns encrypted by a key in another database (Adaptive Server issues a warning message, but the operation is successful).
- If you do not include with override, commands fail with an error message

These commands will fail with an error message without the override:

```
unmount database key_db
```

```
unmount database col_db
```

Standards

ANSI SQL – Compliance level: Entry-level compliant.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
102	unmount	unmount database	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a set proxy is in effect

See also

Commands mount, quiesce database

update

Description

Changes data in existing rows, either by adding data or by modifying existing data.

Syntax

```
update [top unsigned_integer]
          [[database.]owner.]{table_name | view_name}
          set [[[database.]owner.]{table_name.|view_name.}]
          column_name1 =
          {expression1 | NULL | (select_statement)} |
          variable_name1 =
          {expression1 | NULL | (select_statement)}
          [, column_name2 =
          {expression2 | NULL | (select_statement)}]... |
          [, variable_name2 =
          {expression2 | NULL | (select_statement)}]...

          [from [[database.]owner.]{view_name [readpast]|
               table_name
                    [(index {index_name | table_name}
                         [prefetch size][lru|mru])]}
                    [readpast]
               [,[[database.]owner.]{view_name [readpast] | table_name
                    [(index {index_name | table_name}
                         [prefetch size][lru|mru])]}]
                    [readpast] ...]
          [where search_conditions]
          [plan "abstract plan"]
```

```
update [[database.]owner.]{table_name | view_name}
          set [[[database.]owner.]{table_name.|view_name.}]
               column_name1 =
                    {expression1 | NULL | (select_statement)} |
               variable_name1 =
                    {expression1 | NULL | (select_statement)}
               [, column_name2 =
                    {expression2 | NULL | (select_statement)}]... |
               [, variable_name2 =
                    {expression2 | NULL | (select_statement)}]...
          where current of cursor_name
```

Parameters

table_name | *view_name*

is the name of the table or view to update. Specify the database name if the table or view is in another database, and specify the owner's name if more than one table or view of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

top *unsigned_integer*
: inserts the top *n* clause immediately after the keyword, and limits the number of rows updated.

set
: specifies the column name or variable name and assigns the new value. The value can be an expression or a NULL. When more than one column name or variable name and value are listed, they must be separated by commas.

from
: uses data from other tables or views to modify rows in the table or view you are updating.

readpast
: causes the update command to modify unlocked rows only on datarows-locked tables, or rows on unlocked pages, for datapages-locked tables. update...readpast silently skips locked rows or pages rather than waiting for the locks to be released.

where
: is a standard where clause (see where clause).

index {*index_name* | *table_name*}
: *index_name* specifies the index to be used to access *table_name*. You cannot use this option when you update a view.

prefetch *size*

specifies the I/O size, in kilobytes, for tables bound to caches with large I/Os configured. You cannot use this option when you update a view. sp_helpcache shows the valid sizes for the cache to which an object is bound or for the default cache. To configure the data cache size, use sp_cacheconfigure.

When using prefetch and designating the prefetch size (*size*), the minimum is 2K and any power of two on the logical page size up to 16K. prefetch size options in kilobytes are:

Logical page size	Prefetch size options
2	2, 4, 8 16
4	4, 8, 16, 32
8	8, 16, 32, 64
16	16, 32, 64, 128

The prefetch size specified in the query is only a suggestion. To allow the size specification configure the data cache at that size. If you do not configure the data cache to a specific size, the default prefetch size is used.

If CIS is enabled, you cannot use prefetch for remote servers.

lru | mru

specifies the buffer replacement strategy to use for the table. Use lru to force the optimizer to read the table into the cache on the MRU/LRU (most recently used/least recently used) chain. Use mru to discard the buffer from cache and replace it with the next buffer for the table. You cannot use this option when you update a view.

where current of

causes Adaptive Server to update the row of the table or view indicated by the current cursor position for *cursor_name*.

index_name

is the name of the index to be updated. If an index name is not specified, the distribution statistics for all the indexes in the specified table are updated.

plan "*abstract plan*"

specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. See Chapter 30, “Creating and Using Abstract Plans,” in the *Performance and Tuning Guide* for more information.

Examples

Example 1 All the McBaddens in the authors table are now MacBaddens:

```
update authors
```

```
set au_lname = "MacBadden"
where au_lname = "McBadden"
```

Example 2 Modifies the total_sales column to reflect the most recent sales recorded in the sales and salesdetail tables. This assumes that only one set of sales is recorded for a given title on a given date, and that updates are current:

```
update titles
set total_sales = total_sales + qty
from titles, salesdetail, sales
where titles.title_id = salesdetail.title_id
    and salesdetail.stor_id = sales.stor_id
    and salesdetail.ord_num = sales.ord_num
    and sales.date in
         (select max (sales.date) from sales)
```

Example 3 Changes the price of the book in the titles table that is currently pointed to by title_crsr to $24.95:

```
update titles
set price = 24.95
where current of title_crsr
```

Example 4 Finds the row for which the IDENTITY column equals 4 and changes the price of the book to $18.95. Adaptive Server replaces the syb_identity keyword with the name of the IDENTITY column:

```
update titles
set price = 18.95
where syb_identity = 4
```

Example 5 Updates the titles table using a declared variable:

```
declare @x money
select @x = 0
update titles
    set total_sales = total_sales + 1,
    @x = price
    where title_id = "BU1032"
```

Example 6 Updates rows on which another task does not hold a lock:

```
update salesdetail set discount = 40
        from salesdetail readpast
    where title_id like "BU1032"
        and qty > 100
```

Usage

- Use update to change values in rows that have already been inserted. Use insert to add new rows.
- You can refer to as many as 15 tables in an update statement.

- update interacts with the ignore_dup_key, ignore_dup_row, and allow_dup_row options set with the create index command. See create index for more information.
- You can define a trigger that takes a specified action when an update command is issued on a specified table or on a specified column in a table.
- In pre-12.5.2 versions of Adaptive Server, queries that used update and delete on views with a union all clause were sometimes resolved without using worktables, which occasionally lead to incorrect results. In Adaptive Server 12.5.2, queries that use update and delete on views with a union all clause are always resolved using worktables in tempdb.

Using variables in *update* statements

- You can assign variables in the set clause of an update statement, similarly to setting them in a select statement.
- Before you use a variable in an update statement, you must declare the variable using declare, and initialize it with select, as shown in Example 5.
- Variable assignment occurs for every qualified row in the update.
- When a variable is referenced on the right side of an assignment in an update statement, the current value of the variable changes as each row is updated. The **current value** is the value of the variable just before the update of the current row. The following example shows how the current value changes as each row is updated.

  Suppose you have the following statement:

```
declare @x int
select @x=0
update table1
    set C1=C1+@x, @x=@x+1
    where column2=xyz
```

  The value of C1 before the update begins is 1. The following table shows how the current value of the *@x* variable changes after each update:

Row	Initial C1 value	Initial @x value	Calculations: C1+@x= updated C1	Updated C1 value	Calculations: @x+1= updated @x	Updates value
A	1 0		1+0	1	0+1	1
B	1	1	1+1	2	1+1	2
C	2	2	2+2	4	2+1	3
D	4	3	4+3	7	3+1	4

- When multiple variable assignments are given in the same update statement, the values assigned to the variables can depend on their order in the assignment list, but they might not always do so. For best results, do not rely on placement to determine the assigned values.
- If multiple rows are returned and a nonaggregating assignment of a column to a variable occurs, then the final value of the variable is the last row processed; therefore, it might not be useful.
- An update statement that assigns values to variables need not set the value of any qualified row.
- If no rows qualify for the update, the variable is not assigned.
- A variable that is assigned a value in the update statement cannot be referenced in subquery in that same update statement, regardless of where the subquery appears in that update statement.
- A variable that is assigned a value in the update statement cannot be referenced in a where or having clause in that same update statement.
- In an update driven by a join, a variable that is assigned a value in the right hand side of the update statement uses columns from the table that is not being updated. The result value depends on the join order chosen for the update and the number of rows that qualify from the joined table.
- Updating a variable is not affected by a rollback of the update statement because the value of the updated variable is not stored on disk.

Using *update* with transactions

When you set chained transaction mode on, and no transaction is currently active, Adaptive Server implicitly begins a transaction with the update statement. To complete the update, you must either commit the transaction or rollback the changes. For example:

```
update stores set city = 'Concord'
    where stor_id = '7066'
if exists (select t1.city, t2.city
    from stores t1, stores t2
    where t1.city = t2.city
    and t1.state = t2.state
    and t1.stor_id < t2.stor_id)
        rollback transaction
else
        commit transaction
```

This batch begins a transaction (using chained transaction mode) and updates a row in the stores table. If it updates a row containing the same city and state information as another store in the table, it rolls back the changes to the stores table and ends the transaction. Otherwise, it commits the updates and ends the transaction.

Adaptive Server does not prevent you from issuing an update statement that updates a single row more than once in a given transaction. For example, both of these updates affect the price of the book with title_id MC2022, since its type id "mod_cook":

```
begin transaction
update titles
set price = price + $10
where title_id = "MC2222"
update titles
set price = price * 1.1
where type = "mod_cook"
```

Using joins in updates

Performing joins in the from clause of an update is an Transact-SQL extension to the ANSI standard SQL syntax for updates. Because of the way an update statement is processed, updates from a single statement do not accumulate. That is, if an update statement contains a join, and the other table in the join has more the one matching value in the join column, the second update is not based on the new values from the first update but on the original values. The results are unpredictable, since they depend on the order of processing. Consider this join:

```
update titles set total_sales = total_sales + qty
    from titles t, salesdetail sd
    where t.title_id = sd.title_id
```

The total_sales value is updated only once for each title_id in titles, for *one* of the matching rows in salesdetail. Depending on the join order for the query, on table partitioning, or on the indexes available, the results can vary each time. But each time, only a single value from salesdetail is added to the total_sales value.

