SAP

Configuration Guide

SAP® Adaptive Server® Enterprise 16.0

UNIX

Contents

Contents

CHAPTER 1   **About SAP ASE**

SAP®Adaptive Server® Enterprise (SAP® ASE) performs data management and transaction functions, independent of client applications and user interface functions.

SAP ASE also:

- Manages multiple databases and multiple users
- Keeps track of the data's location on disks
- Maintains the mapping of logical data description to physical data storage
- Maintains data and procedure caches in memory

SAP ASE uses these auxiliary programs to perform dedicated tasks:

- Backup Server manages database load, dump, backup, and restoration activities.
- XP Server stores the extended stored procedures (ESPs) that allow SAP ASE to run operating system and user-defined commands.

Note: These instructions assume that SAP ASE is installed and running. For information about installing and starting SAP ASE, as well as for an overview of SAP ASE, see the SAP ASE *Installation Guide* for your platform.

SAP ASE is a full-featured server that runs on:

- HP-UX
- IBM AIX
- Sun Solaris
- Linux

System-Specific Issues

SAP ASE runs on a variety of hardware and operating system platforms. System-specific issues do not affect the basic functionality of SAP ASE, but there are differences among platform implementations.

These differences may include:

- SAP ASE configuration
- Changes to the operating system that enable or enhance SAP ASE performance
- The structure of entries in the `interfaces` file
- Options for selecting database devices

- Operating system commands or utilities that simplify or automate routine system administration tasks
- Operating system utilities for monitoring SAP ASE performance

See the *Installation Guide* and release bulletin for your platform.

System User Roles

The SAP ASE installation and setup process defines various user roles. Different user roles have different responsibilities and privileges.

These user roles clarify the way SAP ASE is to be integrated into your system:

- Operating system administrator – the individual who maintains the operating system. This individual has superuser or root privileges.
- System administrator – the individual in charge of SAP ASE system administration, creating user accounts, assigning permissions on databases, and creating new databases. At installation time, the system administrator's login name is "sa". The "sa" login is not a UNIX login. The "sa" login is specific to SAP ASE and is used to log in to SAP ASE using the **isql** command.
- "sap" login – the "sap" login is a UNIX login that owns all the SAP® installation directories and files, sets permissions on those directories and files, and performs the installation and upgrading of SAP ASE.

  Note: This account is also known as "sybase" login in previous releases.

Environment Variables

The operation of SAP products relies on system environment variables being set correctly.

Environment variables are set in the user's environment either interactively or by including them in the user's `.login` and `.cshrc` files (for C shell) or `.profile` file (for Bourne shell).

Note: The installer configures these environment variables in the `SYBASE.csh` and `SYBASE.sh` files. Source these file to set the user's environment.

- DSLISTEN – defines the name SAP ASE uses to listen for client connections if no name is given during the SAP ASE start-up. If DSLISTEN is not set, and no name is given during the SAP ASE start-up, the SAP ASE name defaults to SYBASE.
- DSQUERY – defines the SAP ASE name that client programs attempt to connect to if no SAP ASE is specified with a command line option. If DSQUERY is not set, and you do not supply the SAP ASE name with a command line option, clients attempt to connect to SYBASE.