If the intention is to return the sum of the values that match the join column, the following query, using a subquery, returns the correct result:

```
update titles set total_sales = total_sales +
     (select isnull (sum (qty),0)
        from salesdetail sd
        where t.title_id = sd.title_id)
    from titles t
```

Using *update* with character data

- Updating variable-length character data, or text or unitext columns with the empty string ("") inserts a single space. Fixed-length character columns are padded to the defined length.
- All trailing spaces are removed from variable-length column data, except when a string contains only spaces. Strings that contain only spaces are truncated to a single space. Strings longer than the specified length of a char, nchar, unichar, varchar, univarchar, or nvarchar column are silently truncated unless you set string_rtruncation on.
- An update to a text or unitext column initializes the text or unitext column, assigns it a valid text pointer, and allocates at least one text page.

Using *update* with cursors

- You cannot update a scrollable cursor.
- To update a row using a cursor, define the cursor with declare cursor, then open it. The cursor name cannot be a Transact-SQL parameter or a local variable. The cursor must be updatable, or Adaptive Server returns an error. Any update to the cursor result set also affects the base table row from which the cursor row is derived.
- The *table_name* or *view_name* specified with an update...where current of must be the table or view specified in the first from clause of the select statement that defines the cursor. If that from clause references more than one table or view (using a join), you can specify only the table or view being updated.

  After the update, the cursor position remains unchanged. You can continue to update the row at that cursor position, provided another SQL statement does not move the position of that cursor.
- Adaptive Server allows you to update columns that are not specified in the list of columns of the cursor's *select_statement*, but that are part of the tables specified in the *select_statement*. However, when you specify a *column_name_list* with for update, and you are declaring the cursor, you can update only those specific columns.

Updating IDENTITY columns

You cannot update a column with the IDENTITY property, either through its base table or through a view. To determine whether a column was defined with the IDENTITY property, use sp_help on the column's base table.

An IDENTITY column selected into a result table observes the following rules with regard to inheritance of the IDENTITY property:

- If an IDENTITY column is selected more than once, it is defined as NOT NULL in the new table. It does not inherit the IDENTITY property.
- If an IDENTITY column is selected as part of an expression, the resulting column does not inherit the IDENTITY property. It is created as NULL if any column in the expression allows nulls; otherwise, it is NOT NULL.
- If he select statement contains a group by clause or aggregate function, the resulting column does not inherit the IDENTITY property. Columns that include an aggregate of the IDENTITY column are created NULL; others are created NOT NULL.
- An IDENTITY column that is selected into a table with a union or join does not retain the IDENTITY property. If the table contains the union of the IDENTITY column and a NULL column, the new column is defined as NULL. Otherwise, it is defined as NOT NULL.

Updating data through views

- You cannot update views defined with the distinct clause.
- If a view is created with check option, each row that is updated through the view must remain visible through the view. For example, the stores_cal view includes all rows of the stores table where state has a value of “CA”. The with check option clause checks each update statement against the view’s selection criteria:

  ```
  create view stores_cal
  as select * from stores
  where state = "CA"
  with check option
  ```

  An update statement such as this one fails if it changes state to a value other than “CA”:

  ```
  update stores_cal
  set state = "WA"
  where store_id = "7066"
  ```

- If a view is created with check option, all views derived from the base view must satisfy the view’s selection criteria. Each row updated through a *derived* view must remain visible through the base view.

  Consider the view stores_cal30, which is derived from stores_cal. The new view includes information about stores in California with payment terms of “Net 30”:

  ```
  create view stores_cal30
  as select * from stores_cal
  where payterms = "Net 30"
  ```

Because stores_cal was created with check option, all rows updated through stores_cal30 must remain visible through stores_cal. Any row that changes state to a value other than “CA” is rejected.

Notice that stores_cal30 does not have a with check option clause of its own. Therefore, you can update a row with a *payterms* value other than “Net 30” through stores_cal30. For example, the following update statement would be successful, even though the row would no longer be visible through stores_cal30:

```
update stores_cal30
set payterms = "Net 60"
where stor_id = "7067"
```

- You cannot update a row through a view that joins columns from two or more tables, unless both of the following conditions are true:
  - The view has no with check option clause, and
  - All columns being updated belong to the same base table.
- update statements are allowed on join views that contain a with check option clause. The update fails if any of the affected columns appear in the where clause in an expression that includes columns from more than one table.
- If you update a row through a join view, all affected columns must belong to the same base table.

Using *index*, *prefetch*, or *lru* | *mru*

index, prefetch, and lru | mru override the choices made by the Adaptive Server optimizer. Use them with caution, and always check the performance impact with set statistics io on. For more information about using these options, see the *Performance and Tuning Guide*.

Using *readpast*

- The readpast option applies only to data-only-locked tables. readpast is ignored if it is specified for an allpages-locked table.
- The readpast option is incompatible with the holdlock option. If both are specified in the same select command, an error is generated and the command terminates.
- If the session-wide isolation level is 3, the readpast option is ignored.

- If the transaction isolation level for a session is 0, update commands using readpast do not issue warning messages. For datapages-locked tables, these commands modify all rows on all pages that are not locked with incompatible locks. For datarows-locked tables, they affect all rows that are not locked with incompatible locks.
- If an update command with readpast applies to two or more text columns, and the first text column checked has an incompatible lock on it, readpast locking skips the row. If the column does not have an incompatible lock, the command acquires a lock and modifies the column. Then, if any subsequent text column in the row has an incompatible lock on it, the command blocks until it can obtain a lock and modify the column.
- See the *Performance and Tuning Guide* for more on readpast.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The following are Transact-SQL extensions:

- The use of a from clause or a qualified table or column name are Transact-SQL extensions detected by the FIPS flagger. Updates through a join view or a view of which the target list contains an expression are Transact-SQL extensions that cannot be detected until run time and are not flagged by the FIPS flagger.
- The use of variables.
- readpast

Permissions

update permission defaults to the table or view owner, who can transfer it to other users.

If set ansi_permissions is on, you need update permission on the table being updated and, in addition, you must have select permission on all columns appearing in the where clause and on all columns following the set clause. By default, ansi_permissions is off.

Auditing

Values in event and extrainfo columns of sysaudits are:

Event	Audit option	Command or access audited	Information in extrainfo
70	update	update to a table	• *Roles* – current active roles • *Keywords or options* – update or writetext • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

Event	Audit option	Command or access audited	Information in extrainfo
71	update	update to a view	• *Roles* – current active roles • *Keywords or options* – update or writetext • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if set proxy is in effect

See also

Commands alter table, create default, create index, create rule, create trigger, insert, where clause

System procedures sp_bindefault, sp_bindrule, sp_help, sp_helpartition, sp_helpindex, sp_unbindefault, sp_unbindrule

update all statistics

Description

Updates all statistics information for a given table. You can run update all statistics on a single data partition.

Syntax

update all statistics *table_name* [partition *data_partition_name*]

Parameters

table_name
is the name of the table for which statistics are being updated.

data_partition_name
is the name of the partition to be updated. Statistics for each local index partition on the data partition is updated. Does not update statistics for global indexes.

Examples

Example 1 Updates all statistics for the salesdetail table:

```
update all statistics salesdetail
```

Example 2 Updates all statistics for the smallsales partition on salesdetail table:

```
update all statistics salesdetail partition smallsales
```

Usage

- update all statistics updates all the statistics information for a given table. Adaptive Server keeps statistics about the distribution of pages within a table, and uses these statistics when considering whether or not to use a parallel scan in query processing on partitioned tables, and which index (es) to use in query processing. The optimization of your queries depends on the accuracy of the stored statistics.
- Histogram statistics are created on each column, either through an index scan of a leading column or a projection of the column into a work table, followed by a sort.
- Density statistics are created for all the prefix subsets of the columns of index (es) whose statistics is being updated. For example, if an index is on columns c1, c2 and c3, then the prefix subsets are (c1,c2) and (c1, c2, c3).
- When you run update all statistics on a single data partition, histograms are generated for each leading column of the local indexes using an index scan. For all other columns, including leading columns of a global index, update all statistics performs a data scan followed by a sort.
- update statistics commands create partition-specific statistics. Global statistics are implicitly created during partition statistics creation. The partition statistics serve as input to global statistics creation and enable per-partition DDL operations. Global statistics are used by the optimizer.

- update all statistics regenerates and update the table statistics stored in systabstats for each data and index partition of the table. If the update all statistics command is run for a specific data partition, the table statistitics are generated and updated only for that data partition and any local index partitions. Global indexes are skipped.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

update all statistics permission defaults to the table owner and is not transferrable.

See also

Commands update statistics, update index statistics, update statistics, update table statistics

update index statistics

Description

Updates the statistics for all columns in an index.

Syntax

```
update index statistics
        table_name [[partition data_partition_name] |
        [index_name [partition index_partition_name]]]
        [using step values]
        [with consumers = consumers] [, sampling=N percent]
```

Parameters

table_name
when used with update statistics, *table_name* is the name of the table with which the index is associated. *table_name* is required, since Transact-SQL does not require index names to be unique in a database.

data_partition_name
is the name of the partition to be updated. Statistics for each local index partition on the data partition is updated. Does not update statistics for global indexes.

index_name
is the name of the index to be updated. If an index name is not specified, the distribution statistics for all the indexes in the specified table are updated.

index_partition_name
is the name of the index partition to be updated.

using *step* values
specifies the number of histogram steps. The default value is 20, for columns where no statistics exist. If you need to change the default for this, use sp_configure to modify the *number of histogram steps* parameter. If statistics for a column already exist in sysstatistics, the default value is the current number of steps.

The steps are applied to each partition of a partitioned table—for example, update index statistics uses the default value of 20 steps for each data and index partition involved in the scan for updating statistics. If global statistics are generated through an index scan of a global index, then 20 steps are applied by default. If partition statistics are generated, either through a data scan or local index scan, then 20 steps are applied by default for each partition.