- SYBASE – defines the path of the SAP installation directory. The installation program sets up the variable SYBASE to point to the release directory specified during installation.
- SYBASE_ASE –defines the subdirectory of the SAP ASE component.
- SYBASE_OCS –defines the subdirectory to which Open Client™ is set.
- SYBASE_SYSAM– points to the license-management software directory.
- PATH – specifies the directory path to search for executables. The SAP executables are located in the installed componen'ts /bin directory. When using the source files SYBASE.csh or SYBASE.sh, these paths are prepended to PATH:
  ```
  $SYBASE/$SYBASE_ASE/bin:$SYBASE/$SYBASE_OCS/bin
  ```
- LD_LIBRARY_PATH– this variable specifies the directory to search for shared libraries. The SAP shared libraries are located in the installed component's /lib directory.
  When using the source files SYBASE.csh or SYBASE.sh, these paths are prepended to the LD_LIBRARY_PATH environment variable:
  ```
  $SYBASE/$SYBASE_ASE/lib:$SYBASE/$SYBASE_OCS/
  lib:$SYBASE/SYBASE_FTS/lib,etc.
  ```
- LD_LIBRARY_PATH64– this variable specifies the directory to search for shared libraries on 64-bit Sun platforms.
- LIBPATH– on the IBM RS/6000 platform, this variable specifies which directory to search for libraries.
  When using the source files SYBASE.csh or SYBASE.sh, these paths are prepended to the LIBPATH environment variable:
  ```
  $SYBASE/$SYBASE_ASE/lib:$SYBASE/$SYBASE_OCS/
  lib: $SYBASE/SYBASE_FTS/lib, etc.
  ```
- SHLIB_PATH – on HP-UX platforms, this variable specifies which directory to search for libraries.
  When using the source files SYBASE.csh or SYBASE.sh, these paths are prepended to the LIBPATH environment variable:
  ```
  $SYBASE/$SYBASE_ASE/lib:$SYBASE/$SYBASE_OCS/
  lib: $SYBASE/SYBASE_FTS/lib, etc.
  ```

See also
- *Verifying Environment Variables* on page 35

CHAPTER 2   **SAP ASE Devices and System Databases**

Devices are files or portions of a disk that store databases and database objects. You can initialize devices using raw disk partitions or operating system files.

These devices are created when you create a new SAP ASE:

- `master` – stores system databases.
- `sybsystemdb` – stores information about distributed transaction.
- `sysprocsdev` – stores system procedures.

The master Device

The master device contains the `master`, `tempdb`, `model`, and sample databases.

- `master` – controls the operation of SAP ASE and stores information about all users, user databases, devices, objects, and system table entries. The `master` database is contained entirely on the master device and cannot be expanded onto any other device.
- `model` – provides a template for new user databases. The `model` database contains required system tables, which are copied into a new user database with the **create database** command.
- `tempdb` – the work area for temporary databases in SAP ASE. SAP ASE supports multiple `tempdb` databases. See *Create temporary database* in the *Transact-SQL Users Guide*. Each time SAP ASE is started, the `tempdb` database is cleared and rebuilt from the `model` database.
- The sample databases, `pubs2` and `pubs3`, are stored on the master device at installation, but should be moved to a user-defined device after installation.

Note: For recovery purposes, SAP recommends that you do not create other system or user databases or user objects on the master device.

The sybsystemdb Device

The `sybsystemdb` device stores the `sybsystemdb`database, which stores information about transactions in progress, and which is also used during recovery.

For new installations, the `master` device also contains the `sybsystemdb` database.

The `sybsystemdb` database is required to support distributed transaction management (DTM) features. Before installation, make sure you have enough space available on the default segment to support `sybsystemdb`.

The sysprocsdev Device

The `sysprocsdev` devices stores the `sybsystemprocs` database, which contains most of the SAP-supplied system procedures.

System procedures are a collection of SQL statements and flow-of-control statements that perform system tasks. The system procedures that are needed, for example `sp_configure`, during recovery situations are stored in the `master` database.

Note: `sysprocsdev` is the default system name for this device. However, it is frequently referred to as the `sybsystemprocs` device, since it stores the `sybsystemprocs` database.

Optional Devices and Databases

Optional devices and databases include the pluggable component interface (PCI) database, the sample databases, the `sybsecurity` device and database, and the `dbccdb` database.

Pluggable Component Interface (PCI) Database

The pluggable component interface (PCI) lets you add libraries that provide different functionalities to the SAP ASE. Java support (pluggable component adaptor/Java virtual machine) is included as a pluggable component with SAP ASE 15.0.3 and later.

The `sybpcidb` database stores necessary configuration information for the PCI and the pluggable component adaptor/Java virtual machine (PCA/JVM) plug-in.