If the histogram steps specified through using *step* values is M, and the *histogram tuning factor* parameter is N, then update index statistics uses between M and M*N steps, depending on the number of frequency cells that update index statistics isolates.

with consumers = *consumers*
specifies the number of consumer processes to be used for a sort when *column_list* is provided and parallel query processing is enabled. The consumers option specifies the degree of parallelism applied to a sort performed for statistics update on a single data partition. For example, if update statistics with a column list is applied to a table with three data partitions, data from each of the three partitions is sorted separately and the consumers option is applied during each of the sort. The three sorts themselves are not performed in parallel.

with sampling = *N* percent
specifies the percentage of the column to be randomly sampled in order to gather statistics. The value for *N* is any number between 1 and 100.

Examples

Example 1 Generates statistics for all columns in all indexes of the authors table:

```
update index statistics authors
```

Example 2 Generates statistics for all columns in the au_names_ix index of the authors table:

```
update index statistics authors au_names_ix
```

Example 3 Generates statistics on all inner columns of the au_names_ix index using a sampling rate of 20 percent.

```
update index statistics authors au_names_ix
    with sampling = 20 percent
```

The statistics for the leading column of au_names_ix is gathered using a full scan of the index pages; sampling is not applied on this column.

Example 4 Generates statistics for all the columns of an index partition:

```
update index statistics publishers publish1_idx
    partition p1
```

Usage

- update index statistics, when used with a table name and an index name, updates statistics for all columns in the specified index. If update index statistics is used with just a table name, it updates statistics for all columns in all indexes of the table.
- If you run update index statistics against large tables, the command fails with error number 1105 if tempdb is not large enough to process the command.
- Specifying the name of an unindexed column or the nonleading column of an index generates statistics for that column without creating an index.

- Histogram statistics are created for each column of index (es) whose statistics is being updated.
- Density statistics are created for all the prefix subsets of the columns of index (es) whose statistics are being updated.
- If you use update index statistics on a specific partition, you update global statistics implicitly as well.
- The partition statistics serve as input to global statistics creation and enable per-partition DDL operations. Global statistics are used by the optimizer.
- update index statistics also regenerates and updates the table statistics stored in systabstats for each data and index partition of the table the command updates. If you run the update index statistics command for a specific data partition, the table statistitics are generated and updated only for that data partition and for any local index partitions. Global indexes are skipped. If you run the update index statistics for a specific index partition, only the table statistics for that index partition are updated.
- The with consumers clause is designed for use on partitioned tables on RAID devices, which appear to Adaptive Server as a single I/O device, but which are capable of producing the high throughput required for parallel sorting. See Chapter 24, “Parallel Sorting,” in the *Performance and Tuning Guide*.
- The update index statistics command generates a series of update statistics operations that use the same locking, scanning, and sorting as the equivalent index-level and column-level command. For example, if the salesdetail table has a nonclustered index named sales_det_ix on salesdetail (stor_id, ord_num, title_id), the update index statistics salesdetail command performs these update statistics operations:

```
update statistics salesdetail sales_det_ix
update statistics salesdetail (ord_num)
update statistics salesdetail (title_id)
```

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

update index statistics permission defaults to the table owner and is not transferable. The command can also be executed by the database owner, who can impersonate the table owner by running the setuser command.

See also

Commands delete statistics, update all statistics, update statistics, update table statistics

Documentation *Performance and Tuning Guide*

update statistics

Description

Updates information about the distribution of key values in specified indexes, for all columns in an index, table, or partition, and resets the data change counters for global nonclustered indexes.

Syntax

```
update statistics table_name
        [[partition data_partition_name] [(column_list)] |
        index_name [partition index_partition_name]]
        [using step values]
        [with consumers = consumers][, sampling=N percent]
```

Parameters

table_name
when used with update statistics, *table_name* is the name of the table with which the index is associated. *table_name* is required, since Transact-SQL does not require index names to be unique in a database.

index_name
is the name of the index to be updated. If an index name is not specified, the distribution statistics for all the indexes in the specified table are updated.

data_partition_name
is the name of the partition to be updated. Statistics for each local index partition on the data partition is updated. Does not update statistics for global indexes.

index_partition_name
is the name of the index partition to be updated.

column_list
is a comma-separated list of columns.

using *step* values

specifies the number of histogram steps. The default value is 20, for columns where no statistics exist. If you need to change the default for this, use sp_configure to modify the *number of histogram steps* parameter. If statistics for a column already exist in sysstatistics, the default value is the current number of steps.

The steps are applied to each partition of a partitioned table—for example, update statistics uses the default value of 20 steps for each data and index partition involved in the scan for updating statistics. If global statistics are generated through an index scan of a global index, then 20 steps are applied by default. If partition statistics are generated, either through a data scan or local index scan, then 20 steps are applied by default for each partition.

If the histogram steps specified through using *step* values is M, and the *histogram tuning factor* parameter is N, then update statistics uses between M and M*N steps, depending on the number of frequency cells that update statistics isolates.

with consumers = *consumers*

specifies the number of consumer processes to be used for a sort when *column_list* is provided and parallel query processing is enabled. The consumers option specifies the degree of parallelism applied to a sort performed for statistics update on a single data partition. For example, if update statistics with a column list is applied to a table with three data partitions, data from each of the three partitions is sorted separately and the consumers option is applied during each of the sort. The three sorts themselves are not performed in parallel.

with sampling = *N* percent

specifies the percentage of the column to be randomly sampled in order to gather statistics. The value for *N* is any number between 1 and 100. Sampling applies to all update statistics types:

- update statistics *table_name*
- update statistics *table_name* (*col_name*)
- update index statistics
- update all statistics

index

specifies that statistics for all columns in an index are to be updated.

Examples

Example 1 Generates statistics for the price column of the titles table:

```
update statistics titles (price) using 40 values
```

Example 2 Updates statistics on the data partition smallsales Adaptive Server creates histograms for each leading column and densities for the composite columns of each local index of the data partition. Statistics are not updated for global indexes:

```
update statistics titles partition smallsales
```

Example 3 Updates statistics on the data partition smallsales. Adaptive Server creates histograms on column col1 and creates densities for the composite columns col1 and col2:

```
update statistics titles partition smallsales (col1,
col2)
```

Usage

- Adaptive Server keeps statistics about the distribution of the key values in each index, and uses these statistics in its decisions about which index (es) to use in query processing.
- When you create a nonclustered index on a table that contains data, update statistics is automatically run for the new index. When you create a clustered index on a table that contains data, update statistics is automatically run for all indexes.
- Running update statistics on an empty table does not affect the system tables.
- The optimization of your queries depends on the accuracy of the statistics. If there is significant change in the key values in your index, you should rerun update statistics on that index or column. Use the update statistics command if a great deal of data in an indexed column has been added, changed, or removed (that is, if you suspect that the distribution of key values has changed).
- You should also run update statistics on system tables with a large number of rows. If you have permission to run the command on a user table, it is no different with respect to system table. Without statistics, there is always a chance for system stored procedures to perform poorly.
- update statistics skips global indexes when you run the command on a data partition.
- update statistics, when used with a table name and an index name, updates statistics for the leading column of an index. If update statistics is used with just a table name, it updates statistics for the leading columns of all indexes on the table.
- Specifying the name of an unindexed column or the nonleading column of an index generates statistics for that column without creating an index.

- Specifying more than one column in a column list generates or updates a histogram for the first column, and density statistics for all prefix subsets of the list of columns.
- If you use update statistics to generate statistics for a column or list of columns, update statistics must scan the table and perform a sort.
- If you use update statistics on a specific partition, you update global statistics implicitly as well.
- update statistics regenerates and updates the table statistics stored in systabstats for each data and index partition of the table the command updates. If you run the update statistics command for a specific data partition, the table statistitics are generated and updated only for that data partition and for any local index partitions. Global indexes are skipped. If you run the update statistics for a specific index partition, only the table statistics for that index partition are updated.
- The with consumers clause is designed for use on partitioned tables on RAID devices, which appear to Adaptive Server as a single I/O device, but which are capable of producing the high throughput required for parallel sorting. See Chapter 24, “Parallel Sorting,” in the *Performance and Tuning Guide*.
- Table 1-35 shows the types of scans performed during update statistics, the types of locks acquired, and when sorts are needed.

Table 1-35: Locking, scans, and sorts during update statistics

update statistics specifying	Scans and sorts performed	Locking
Table name		
Allpages-locked table	Table scan, plus a leaf-level scan of each nonclustered index	Level 1; shared intent table lock, shared lock on current page
Data-only-locked table	Table scan, plus a leaf-level scan of each nonclustered index and the clustered index, if one exists	Level 0; dirty reads
Table name and clustered index name		
Allpages-locked table	Table scan	Level 1; shared intent table lock, shared lock on current page
Data-only-locked table	Leaf level index scan	Level 0; dirty reads
Table name and nonclustered index name		
Allpages-locked table	Leaf level index scan	Level 1; shared intent table lock, shared lock on current page
Data-only-locked table	Leaf level index scan	Level 0; dirty reads
Table name and column name		

update statistics specifying	Scans and sorts performed	Locking
Allpages-locked table	Table scan; creates a worktable and sorts the worktable	Level 1; shared intent table lock, shared lock on current page
Data-only-locked table	Table scan; creates a worktable and sorts the worktable	Level 0; dirty reads

- The update index statistics command generates a series of update statistics operations that use the same locking, scanning, and sorting as the equivalent index-level and column-level command. For example, if the salesdetail table has a nonclustered index named sales_det_ix on salesdetail (stor_id, ord_num, title_id), the update index statistics salesdetail command performs these update statistics operations:

```
update statistics salesdetail sales_det_ix
update statistics salesdetail (ord_num)
update statistics salesdetail (title_id)
```

- update statistics is not run on system tables in the master database during upgrade from earlier versions. Indexes exist on columns queried by most system procedures, and running update statistics on these tables is not required for normal usage. However, running update statistics is allowed on all system tables in all databases, except those that are not normal tables. These tables, which are built from internal structures when queried, include syscurconfigs, sysengines, sysgams, syslisteners, syslocks, syslogs, syslogshold, sysmonitors, sysprocesses, syssecmechs, systestlog and systransactions.