To enable PCI in SAP ASE by using **srvbuildres**, add PCI/Java related properties to the resource files used by these utilities. Enter these values:

```
sqlsrv.do_configure_pci: yes
sqlsrv.sybpcidb_device_physical_name:/device_path
sqlsrv.sybpcidb_device_size: USE_DEFAULT
sqlsrv.sybpcidb_database_size: USE_DEFAULT
```

Sample Databases

`pubs2`, `pubs3`, `interpubs`, and `jpubs` are the available sample databases.

- `pubs2` and `pubs3` are provided as learning tools for SAP ASE. `pubs2` is used for most of the examples in the SAP ASE documentation; other examples use the `pubs3` database. Both are available in US English versions of SAP ASE.

- `interpubs` database contains French and German data.
- `jpubs` contains Japanese data.

For information about installing the sample databases, see *Post-Installation Tasks* in the *Installation Guide* for your platform.

For information about the contents of the sample databases, see the *Transact-SQL Users Guide*.

sybsecurity Device and Database

The `sybsecurity` device is created as part of the auditing installation process, storing the `sybsecurity` database and the system procedures with which to configure auditing.

The auditing system records system security information in an SAP ASE audit trail. You can use this audit trail to monitor the use of SAP ASE or system resources.

See *Auditing* in the *Security Administration Guide*.

See also
- *Chapter 19, Database Management System Auditing* on page 109
- *Determine the Size of a Database Device* on page 9

dbccdb Database

Database consistency checker (**dbcc**) commands lets you check the logical and physical consistency of a database. The `dbccdb` database stores the results of **dbcc checkstorage** or **dbcc checkverify**.

dbcc checkstorage records configuration information for the *target database*, operation activity, and the results of the operation in the `dbccdb` database. Stored in the database are **dbcc** stored procedures for creating and maintaining `dbccdb` and for generating reports on the results of **dbcc checkstorage** operations.

See *Checking Database Consistency* in the *System Administration Guide: Volume 2*.

sybmgmtdb Database

All the job, schedule, and scheduled job information, and data needed by the Job Scheduler task for internal processing is stored in the `sybmgmtdb` database.

Most access to data in the `sybmgmtdb` database is via stored procedure, which make data available to the GUI, the JS Agent, and the command line interface. Only the Job Scheduler task accesses data directly from the `sybmgmtdb` database.

See the *Job Scheduler Users Guide*.

Using Operating System Files as Database Devices

For devices that are initialized on operating system files, ensure that device writes occur directly on the physical media.

Use:

- **directio** with **disk init**, **sp_deviceattr**, and **disk reinit**
- **dsync** with **disk init**

directio and **dsync** parameters are mutually exclusive. If a device has **dsync** set to true, you cannot set **directio** to true for the same device. To enable **directio** for a device, also reset **dsync** to false.

The directio Parameter

The **directio** parameter for **disk init**, **disk reinit**, and **sp_deviceattr** lets you bypass the operating system buffer cache and transfer SAP ASE data directly to disk.

directio performs I/O in the same manner as raw devices and provides the same performance benefit, but has the ease of use and manageability of file system devices.

By default, the **directio** option is set to true (on) for all platforms. **directio** and **dsync** are ignored for raw devices.

See the *System Administration Guide, Volume 1.*

See also
- *The dsync Parameter* on page 8

The dsync Parameter

The **dsync** parameter ensures SAP ASE can recover data from devices on file systems.

By default, SAP ASE disables **dsync** for file system devices. However, **dsync** may cause performance degradation for file system devices that experience high write activity. You can set or reset **dsync** using the **disk init**, **disk reinit**, and **sp_deviceattr** commands. When **dsync** is set to false (off), cached I/O is used.

Note: dsync and **directio** are ignored for raw devices.

Immediately after upgrading, make sure that either **dsync** or **directio** is set for the file system devices. See also **sp_deviceattr** and **sp_helpdevice** in the *Reference Manual: Procedures*

See also
- *The directio Parameter* on page 8

Determine the Size of a Database Device

SAP ASE requires baseline values for each database device.

See the release bulletin for any last-minute changes to these values.

Table 1. SAP ASE Database Devices

Device	Purpose	Minimum size	Minimum recommended size
`master`	Stores system databases	24MB for 2K pages 45MB for 4K pages 89MB for 8K pages 177MB for 16K pages	30MB 60MB 120MB 240MB
`sysprocsdev` (also called the `sybsystemprocs` device)	Stores the `sybsystemprocs` database	160MB	172MB (plus any space for holding stored procedures you have created)
`sybsystemdb`	Transaction processing	3MB for 2K pages 6MB for 4K pages 12MB for 8K pages 24MB for 16K pages	5 – 24MB
`sybsecurity` (optional)	Required for auditing	10MB or size of the `model` database, whichever is larger	Depends on specific auditing needs

See also
- *sybsecurity Device and Database* on page 7
- *Chapter 19, Database Management System Auditing* on page 109

Support for Raw Partitions or Files

You can use either a raw partition or a file system for all databases.

SAP ASE supports the database devices on NFS- and CIFS-mounted devices with network appliance filers for storing data. Network appliance filers provide the same performance and data integrity as raw devices. No operating system or SAP ASE changes are required.

NFS-mounted devices have been tested on Solaris, HP-UX, IBM AIX, and Linux.

Preparation of a Raw Partition Device

Increase performance and avoid file damange by using best practices when preparing a raw partition device.

You may need to repartition the disk you choose. Contact your operating system administrator for assistance.

- Do not initialize a database device on the partition that contains your SAP installation software. Doing so destroys all existing files on that partition.
- You cannot mount a raw partition designated for use by SAP for use by the operating system for any other purpose, such as for file systems or swap space.
- After a SAP configuration utility or the **disk init** command has initialized a portion of a partition as a database device, you cannot use the entire partition for any other purpose. To dynamically increase the size of your database devices, rather than initializing a new device, use **disk resize**.
- For best performance, place the SAP software and all disk devices, including the `master` device, on the same machine.
- To avoid any possibility of using a partition that contains the partition map, do not use cylinder 0.

Choosing a Raw Partition

Determine the size and availability of raw devices.

1. Determine which raw partitions are available.
2. Determine the sizes of the raw partitions.
3. From the list of available raw partitions, select a raw partition for each device.
4. Verify with the operating system administrator that the partition you have chosen is available.
5. Make sure the "SAP" user has read and write privileges to the raw partition.

   For more information on choosing a raw partition, see your operating system documentation.

CHAPTER 3   **Client/Server Communication**

SAP ASE communicates with other SAP ASE servers, Open Server™ applications (such as Backup Server), and client software on your network. Clients communicate to one or more servers, and servers can communicate with other servers using remote procedure calls.

For SAP products to interact with one another, each product needs to know where the others reside on the network. Names and addresses of every known server are listed in a directory services file. This information can be stored in a directory services file two different ways:

* In an interfaces file, named `interfaces` on UNIX platforms, located in the `$SYBASE` installation directory, or
* In an LDAP server.

After your SAP ASE or client software is installed, it can connect with any server on the network that is listed in the directory services.

When you are using a client program, and you want to connect with a particular server, the client program looks up the server name in the directory services and connects to that server. You can supply the name of the server by using the DSQUERY environment variable.

On TCP/IP networks, the port number gives clients a way to identify the SAP ASE, Open Server, or Backup Server to which they want to connect. It also tells the server where to listen for incoming connection attempts from clients. The server uses a single port for these two services (referred to as *query service* and *listener service*).

During installation, you use the **srvbuild** utility to create and configure a new server. The **srvbuild** process adds entries to the interfaces file for your new SAP ASE, Backup Server, and XP Server.

For instructions about how to modify existing interfaces file entries using **dsedit** and **dscp**, see the *Utility Guide*.

See also

CHAPTER 4 **About Changing SAP ASE Configuration**

Use **sp_configure** to change SAP ASE configuration.

To change the configuration of several servers, enter the **sp_configure** information in a script. For details on using **sp_configure**, see the *System Administration Guide: Volume 1* and the *Reference Manual: Procedures*.

You can also:

- Configure languages, character sets, and sort orders.
- Configure SAP ASE to use high availability features. See *Using SAP Failover in a High Availability Environment*.
- Configure SAP ASE for distributed transaction management (two-phase commit). See the *System Administration Guide: Volume 2*.