  You do not need to run update statistics on Replication Server RSSD tables. Running updates statistics on these tables can result in Replication Server errors if you run it while Replication Server attempts to access the RSSD tables. RSSD tables and their format are specific to Replication Server processing.

update statistics and sampling

Sampling is not performed for leading columns of indexes. If you specify an index in update statistics, such as in the following:

```
update statistics table_name [index_name] with sampling = N percent
```

This command creates and updates statistics on the leading column of all indexes on the specified table, or the leading column of a specified index.

When you use the sampling = *N* percent option with the using *steps* value , you must specify the sampling = *N* percent option last:

```
update statistics titles (type)
```

```
    using 40 value
    with sampling = 10 percent
```

If you do not, you get an error message:

```
update statistics titles (type)
    with sampling = 10 percent
    using 40 value

Msg 156, Level 15, State 2:
Line 1:
Incorrect syntax near the keyword 'using'.
```

create index and stored procedures

Adaptive Server automatically recompiles stored procedures after executing update statistics statements. Although ad hoc queries that you start before executing update statistics still continue to work, they do not take advantage of the new statistics.

In Adaptive Server versions 12.5 and earlier, update statistics was ignored by cached stored procedures.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

update statistics permission defaults to the table owner and is not transferable. The command can also be executed by the database owner, who can impersonate the table owner by running the setuser command.

See also

Commands delete statistics, update all statistics, update index statistics, update table statistics

Documentation *Performance and Tuning Guide*

update table statistics

Description

update table statistics updates statistics that are stored in systabstats table, such as rowcount, cluster ratios, and so on. update table statistics does not affect column statistics stored in sysstatistics.

Syntax

update table statistics *table_name*
    [partition *data_partition_name*]
    [*index_name* [partition *index_partition_name*]]

Parameters

table_name
is the name of the table you are updating the statistics for.

data_partition_name
is the name of the data partition for which you are updating the statistics for. If you do not include this, table statistics for all the the data partitions are updated.

index_name
is the name of index associated with the partition.

index_partition_name
is the name of the index partition.

Examples

Example 1 Performs a table statistics update on the smallsales partition:

```
update table statistics titles partition smallsales
```

Example 2 Performs a table statistics update on all of the partitions in the titles table:

```
update table statistics titles
```

Usage

- update table statistics does not update statistics for index partitions. To generate table-level statistics for index partitions, use update statistics.
- Because running update table statistics incurs the I/O cost of running update statistics, use update statistics to generate both column and table statistics.

  You can create, and then drop, a global index to generate global statistics.

  When you run update statistics on a single partition, you create global statistics by merging partition statistics. However, these merged global statistics are less accurate than the global statistics created as a side-effect of global index creation. Avoid generating column statistics that overwrite more accurate, earlier versions of column statistics.

  When you specify:

- *index_name* – update table statistics updates statistics for all the index partitions of the index.
- *index_partition* – update table statistics updates statistics for the specific index partition.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

update table statistics permission defaults to the table owner and is not transferable. The command can also be executed by the database owner, who can impersonate the table owner by running the setuser command.

See also

Commands update all statistics, update index statistics, update statistics

Documentation *Performance and Tuning Guide*

use

Description
Specifies the database with which you want to work.

Syntax
use *database_name*

Parameters
database_name
is the name of the database to open.

Examples

```
use pubs2
go
```

The current database is now pubs2.

Usage

- Allowed with an archive database.
- The use command must be executed before you can reference objects in a database.
- use cannot be included in a stored procedure or a trigger.
- sp_addalias adds an alias, which permits a user to use a database under another name to gain access to that database.

Standards
ANSI SQL – Compliance level: Transact-SQL extension.

Permissions
If the database has a "guest" account, all users can use the database. If the database does not have a "guest" account, you must be a valid user in the database, have an alias in the database, or be a system administrator or system security officer.

See also
Commands create database, drop database

System procedures sp_addalias, sp_adduser, sp_modifylogin

waitfor

Description

Specifies a specific time, a time interval, or an event for the execution of a statement block, stored procedure, or transaction.

Syntax

waitfor {delay *time* | time *time* | errorexit | processexit | mirrorexit}

Parameters

delay
: instructs Adaptive Server to wait until the specified amount of time has passed, up to a maximum of 24 hours.

time
: instructs Adaptive Server to wait until the specified time.

time
: a time in one of the acceptable formats for date/time data, or a variable of character type. You cannot specify dates—the date portion of the date/time value is not allowed. You can use the datatype time for this information.

errorexit
: instructs Adaptive Server to wait until a kernel or user process terminates abnormally.

processexit
: instructs Adaptive Server to wait until a kernel or user process terminates for any reason.

mirrorexit
: instructs Adaptive Server to wait for a mirror failure.

Examples

Example 1 At 2:20 p.m., the chess table is updated with my next move, and a procedure called sendmail inserts a row in a table owned by Judy, notifying her that a new move now exists in the chess table:

```
begin
    waitfor time "14:20"
    insert chess (next_move)
        values ('Q-KR5')
    execute sendmail 'judy'
end
```

Example 2 After 10 seconds, Adaptive Server prints the message specified:

```
declare @var char (8)
select @var = "00:00:10"
begin
    waitfor delay @var
    print "Ten seconds have passed.  Your time
        is up."
```

```
end
```

Example 3 After any process exits abnormally, Adaptive Server prints the message specified:

```
begin
    waitfor errorexit
    print "Process exited abnormally!"
end
```

Usage

- After issuing the waitfor command, you cannot use your connection to Adaptive Server until the time or event that you specified occurs.
- You can use waitfor errorexit with a procedure that kills the abnormally terminated process, to free system resources that would otherwise be taken up by an infected process.
- To find out which process terminated, check the sysprocesses table with sp_who.
- The time you specify with waitfor time or waitfor delay can include hours, minutes, and seconds. Use the format "hh:mi:ss", as described in "Date and time datatypes" on page 20 in Chapter 1, "System and User-Defined Datatypes" of *Reference Manual: Building Blocks*.

  The following example instructs Adaptive Server to wait until 4:23 p.m:

  ```
  waitfor time "16:23"
  ```

  This statement instructs Adaptive Server to wait for 1 hour and 30 minutes:

  ```
  waitfor delay "01:30"
  ```

- Changes in system time (such as setting the clock back for Daylight Savings Time) can delay the waitfor command.
- You can use waitfor mirrorexit within a DB-Library program to notify users when there is a mirror failure.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

waitfor permission defaults to all users. No permission is required to use it.

See also

Commands begin...end

Datatypes Date and time datatypes

System procedures sp_who

where clause

Description

Sets the search conditions in a select, insert, update, or delete statement.

Syntax

Search conditions immediately follow the keyword where in a select, insert, update, or delete statement. If you use more than one search condition in a single statement, connect the conditions with and or or.

where [not] *expression comparison_operator expression*

where {[not] *expression comparison_operator expression*} | {...}

where [not] *expression* [not] like "*match_string*"
    [escape "*escape_character* "]

where [not] *expression* is [not] null

where [not] *expression* [not] between *expression* and *expression*

where [not] *expression* [not] in ({*value_list* | *subquery*})

where [not] exists (*subquery*)

where [not] *expression comparison_operator* {any | all} (*subquery*)

where [not] *column_name join_operator column_name*

where [not] *logical_expression*

where [not] *expression* {and | or} [not] *expression*

where *column_name* is [not] null

Parameters

not
: negates any logical expression or keywords such as like, null, between, in, and exists.

expression
: is a column name, a constant, a function, a subquery, or any combination of column names, constants, and functions connected by arithmetic or bitwise operators. For more information about expressions, see “Expressions” on page 337 in Chapter 4, “Expressions, Identifiers, and Wildcard Characters” of *Reference Manual: Building Blocks*.

comparison_operator
is one of the following:

Operator	Meaning
=	Equal to
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
!=	Not equal to
<>	Not equal to
!>	Not greater than
!<	Not less than

In comparing char, nchar, unichar, varchar, univarchar, and nvarchar data, < means closer to the beginning of the alphabet and > means closer to the end of the alphabet.

Case and special character evaluations depend on the collating sequence of the operating system on the machine on which Adaptive Server is located. For example, lowercase letters may be greater than uppercase letters, and uppercase letters may be greater than numbers.

Trailing blanks are ignored for the purposes of comparison. For example, “Dirk” is the same as “Dirk ”.

In comparing dates, < means earlier and > means later. Put quotes around all character and date data used with a comparison operator. For example:

```
= "Bennet"
> "94609"
```

See “User-defined datatypes” on page 47 in Chapter 1, “System and User-Defined Datatypes” of *Reference Manual: Building Blocks* for more information about data entry rules.

like

is a keyword indicating that the following character string (enclosed by single or double quotes) is a matching pattern. like is available for char, varchar, unichar, univarchar, nchar, nvarchar, datetime, date and time, text, and unitext columns, but not to search for seconds or milliseconds.

You can use the keyword like and wildcard characters with datetime and date data as well as with char and varchar. When you use like with datetime or date and time values, Adaptive Serverconverts the dates to standard datetime format, then to varchar. Since the standard storage format does not include seconds or milliseconds, you cannot search for seconds or milliseconds with like and a pattern.

It is a good idea to use like when you search for date/ time values, since date/time entries may contain a variety of date parts. For example, if you insert the value "9:20" into a column named arrival_time, the following clause would not find it because Adaptive Server converts the entry into "Jan 1, 1900 9:20AM.":

```
where arrival_time = '9:20'
```

However, the following clause would find it:

```
where arrival_time like '%9:20%'
```

match_string

is a string of characters and wildcard characters enclosed in quotes. Table 1-36 lists the wildcard characters.

Table 1-36: Wildcard characters

Wildcard character	Meaning
%	Any string of 0 or more characters
_	Any single character
[ ]	Any single character within the specified range ([a-f]) or set ([abcdef])
[^]	Any single character that is not within the specified range ([^a-f]) or set ([^abcdef])

escape

specifies an escape character with which you can search for literal occurrences of wildcard characters.

escape_character

is any single character. See "Using the escape clause" on page 363 in Chapter 4, "Expressions, Identifiers, and Wildcard Characters" of *Reference Manual: Building Blocks*.

is null

searches for null values.

between

is the range-start keyword. Use and for the range-end value. The following range is inclusive:

```
where @val between x and y
```

The following range is not:

```
x and @val < y
```

Queries using between return no rows if the first value specified is greater than the second value.

and

joins two conditions and returns results when both of the conditions are true.

When more than one logical operator is used in a statement, and operators are usually evaluated first. However, you can change the order of execution with parentheses.

in

allows you to select values that match any one of a list of values. The comparator can be a constant or a column name, and the list can be a set of constants or, more commonly, a subquery. For information on using in with a subquery, see the *Transact-SQL User's Guide*. Enclose the list of values in parentheses.

value_list

is a list of values. Put single or double quotes around character values, and separate each value from the following one with a comma (see example 7). The list can be a list of variables, for example:

```
in (@a, @b, @c)
```

However, you cannot use a variable containing a list, such as the following, for a values list:

```
@a = "'1', '2', '3'"
```

exists

is used with a subquery to test for the existence of some result from the subquery. See the *Transact-SQL User's Guide*.

subquery

is a restricted select statement (order by and compute clauses and the keyword into are not allowed) inside the where or having clause of a select, insert, delete, or update statement, or a subquery. See the *Transact-SQL User's Guide*.

any
: is used with >, <, or = and a subquery. It returns results when any value retrieved in the subquery matches the value in the where or having clause of the outer statement. See the *Transact-SQL User's Guide*.

all
: is used with > or < and a subquery. It returns results when all values retrieved in the subquery match the value in the where or having clause of the outer statement. See the *Transact-SQL User's Guide*.

column_name
: is the name of the column used in the comparison. Qualify the column name with its table or view name if there is any ambiguity. For columns with the IDENTITY property, you can specify the syb_identity keyword, qualified by a table name where necessary, rather than the actual column name.

  column_name allows text, unitext, or image datatypes.

join_operator
: is a comparison operator or one of the join operators =* or *=. See the *Transact-SQL User's Guide*.

logical_expression
: is an expression that returns TRUE or FALSE.

or
: joins two conditions and returns results when either of the conditions is true.

  When more than one logical operator is used in a statement, or operators are normally evaluated after and operators. However, you can change the order of execution with parentheses.

Examples

Example 1

```
where advance * $2 > total_sales * price
```

Example 2 Finds all the rows in which the phone number does not begin with 415:

```
where phone not like '415%'
```

Example 3 Finds the rows for authors named Carson, Carsen, Karsen, and Karson:

```
where au_lname like "[CK]ars[eo]n"
```

Example 4 Finds the row of the sales_east table in which the IDENTITY column has a value of 4:

```
where sales_east.syb_identity = 4
```

Example 5

```
where advance < $5000 or advance is null
```

Example 6

```
where (type = "business" or type = "psychology") and advance > $5500
```

Example 7

```
where total_sales between 4095 and 12000
```

Example 8 Finds the rows in which the state is one of the three in the list:

```
where state in ('CA', 'IN', 'MD')
```

Example 9 Select data based on null values of text, unitext, and image columns:

```
create table temp1(c1 int, c2 text null, c3 unitext null, c4 image null)
   insert into temp1 values(1, null, replicate("u",5), null)
   insert into temp1 values(2, replicate("x",3), null, null)
go
select * from temp1 where c2 is null
go

c1    c2          c3                          c4
----- ----------  --------------------------  ------------
    1       NULL      0x75007500750075007500          NULL
(1 row affected)


select * from temp1 where c2 is not null and c3 is null and c4 is null
go

c1    c2          c3           c4
----- ----------  ----------   ----------
    2        xxx        NULL         NULL
```

Example 10 Update data based on non-null values of text column:

```
insert into temp1 values(3, replicate("y", 3), null, 0x858585847474)
insert into temp1 values(4, replicate("z",3),"aaa", 0x75)
go
update temp1 set c2 = "updated" where c2 is not null
select * from temp1 where c2 is not null
go

(3 rows affected)
c1          c2          c3           c4
----- ----------  ----------   ----------
```

```
2        updated       NULL   NULL
3        updated       NULL   0x858585847474
4        updated       0x610061006100   0x75
```

Example 11 Select data into table temp2 based on null values of text column in temp1:

```
select c1, c2 into temp2 from temp1 where c2 is null
select * from temp2
go
(1 row affected)
c1      c2
-----  ----------
1       NULL
```

Example 12 Insert data into table temp2, selecting from temp1, based on non-null values of text column in temp1:

```
insert into temp2 select c1, c2 from temp1 where c2 is not null
select * from temp2
go
(3 rows affected)
c1          c2
-----  ----------
1        NULL
2        updated
3        updated
4        updated
(4 rows affected)
```

Example 13 Select data in a sub-query based on null value of text column:

```
select count(*) from temp2
where c1 in (select c1 from temp1 where c2 is null and c3 is not null)

 -----------
           1
 (1 row affected)
```

Example 14 Delete data based on null value of unitext column:

```
delete from temp1 where c3 is null
go
(2 rows affected)
```

Usage

- where and having search conditions are identical, except that aggregate functions are not permitted in where clauses. For example, this clause is legal:

  ```
  having avg (price) > 20
  ```

  This clause is not legal:

  ```
  where avg (price) > 20
  ```

  For examples, see Chapter 2, "Transact-SQL Functions" in *Reference Manual: Building Blocks* for information on the use of aggregate functions, and group by and having clauses on page 461.

- Joins and subqueries are specified in the search conditions; see the *Transact-SQL User's Guide* for full details.

- You can use the keyword like to search a unitext column for a specific pattern. However, the like clause is not optimized when it is used with a unitext column. like pattern matching for unitext depends on the default Unicode sort order, which is also used for like pattern matching for unichar and univarchar datatypes.

- The where clause accepts text and unitext LOB locators, but not image LOB locators, for the variables *expression* and *match_string*.

  ...
  where *expression* like '*match_string*'
  ...

  When *match_string* is a locator, Adaptive Server uses only up to 16KB of the corresponding LOB.

- Specifying the null condition selects only those rows with a null value in the specified LOB column. The LOB value may be null either because it was explicitly assigned a null value, or because the LOB was not initialized.

- The number of and and or conditions in a where clause is limited only by the amount of memory available to run the query.

- The pattern string included in the like predicate is limited only by the size of string that can be placed in a varchar.

- There are two ways to specify literal quotes within a char or varchar entry. The first method is to use two quotes. For example, if you began a character entry with a single quote, and you want to include a single quote as part of the entry, use two single quotes:

  ```
  'I don''t understand.'
  ```

Or use double quotes:

```
"He said, ""It's not really confusing."""
```

The second method is to enclose a quote in the opposite kind of quotation mark. In other words, surround an entry containing double quotes with single quotes (or vice versa). Here are some examples:

```
'George said, "There must be a better way."'
"Isn't there a better way?"
'George asked, "Isn"t there a better way?"'
```

- To enter a character string that is longer than the width of your screen, enter a backslash (\) before going to the next line.
- If a column is compared to a constant or variable in a where clause, Adaptive Server converts the constant or variable into the datatype of the column so that the optimizer can use the index for data retrieval. For example, float expressions are converted to int when compared to an int column. For example:

```
where int_column = 2
```

selects rows where *int_column* = 2.

- When Adaptive Server optimizes queries, it evaluates the search conditions in where and having clauses, and determines which conditions are search arguments (SARGs) that can be used to choose the best indexes and query plan. All of the search conditions are used to qualify the rows. For more information on search arguments, see the *Performance and Tuning Guide*.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

See also

Commands delete, execute, group by and having clauses, insert, select, update

Datatypes Date and time datatypes

System procedures sp_helpjoins

while

Description

Sets a condition for the repeated execution of a statement or statement block. The statements are executed repeatedly, as long as the specified condition is true.

Syntax

while *logical_expression* [plan "*abstract plan*"] *statement*

Parameters

logical_expression
is any expression that returns TRUE, FALSE, or NULL.

plan "*abstract plan*"
specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. Plans can only be specified for optimizable SQL statements, that is, queries that access tables. See Chapter 30, "Creating and Using Abstract Plans," in the *Performance and Tuning Guide* for more information.

statement
can be a single SQL statement, but is usually a block of SQL statements delimited by begin and end.

Examples

If the average price is less than $30, double the prices of all books in the titles table. As long as it is still less than $30, the while loop keeps doubling the prices. In addition to determining the titles whose price exceeds $20, the select inside the while loop indicates how many loops were completed (each average result returned by Adaptive Server indicates one loop):

```
while (select avg (price) from titles) < $30
begin
    select title_id, price
        from titles
        where price > $20
    update titles
        set price = price * 2
end
```

Usage

- The execution of statements in the while loop can be controlled from inside the loop with the break and continue commands.
- The continue command causes the while loop to restart, skipping any statements after the continue. The break command causes an exit from the while loop. Any statements that appear after the keyword end, which marks the end of the loop, are executed. The break and continue commands are often activated by if tests.

  For example:

  ```
  while (select avg (price) from titles) < $30
  ```

```
begin
        update titles
        set price = price * 2
    if (select max (price) from titles) > $50
        break
    else
        if (select avg (price) from titles) > $30
           continue
        print "Average price still under $30"
end

select title_id, price from titles
        where price > $30
```

This batch continues to double the prices of all books in the titles table as long as the average book price is less than $30. However, if any book price exceeds $50, the break command stops the while loop. The continue command prevents the print statement from executing if the average exceeds $30. Regardless of how the while loop terminates (either normally or because of the break command), the last query indicates which books are priced over $30.

- If two or more while loops are nested, the break command exits to the next outermost loop. All the statements after the end of the inner loop run, then the next outermost loop restarts.

Warning! If a or create view command occurs within a while loop, Adaptive Server creates the schema for the table or view before determining whether the condition is true. This may lead to errors if the table or view already exists.

Standards — ANSI SQL – Compliance level: Transact-SQL extension.

Permissions — while permission defaults to all users. No permission is required to use it.