See also

- *Changing SAP ASE Localization Configuration* on page 100

CHAPTER 5 **Languages Other Than US English**

If you are running **srvbuild** in a language other than US English, verify that any input you provide uses a character set that is supported by the us_english character set.

Note: The us_english character set does not support accent marks, such as tildes (~) and umlauts (ü). This prevents **srvbuild** from supporting the character sets that use these characters.

For more information about languages, character sets, and sort orders, see the *Installation Guide* for your platform. For more information on **srvbuild**, see the *Utility Guide*.

CHAPTER 6   **SAP ASE Specifications**

SAP ASE specifications include databases, tables, queries, procedures, and extended-limit capabilities information about SAP ASE requirements.

Database Specifications

Database specifications define requirements for items such as database size, and the number of database devices per server.

Item	Requirement	Notes
Databases per SAP ASE	A maximum of 32,767 databases per server	
Maximum database size	2K page server – 8TB 4K page server – 16TB 8K page server – 32TB 16K page server – 64TB	Because SAP ASE reserves 256 logical page IDs—which cannot be allocated or used—at the high end of the logical page range, the sizes listed above are slightly higher than the actual amount of space available for use. This overhead reduces the actual amount of space available by 256 times the logical page size for each listed page size (for example, the actual available size for a 2K server is 8TB – (256 x 2K)).
Minimum allowable `syb-systemprocs` database	136MB	Required for an upgrade
Maximum size of a database device (disk partition)	2^{42} (4TB)	If the operating system supports file sizes up to 4TB, then SAP ASE supports file system devices up to 4TB
Maximum number of database devices per server	2^{31}	
Maximum number of devices or device pieces per database	Unlimited	Limited by available memory

Item	Requirement	Notes
Maximum number of segments per database	31	
Maximum number of login IDs per serve	2147516416	
Maximum number of users per database	2146484223	
Maximum number of groups per database	1032193	

Table Specifications

Table specifications define requirements for items such as indexes, rows, and columns per table.

Item	Requirement	Notes
User objects per database	$2^{31} - 255$	
Indexes per table	250 (one clustered index)	
Rows per table	Limited by available storage	Maximum 2^{32}
Columns per composite index	31	
Creation of clustered index	$1.2*(x + y)$ x = total data space in table, y = sum of space of all nonclustered indexes on table, and 20 percent overhead for logging	For sorted data, approximately 20 percent of the table size needed
Maximum size of object name	255	

Procedure Specifications

Procedure specifications list items such as number of buffers and procedure buffers, and the required minimum memory per stored procedure.

Item	Requirement	Notes
Number of buffers and procedure buffers	Configurable	Limited by amount of RAM and maximum size of shared memory segment

Item	Requirement	Notes
Minimum memory required per stored procedure	2K	
Maximum number of parameters per stored procedure	2048	

Query Specifications

Query specifications define requirements for items such as maximum number of tables in a "union" query.

Item	Requirement	Notes
Maximum number of tables participating in a query, for a query without a union, or for each side of a union in a query	64	Maximum of 50 user tables, including result tables, tables referenced by views (the view itself is not counted) correlations and self-joins; maximum of 46 worktables
Maximum number of tables in a "union" query	256	Includes up to 50 user tables and 14 worktables on every side of the union, for a maximum of 256 tables across all sides of the union
Maximum number of databases participating in one transaction	Unlimited	Includes database where transaction began, all databases changed during transaction, and tempdb, if it is used for results or worktables
Practical number of databases participating in one query	16	Includes each occurrence of each database queried and tempdb, if it is used for results or worktables
Maximum number of tables with referential integrity constraints for a query	192	
Number of items in an **in** clause.	Unlimited	No hardcoded limit, but potentially limited by free procedure cache.