See also — **Commands** begin...end, break, continue, goto label

writetext

Description

Permits minimally logged, interactive updating of an existing text, unitext or image column.

Syntax

writetext [[*database*.]*owner*.]*table_name*.*column_name*
    text_pointer [readpast] [with log] *data*

Parameters

table_name.*column_name*

is the name of the table and text, unitext or image column to update. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

text_pointer

a varbinary (16) value that stores the pointer to the text, unitext or image data. Use the textptr function to determine this value. text, unitext or image data is not stored in the same set of linked pages as other table columns. It is stored in a separate set of linked pages. A pointer to the actual location is stored with the data; textptr returns this pointer.

readpast

specifies that the command should modify only unlocked rows. If the writetext command finds locked rows, it skips them, rather than waiting for the locks to be released.

with log

logs the inserted text, unitext or image data. The use of this option aids media recovery, but logging large blocks of data quickly increases the size of the transaction log, so make sure that the transaction log resides on a separate database device. See create database, sp_logdevice, and the *System Administration Guide* for details.

data

is the data to write into the text, unitext or image column. text and unitext data must be enclosed in quotes. image data must be preceded by "0x". Check the information about the client software you are using to determine the maximum length of text, unitext or image data that can be accommodated by the client.

Examples

Example 1 Puts the text pointer into the local variable *@val*. Then, writetext places the text string "hello world" into the text field pointed to by *@val*:

```
declare @val varbinary (16)
select @val = textptr (copy) from blurbs
    where au_id = "409-56-7008"
```

```
writetext blurbs.copy @val with log "hello world"
```

Example 2

```
declare @val varbinary (16)
select @val = textptr (copy)
from blurbs readpast
    where au_id = "409-56-7008"
writetext blurbs.copy @val readpast with log "hello
world"
```

Example 3 writetext includes information about unitext datatypes, and places the string “Hello world” into the unitext field that *@val* points to:

```
declare @val varbinary (16)
select @val = textptr (ut) from unitable
where i = 100
writetext unitable.ut @val with log "Hello world"
```

The varchar constant is implicitly converted to unitext before the column is updated.

Usage

- The maximum length of text that can be inserted interactively with writetext is approximately 120K bytes for text, unitext or image data.
- By default, writetext is a minimally logged operation; only page allocations and deallocations are logged, but the text, unitext or image data is not logged when it is written into the database. To use writetext in its default, minimally logged state, a system administrator must use sp_dboption to set select into/bulkcopy/pllsort to true.
- writetext updates text data in an existing row. The update completely replaces all of the existing text.
- writetext operations are not caught by an insert or update trigger.
- writetext requires a valid text pointer to the text, unitext or image column. For a valid text pointer to exist, a text, or unitext column must contain either actual data or a null value that has been explicitly entered with update.

  Given the table textnull with columns textid and *x*, where *x* is a text column that permits nulls, this update sets all the text values to NULL and assigns a valid text pointer in the text column:

  ```
  update textnull
  set x = null
  ```

  No text pointer results from an insert of an explicit null:

  ```
  insert textnull values (2,null)
  ```

And, no text pointer results from an insert of an implicit null:

```
insert textnull (textid)
values (2)
```

- insert and update on text columns are logged operations.
- You cannot use writetext on text and image columns in views.
- If you attempt to use writetext on text values after changing to a multibyte character set, and you have not run dbcc fix_text, the command fails, and an error message is generated, instructing you to run dbcc fix_text on the table.
- writetext in its default, non-logged mode runs more slowly while a dump database is taking place.
- The Client-Library functions dbwritetext and dbmoretext are faster and use less dynamic memory than writetext. These functions can insert up to 2GB of text data.

Using the *readpast* option

- The readpast option applies only to data-only-locked tables. readpast is ignored if it is specified for an allpages-locked table.
- If the session-wide isolation level is 3, the readpast option is silently ignored.
- If the transaction isolation level for a session is 0, writetext commands using readpast do not issue warning messages. These commands at session isolation level 0 modify the specified text column if the text column is not locked with incompatible locks.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

writetext permission defaults to the table owner, who can transfer it to other users.

See also

Commands readtext

Datatypes Converting text and image datatypes

CHAPTER 2

Interactive SQL Commands

This chapter describes Interactive SQL commands. These commands are entered in top pane of the Interactive SQL display. These commands are intended only for Interactive SQL and are not sent to Adaptive Server for execution. For information about Interactive SQL, see Chapter 9, “Using Interactive SQL” in the *Utility Guide*, and the Adaptive Server Plug-in online help.

Table 2-1: DBISQL commands

Command	Description
clear on page 746	Clears the Interactive SQL panes.
configure on page 747	Opens the Interactive SQL Options dialog.
connect on page 748	Establishes a connection to a database.
disconnect on page 751	Drops the current connection to a database.
exit on page 752	Leaves Interactive SQL.
input on page 753	Imports data into a database table from an external file or from the keyboard.
output on page 758	Imports data into a database table from an external file or from the keyboard.
parameters on page 763	Specifies parameters to an Interactive SQL command file.
read on page 764	Reads Interactive SQL statements from a file.
set connection on page 766	Changes the current database connection to another server.
set option on page 767	Use this statement to change the values of Interactive SQL options.
start logging on page 768	Use this statement to start logging executed SQL statements to a log file.
stop logging on page 769	Use this statement to stop logging of SQL statements in the current session.
system on page 770	Use this statement to launch an executable file from within Interactive SQL.

clear

Description Clears the Interactive SQL panes.

Syntax clear

Usage

- Use he clear statement to clear the SQL Statements and Messages panes and the Results, Messages, Plan, and Plan tabs in the Results pane.
- clear closes the cursor associated with the data being cleared.

Permissions Any user can execute this command.

configure

Description

Opens the Interactive SQL Options dialog.

Syntax

configure

Usage

- The configure statement opens the Interactive SQL Options dialog and displays the current settings of all Interactive SQL options. It does not display or allow you to modify database options.
- You can configure Interactive SQL settings in this dialog. If you select Make Permanent, the options are saved for use in subsequent Interactive SQL sessions. If you do not choose Make Permanent, and instead click OK, the options are set temporarily and remain in effect for the current database connection only.

Permissions

Any user can run configure.

See also

set

connect

Description

Establishes a connection to a database.

Syntax

connect
    [to *engine_name*]
    [database *database_name*]
    [as *connection_name*]
    [user] *user_id* identified by password
    engine_name, *database_name*, *connection_name*, *user_id*,
        password : {*identifier* | *string* | *hostvar*}

connect using *connect_string* : {*identifier* | *string* | *hostvar*}

Parameters

engine_name
is the name of the engine to which you are connecting.

database_name
is the name of the database to which you are connecting. It must conform to the rules for identifiers and cannot be a variable.

as
you can optionally name a connection by specifying the as clause. This allows multiple connections to the same database, or multiple connections to the same or different database servers, all simultaneously. Each connection has its own associated transaction. You may get locking conflicts between your transactions if, for example, you modify the same record in the same database from two different connections.

connection_name
is the login name you are using to make the connection.

user
indicates that you are connecting to Adaptive Server as a user.

user_id
is the ID of the user who is connecting.

identified by password
indicates that the user will need to include a password when they connect.

password
is the password of the user connecting to Adaptive Server.

identifier
is the identifier you are using for the connection information.

string
is the string you are using for the connection information.

hostvar
is the variable information for the host name and port.

connect_string
is a list of parameter settings of the form *keyword = value*, separated by semicolons, and must be enclosed in single quotes.

Examples

Example 1 Connects to a database from Interactive SQL. Interactive SQL prompts for a user ID and a password:

```
connect
```

Example 2 Connects to the default database as DBA from Interactive SQL. Interactive SQL prompts for a password:

```
connect user "DBA"
```

Example 3 As user `dba`, with password `sql`, connects to the pubs2 database of an Adaptive Server running on host "tribble" at port number 5000:

```
connect to "tribble:5000"
database pubs2
user dba
identified by sql
```

Example 4 As user `dba`, with password `sql`, connects to an Adaptive Server named "tribble" (defined in *interfaces* file):

```
connect to tribble
user dba
identified by sql
```

Usage

- connect establishes a connection to the database identified by *database_name* running on the server identified by *engine_name*.
- No statements are allowed until a successful connect statement has been executed.
- Interactive SQL behavior – if you do not specify a database or server in the connect statement, Interactive SQL remains connected to the current database, rather than to the default server and database. If you do specify a database name without a server name, Interactive SQL attempts to connect to the specified database on the current server. If you specify a server name without a database name, Interactive SQL connects to the default database on the specified server.
- In the user interface, if the password or the user ID and password are not specified, the user is prompted to type the missing information.

- When Interactive SQL is running in command-prompt mode (-nogui is specified when you start Interactive SQL from a command prompt) or batch mode, or if you execute connect without an as clause, an unnamed connection is opened. If there is another unnamed connection already opened, the old one is automatically closed. Otherwise, existing connections are not closed when you run connect.
- Multiple connections are managed through the concept of a current connection. After a successful connect statement, the new connection becomes the current one. To switch to a different connection, use the set connection statement. Use the disconnect statement to drop connections.
- In Interactive SQL, the connection information (including the database name, your user ID, and the database server) appears in the title bar above the SQL Statements pane. If you are not connected to a database, Not Connected appears in the title bar.

Permissions

Any user can execute this command.

See also

disconnect, set connection

disconnect

Description

Drops the current connection to a database.

Syntax

disconnect [{*identifier* | *string* | *hostvar*} | current | all]

Parameters

{*identifier* | *string* | *hostvar*}
is the login name you are using to make the connection.

- *identifier* – is the identifier you are using for the connection information.
- *string* – is the string you are using for the connection information.
- *hostvar* – is the variable information for the host name and port.

current
indicates that you are disconnecting the current connection.

all
indicates that you are disconnecting all connections.

Examples

Disconnects all connections:

```
disconnect all
```

Usage

- disconnect drops a connection to the database server and releases all resources used by it. If the connection to be dropped was named on the connect statement, the name can be specified. Specifying all drops all of the application's connections to all database environments. current is the default, and drops the current connection.
- An implicit rollback is executed on connections that are dropped.