Maximum Column Sizes

SAP ASE extended-limit capabilities vary by type of table and the database logical page size

The column and row limits for allpages-locked (APL) tables are:

Maximum APL Table Limits	Number of Columns	Column Size 2K Page	Column Size 4K Page	Column Size 8K Page	Column Size 16K Page
Fixed-length column	1024	1960 bytes	4008 bytes	8104 bytes	16296 bytes
Variable-length column	254	1948 bytes	3988 bytes	8068 bytes	16228 bytes

The column and row limits for data-only-locked (DOL) tables are:

Maximum DOL Table Limits	Number of Columns	Column Size 2K Page	Column Size 4K Page	Column Size 8K Page	Column Size 16K Page
Fixed-length column	1024	1958 bytes	4006 bytes	8102 bytes	16294 bytes
Variable-length column	1024	1954 bytes	4002 bytes	8098 bytes	16290 bytes

Database Requirements for Varying Page Sizes

Database space requirements depend on the logical page size of the server. If your `model` database is larger than the minimum size listed below, then the minimum size of the database is equal to the `model` database.

The database requirements for varying page sizes for each database are:

Databases	2K page	4K page	8K page	16K page
`master` database	13MB	26MB	52MB	104MB
`model` database	3MB	6MB	12MB	24MB
`tempdb` database	4MB	6MB	12MB	24MB

Databases	2K page	4K page	8K page	16K page
sybsystemdb database	3MB	6MB	12MB	24MB
sybpcidb database	24MB	48MB	96MB	192MB

Data Limits for Tables According to Page Size

Larger logical page sizes can contain more data.

The data limits for tables according to page size:

Tables	2K page	4K page	8K page	16K page
Bytes per index key	600	1250	2600	5300
User-visible row length DOL table	1958	4006	8102	16294
User-visible row length APL table	1960	4008	8104	16296

CHAPTER 7   **Start and Stop Servers**

Start and stop SAP ASE, Backup Server, and XP Server.

XP Server is not started by the installation process. XP Server is started by SAP ASE when you issue an XP command through **isql**.

You can use SAP® Control Center to start and stop servers manually or automatically. For more information about SAP Control Center, see the *System Administration Guide, Volume 1* and the online help.

See also
*   *Migrating from the interfaces File to LDAP* on page 79
*   *Adding a Server to the Directory Services* on page 76
*   *Set the SAP ASE Error Log Path* on page 104

Start Servers

Start SAP ASE or Backup Server from the command line.

You can start SAP ASE or Backup Server using RUN_server_name files and **startserver** commands. You can also customize the start up options by editing RUN_server_name.

To start a server, your user account must have:

*   Access to the database servers (execute privileges) and database devices (read/write privileges).
*   Access to SAP ASE distribution files.
*   System environment variables set.

The installation program creates the interfaces file and system environment variables when you install servers on your computer.

Server Start-up Parameters

Set the start-up parameters to the correct location and device names for starting an SAP ASE or Backup Server.

The default start-up parameters are stored under $SYBASE/$SYBASE_ASE/install/RUN_*server_name*, where *server_name* is the name of the server you installed.

You cannot change any of these default start-up parameters unless you edit the $SYBASE/$SYBASE_ASE/install/RUN_ *server_name* file. You can also specify additional start-up parameters within the $SYBASE/$SYBASE_ASE/install/RUN_ *server_name* file.

Backup server names are appended with "_BAK".

Table 2. Default SAP ASE Start-Up Parameters

Switch	Description
-d `$SYBASE/data/master.dat`	Location of the master device file
-s `server_name`	Name of the SAP ASE
-e `$SYBASE/$SYBASE_ASE /install/` `errorlog`	Location and name of the error log file
-M `$SYBASE/$SYBASE_ASE`	Directory that stores shared memory files
-N`$SYBASE/$SYBASE_ASE/sysam/` `<srv_name>.properties`	Location and name of license cache file.

Additional start-up parameters include any valid server command line options listed for the **databaserver** and **backupserver** descriptions in the *Utility Guide*.

RUN_server_name File

Each time a new SAP ASE or Backup Server is created, the **srvbuild** program creates a RUN_`server_name` file that contains the information required to restart that server.

RUN_server_name files are created in the `$SYBASE/$SYBASE_ASE/install` directory.