Permissions

Any user can execute this command.

See also

connect, set connection

exit

Description

Leaves Interactive SQL.

Syntax

{exit | quit | bye} [{*number* | *connection_variable*}]

Parameters

exit | quit | bye
closes your connection with the database, then closes the Interactive SQL environment.

{*number* | *connection_variable*}
can be used in batch files to indicate success or failure of the commands in an Interactive SQL command file. The default return code is 0.

- *number* – is the number of the return code.
- *connection_varible* – is a variable indicating a specific connection.

Usage

Before closing the database connection, Interactive SQL automatically executes a commit statement if the commit_on_exit option is set to on. If this option is set to off, Interactive SQL performs an implicit rollback. By default, the commit_on_exit option is set to on.

Permissions

Any user can execute this command.

input

Description

Imports data into a database table from an external file or from the keyboard.

Syntax

input into [*owner*.]*table_name*
[from *filename* | prompt]
[format { ascii | dbase | dbaseII | dbaseIII | excel | fixed | foxpro | lotus }]
[escape character *character*]
[escapes { on | off }
[by order | by name]
[delimited by string]
[column widths (integer , . . .)]
[nostrip]
[(*column_name*, . . .)]
[encoding {*identifier* | *string*}]

Parameters

from clause

is the file name that is passed to the server as a quoted string. The string is therefore subject to the same formatting requirements as other SQL strings. In particular:

- To indicate directory paths, you must represent the backslash character (\) by two backslashes. To load data from the file *c: emp\input.dat* into the employee table:

```
input into employee
from 'c: nn temp nn input.dat'
```

- The path name is relative to the machine on which Interactive SQL is running.

prompt

allows the user to enter values for each column in a row. When running in windowed mode, a dialog appears where the user can enter the valuesfor the new row. If the user is running Interactive SQL on the command line, Interactive SQL prompts the user to type the value for each column on the command line.

format

each set of values must be in the format specified by the format clause, or the set option input_format statement if the format clause is not specified. When input is entered by the user, a dialog is provided for the user to enter one row per line in the input format.

Certain file formats contain information about column names and types.

Using this information, the input statement creates the database table if it does not already exist. This is a very easy way to load data into the database. The formats that have enough information to create the table are: dbaseII, dbaseIII, foxpro, and lotus.

Input from a command file is terminated by a line containing end. Input from a file is terminated at the end of the file.

Allowable input formats are:

- ascii – input lines are assumed to be ASCII characters, one row per line, with values separated by commas. Alphabetic strings may be enclosed in apostrophes (single quotes) or quotation marks (double quotes). Strings containing commas must be enclosed in either single or double quotes. If the string itself contains single or double quotes, double the quote character to use it within the string. Optionally, you can use the delimited by clause to specify a delimiter string other than the default, which is a comma.

  Three other special sequences are also recognized. The two characters represent a new line character, “\”, represents a single (\), and the sequence \xDD represents the character with hexadecimal code DD.

- dbase – the file is in DBASEll or DBASElll format. Interactive SQL will attempt to determine which format, based on information in the file. If the table does not exist, it is created.

- dbaseII – the file is in DBASEll format. If the table does not exist, it is created.

- dbaseIII – the file is in DBASElll format. If the table does not exist, it is created.

- excel – input file is inthe format of Microsoft Excel 2.1. If the table does not exist, it is created.

- fixed – input lines are in fixed format. Use the column widths clause to specify column widths. If they are not specified, column widths in the file must be the same as the maximum number of characters required by any value of the corresponding database column’s type.

You cannot use the fixed format with binary columns that contain embedded new line and End of File character sequences.

- foxpro – the file is in FoxPro format. If the table does not exist, it is created.
- lotus – the file is a Lotus WKS format worksheet. input assumes that the first row in the Lotus WKS format worksheet is column names. If the table does not exist, it is created. In this case, the types and sizes of the columns created may not be correct because the information in the file pertains to a cell, not to a column.

escape character

is the default escape character for hexadecimal codes and symbols is a backslash (\), so \x0A is the linefeed character, for example.

You can change the escape character using the escape character clause. For example, to use the exclamation mark as the escape character, enter:

```
... escape character '|'
```

Only one single-byte character can be used as an escape character.

escapes

with escapes enabled (the default), characters following the backslash character are recognized and interpreted as special characters by the database server. New line characters can be included as the combination \n, other characters can be included in data as hexadecimal ASCII codes, such as \x09 for the tab character. A sequence of two backslash characters (\) is interpreted as a single backslash. A backslash followed by any character other than n, x, X or \is interpreted as two separate characters. For example, \q inserts a backslash and the letter q.

by

allows the user to specify whether the columns from the input file should be matched up with the table columns based on their ordinal position in the lists (order, the default) or by their names (name). Not all input formats have column name information in the file. name is allowed only for those formats that do. They are the same formats that allow automatic table creation: dbaseII, dbaseIII, foxpro, and lotus.

delimited

allows you to specify a string to be used as the delimiter in ASCII input format.

column widths

can be specified for fixed format only; it specifies the widths of the columns in the input file. If column widths is not specified, the widths are determined by the database column types. Do not use this clause if you are inserting long varchar or binary data in fixed format.

nostrip

normally, for ASCII input format, trailing blanks are stripped from unquoted strings before the value is inserted. nostrip can be used to suppress trailing blank stripping. Trailing blanks are not stripped from quoted strings, regardless of whether the option is used. Leading blanks are stripped from unquoted strings, regardless of the nostrip option setting.

If the ASCII file has entries such that a column appears to be null, it is treated as NULL. If the column in that position cannot be NULL, a zero is inserted in numeric columns, and an empty string in character columns.

encoding

allows you to specify the encoding that is used to read the file. encoding can be used only with the ASCII format.

If encoding is not specified, Interactive SQL determines the code page that is used to read the file as follows, where code page values occurring earlier in the list take precedence over those occurring later in the list:

- The code page specified with the default_isql_encoding option (if this option is set)
- The code page specified with the -codepage option when Interactive SQL was started
- The default code page for the computer Interactive SQL is running on

Examples

Is an input statement from an ASCII text file:

```
input into employee
from new_emp.inp
format ASCII
```

Usage

- The input statement allows efficient mass insertion into a named database table. Lines of input are read either from the user via an input window (if prompt is specified) or from a file (if you specify from *file_name*). If neither is specified, the input is read from the command file that contains the input statement. In Interactive SQL, this can even be directly from the SQL Statements pane. In this case, input is ended with a line containing only the string end.

- If a column list is specified for any input format, the data is inserted into the specified columns of the named table. By default, the input statement assumes that column values in the input file appear in the same order in which they appear in the database table definition. If the input file's column order is different, you must list the input file's actual column order at the end of the input statement.

  In this example, you create a table called inventory. To import ASCII data from the input file that contains the name value before the quantity value, you must list the input file's actual column order at the end of the input statement for the data to be inserted correctly:

  ```
  create table inventory (
  quantity int,
  item varchar(60)
  )
  ```

  The ASCII data from the input file *stock.txt* that contains the name value before the quantity value:

  ```
  'Shirts', 100
  'Shorts', 60
  ```

  The input file's actual column order at the end of the input statement for the data to be inserted correctly:

  ```
  input into inventory
  from stock.txt
  FORMAT ASCII
  (item, quantity)
  ```

- By default, input stops when it attempts to insert a row that causes an error. Errors can be treated in different ways by setting the on_error and conversion_error options (see "set option" on page 767). Interactive SQL prints a warning in the Messages pane if any string values are truncated on input. Missing values for NOT NULL columns are set to zero for numeric types and to the empty string for non-numeric types. If input attempts to insert a NULL row, the input file contains an empty row.

Permissions

You must have insert permission on the table or view.

output

Description

Imports data into a database table from an external file or from the keyboard.

Syntax

```
output to filename
    [ append ]
    [ verbose ]
    [ format {ascii | dbase | dbaseII| dbaseIII
        | excel | fixed | foxpro | lotus | sql | xml}]
    [ escape character character ]
    [ escapes { on | off}
    [ delimited by string ]
    [ quote string [ all ] ]
    [ column widths (integer , . . . ) ]
    [ hexidecimal { on | off | asis } ]
    [ encoding {string | identifier}]
```

Parameters

append

appends the results of the query to the end of an existing output file without overwriting the previous contents of the file. If the append clause is not used, the output statement overwrites the contents of the output file by default. The append keyword is valid if the output format is ASCII, fixed, or SQL.

verbose

Writes error messages about the query, the SQL statement used to select the data, and the data itself to the output file. Lines that do not contain data are prefixed by two hyphens. If you omit verbose (the default) only the data is written to the file. verbose is valid if the output format is ASCII, fixed, or SQL. Allowable output formats are:

- ascii – the output is an ASCII format file with one row per line in the file. All values are separated by commas, and strings are enclosed in apostrophes (single quotes). You can change the delimiter and quote strings using the delimited by and quote clauses. If all is specified in the quote clause, all values (not just strings) are quoted.

  Three other special sequences are also used. The two characters represent a new line character, "\", represents a single \, and the sequence \xDD represents the character with hexadecimal code DD. This is the default output format.

- dbaseII – the output is in DBASEII which includes column definitions. A maximum of 32 columns can be output. Column names are truncated to 11 characters, and each row of data in each. If the table does not exist, it is created.

- dbaseIII – the output is a dBASE III format file which includes column definitions. A maximum of 128 columns can be output. Column names are truncated to 11 characters, and each row of data in each column is truncated to 255 characters.

- excel – the output is an Excel 2.1 worksheet. The first row of the worksheet contains column labels (or names if there are no labels defined). Subsequent worksheet rows contain the actual table data.

- fixed – the output is fixed format with each column having a fixed width. You can specify the width for each column with column widths. No column headings are output in this format.

  If the column widths clause is omitted, the width for each column is computed from the datatype for the column, and is large enough to hold any value of that datatype. The exception is that long varchar and long binary data default to 32K.

- foxpro – the output is a FoxPro format file which includes column definitions. A maximum of 128 columns can be output. Column names are truncated to 11 characters. Column names are truncated to 11 characters, and each row of data in each column is truncated to 255 characters.

- html – the output is in the HyperText Markup Language format.
- lotus – the output is a Lotus WKS format worksheet. Column names are placed as the first row in the worksheet. There are certain restrictions on the maximum size of Lotus WKS format worksheets that other software (such as Lotus 1-2-3) can load. There is no limit to the size of file Interactive SQL can produce.
- SQL – the output is an Interactive SQL input statement required to recreate the information in the table.
- XML – the output is an XML file encoded in UTF-8 and containing an embedded DTD. Binary values are encoded in CDATA blocks with the binary data rendered as 2-hex-digit strings. The input statement does not accept XML as a file format.

escape character

is the default escape character for characters\ stored as hexadecimal codes and symbols is a backslash (\), so, for example, \x0A is the linefeed character.

You can change the default escape character using escape character. For example, to use the exclamation mark as the escape character, enter:

```
... escape character '!'
```

escapes

if enabled (the default), characters following the backslash character are recognized and interpreted as special characters by the database server. New line characters can be included as the combination \n, and other characters can be included in data as hexadecimal ASCII codes, such as \x09 for the tab character. A sequence of two backslash characters (\) is interpreted as a single backslash. A backslash followed by any character other than n, x, X or \ is interpreted as two separate characters. For example, \q inserts a backslash and the letter q.

delimited by

for the ASCII output format only. The delimiter string is placed between columns (default comma).

quote

for the ASCII output format only. The quote string is placed around string values. The default is a single quote character. If all is specified in the quote clause, the quote string is placed around all values, not just around strings.

column width

specifies the column widths for the fixed format output hexidecimal

specifies how binary data is to be unloaded for the ASCII format only. When set to on, binary data is unloaded in the format 0xabcd. When set to off, binary data is escaped when unloaded (\xab\xcd). When set to asis, values are written as is, that is, without any escaping–even if the value contains control characters. asis is useful for text that contains formatting characters such as tabs or carriage returns.

encoding

allows you to specify the encoding that is used to write the file. encoding can be used only with the ASCII format.

If encoding is not specified, Interactive SQL determines the code page that is used to write the file as follows, where code page values occurring earlier in the list take precedence over those occurring later in the list:

- The code page specified with default_isql_encoding (if this option is set)
- The code page specified with the -codepage option when Interactive SQL was started
- The default code page for the computer Interactive SQL is running

Examples

Example 1 Places the contents of the employee table in a file in ASCII format:

```
select *
    from employee
go
output to employee.txt
    format ASCII
```

Example 2 Place the contents of the employee table at the end of an existing file, and includes any messages about the query in this file as well:

```
select *
    from employee
go
output to employee.txt append verbose
```

Example 3 In this example, you need to export a value that contains an embedded line feed character. A line feed character has the numeric value 10, which you can represent as the string '\x0a' in a SQL statement. If you execute the following statement, with hexidecimal set to on:

```
select 'line1 n x0aline2'
go
output to file.txt hexidecimal on
```

You see a file with one line in it containing the following text:

```
line10x0aline2
```

However, if you execute the same statement with hexidecimal set to off, you see the following:

```
line1 n x0aline2
```

Finally, if you set hexidecimal to asis, you see a file with two lines:

```
line1
line2
```

You get two lines when you use asis because the embedded line feed character has been exported without being converted to a two-digit hexidecimal representation, and without being prefixed by anything.

Usage

- The output statement copies the information retrieved by the current query to a file.
- You can specify the output format with the optional format clause. If you do not specify the format clause, the Interactive SQL output_format option setting is used.
- The current query is the select or input statement that generated the information appearing on the Results tab in the Results pane. The output statement reports an error if there is no current query.
- In Interactive SQL, the Results tab displays only the results of the current query. All previous query results are replaced with the current query results.

Permissions

Any user can execute this command.

parameters

Description

Specifies parameters to an Interactive SQL command file.

Syntax

parameters parameter1, parameter2, . . .

Examples

This Interactive SQL command file takes two parameters:

```
parameters department_id, file;
select emp_lname
    from employee
    where dept_id = {department_id}
    >#{file}.dat
```

If you save this script in a file named *test.sql*, you can run it from Interactive SQL using the following command:

```
read test.SQL [100] [data]
```

Usage

- The parameters statement names the parameters for a command file, so that they can be referenced later in the command file.
- Parameters are referenced by putting `{parameter1}` into the file where you want the named parameter to be substituted. There cannot be any spaces between the braces and the parameter name.
- If a command file is invoked with less than the required number of parameters, Interactive SQL prompts for values of the missing parameters.

Permissions

Any user can execute this command.

See also

read

read

Description

Reads Interactive SQL statements from a file.

Syntax

read [encoding {*identifier* | *string*}] *file_name* [*parameters*]

Parameters

encoding {*identifier* | *string*}

allows you to specify the encoding that is used to write the file. encoding can be used only with the ASCII format.

- *identifier* – is the identifier you are using to indicate the file you are reading.
- *string* – is the string you are using to indicate the file you are reading.

file_name

is the name of the file you are reading.

parameters

correspond to the parameters listed in the statement file.

Examples

These are examples of the read statement:

```
READ status.rpt '160'

READ birthday.SQL [>= '1988-1-1'] [<= '1988-1-30']
```

Usage

- The read statement reads a sequence of Interactive SQL statements from the named file. This file can contain any valid Interactive SQL statement, including other read statements. read statements can be nested to any depth. If the file name does not contain an absolute path, Interactive SQL searches for the file. Interactive SQL first searches the current directory, and then the directories specified in the environment variable SQLPATH, and then the directories specified in the environment variable PATH. If the named file has no file extension, Interactive SQL searches each directory for the same file name with the extension *.SQL*.
- The encoding argument allows you to specify the encoding that is used to read the file. The read statement does not process escape characters when it reads a file. It assumes that the entire file is in the specified encoding. If encoding is not specified, Interactive SQL determines the code page that is used to read the file as follows, where code page values occurring earlier in the list take precedence over those occurring later in the list:
  - The code page specified with the default_isql_encoding option (if this option is set)
  - The code page specified with the -codepage option when Interactive SQL was started

    - The default code page for the computer Interactive SQL is running on

- Parameters can be listed after the name of the command file. These parameters correspond to the parameters named on the parameters statement at the beginning of the statement file. Interactive SQL substitutes the corresponding parameter wherever the source file contains {*parameter_name*}, where *parameter_name* is the name of the appropriate parameter.
- The parameters passed to a command file can be identifiers, numbers, quoted identifiers, or strings. When quotes are used around a parameter, the quotes are placed into the text during the substitution. You must enclose in square brackets ([ ]) parameters that are not identifiers, numbers, or strings (contain spaces or tabs). This allows for arbitrary textual substitution in the command file.
- If not enough parameters are passed to the command file, Interactive SQL prompts for values for the missing parameters.

Permissions

Any user can execute this command.

set connection

Description

Changes the current database connection to another server.

Syntax

```
set connection {identifier | string | hostvar}
```

Parameters

identifier
is the login name identifier you are using for the connection information.

string
is the string you are using for the connection information.

hostvar
is the variable information for the host name and port.

Usage

The set connection statement changes the active database connection to another server. The current connection state is saved, and resumes again when it again becomes the active connection. If you omit *connection_name* and there is a connection that was not named, that connection becomes the active connection.

Permissions

Any user can execute this command.

See also

connect, disconnect

set option

Description

Changes the values of Interactive SQL options.

Syntax

set [temporary] option
[{*identifier* | *string* | *hostvar*}. | public.]
{*identifier* | *string* | *hostvar*| *builtin_date_strings*} = [*option_value*]

set permanent

set

Parameters

temporary
indicates that the options you set are only for this session.

option
indicates that you are setting the subsequent option.

public
indicates that the option is being set for all users.

option_value
is the value of the option you are setting.

identifier
is the identifier you are using for the connection information.

string
is the string you are using for the connection information.

hostvar
is the variable information for the host name and port

builtin_date_strings
is the variable information for bigdatetime and bigtime. The server interprets strings as bigdatetimes.

Usage

- set permanent in Syntax 2 saves all current Interactive SQL options. These settings are automatically established every time Interactive SQL is started for the current user ID.
- Syntax 3 displays all of the current option settings. If there are temporary options set for Interactive SQL or the database server, these are displayed; otherwise, the permanent option settings are displayed.

start logging

Description

Starts logging executed SQL statements to a log file.

Syntax

start logging *file_name*

Parameters

file_name
is the file to which you are logging the session.

Examples

Starts logging to a file called *filename.sql*, located in the c: directory:

```
start logging 'c: n filename.sql'
```

Usage

The start logging statement starts copying all subsequent executed SQL statements to the log file that you specify. If the file does not exist, Interactive SQL creates it. Logging continues until you explicitly stop the logging process with the stop logging statement, or until you end the current Interactive SQL session. You can also start and stop logging by selecting SQL | Start Logging and SQL | Stop Logging.

Permissions

Any user can execute this command.

See also

stop logging

stop logging

Description
Stops logging of executed SQL statements in the current session.

Syntax

stop logging

Examples
Stops the current logging session:

```
stop logging
```

Usage
The stop logging statement stops Interactive SQL from writing each SQL statement you execute to a log file. You can start logging with the start logging statement. You can also start and stop logging by selecting SQL | Start Logging and SQL | Stop Logging.

Permissions
Any user can execute this command.

See also
start logging

system

Description
Launches an executable file from within Interactive SQL.

Syntax

```
system '[path] file_name'
```

Parameters

path
is the path to the Notepad program

file_name
is the file name of the program you are launching.

Examples
Launches the Notepad program, assuming that the Notepad executable is in your path.

```
system 'notepad.exe'
```

Usage
Launches the specified executable file.

- The system statement must be entirely contained on one line.
- Comments are not allowed at the end of a system statement.
- Enclose the path and file name in single quotation marks.

Permissions
Any user can execute this command.

See also
connect

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