For SAP ASE, the RUN_`servername` file is named RUN_`servername` , where *servername* is the name of the server. For example, the RUN_`servername` file name for an SAP ASE named TEST is RUN_TEST.

For Backup Server, the RUN_`servername` files is named RUN_`servername`_back.

Warning! Do not delete the RUN_`servername` file that is created in `$SYBASE/` `$SYBASE_ASE/install`. This file restart servers when you customize your installation. If you need the RUN_`servername` file in another location, make a copy of the original RUN_`servername` file in the new location.

Using the startserver Command

Use **startserver** to start a server from the command line.

Prerequisites

Read and write permissions on the master device.

Task
To start a server from the command line, enter:

```
$SYBASE/$SYBASE_ASE/install/startserver [ -f RUN_server_name
file ]
```

where `$SYBASE/$SYBASE_ASE/install/startserver` is the full path name of the
startserver utility, and *RUN_server_name file* is the full path name of the
`RUN_server_name` file (usually `$SYBASE/$SYBASE_ASE/install/`
`RUN_server_name`).

If your SAP ASE is named SYBASE, the `RUN_server_name` file specification is optional.

For more information about **startserver**, see the *Utility Guide*.

Start Servers When the Operating System Restarts

Configure your operating system to automatically restart SAP ASE and Backup Server.

On production systems, set up SAP ASE and Backup Server to restart automatically when the
UNIX operating system starts. Do this by making an entry for the server in the operating
system start-up script.

Note: The start-up script must set up all the required SAP environment variables, or source
`SYBASE.csh` or `SYBASE.sh,` before starting the server.

Creating a System Restart Script for HP-UX

Create a script that executes when the operating system starts or shuts down.

1. As system administrator must create a script that executes when the operating system starts
   or shuts down.
   You can model your script after the HP-UX template file `/sbin/init.d/template`.
   You cannot edit commands in the `/etc/rc` file in HP-UX versions 10.0 and later. For
   more information about **rc (1M)**, see the HP-UX manual page.
2. After creating the start-up and shutdown script, place it in the directory `/sbin/`
   `init.d`.
   Execution scripts in this directory have symbolic links to directories `/sbin/rcn.d`
   where *n* is the system run level. The linked scripts in `/sbin/rcn.d` control the
   sequencing order of the execution scripts.

Creating a System Restart Script for IBM RS/6000

On production systems, you can restart SAP ASE automatically whenever the UNIX
operating system restarts.

Prerequisites

All network resources must be available before you start SAP ASE; otherwise, SAP ASE does
not start. Also, your server does not start if the network is not running.

Task

To have SAP ASE restart automatically, place the **startserver** command in the `/etc/inittab` file.

Here is a suggested format for an SAP ASE start-up command to add to `/etc/inittab`:

```
"sybase:2:wait:/release_directory/install/startserver -f \
RUN_servername /dev/console 2>&1"
```

where *release_directory* is the full path to the SAP installation directory (specified as the SAP environment variable), and `RUN_servername` is the `RUN_server_name` file for the server you are starting.

Make sure the entry for starting SAP ASE follows any entry for `/etc/rc.tcpip` and `/etc/rc.nfs` in the `/etc/inittab` file.

Slow start-up of network operations may prevent SAP ASE from starting, even when the commands in the `/etc/rc.tcpip` file are in the correct order. You can designate a period of time for SAP ASE to wait before starting by inserting a **sleep** command before the server start-up command in the `RUN_server_name` file. The **sleep** command is in the form:

```
sleep seconds_of_rest
```

Note: To enable restart of a Backup Server when the operating system starts, add a Backup Server start-up command to `/etc/inittab`. Use the path of the Backup Server `RUN_server_name` file in this command.

Creating a System Restart Script for Sun Solaris and Linux

Create a script that automatically starts or shuts down SAP ASE or Backup Server when the operating system starts or shuts down.

Prerequisites

Make sure all network resources are available. Your server does not start if the network is not running. Be sure the entry for restarting the server follows any commands in the `rc` directory for starting network operations. Slow start-up of network operations may prevent servers from starting, even if commands are in the correct order in the `rc` directory.

Task

You may want to designate a period of time for your server to wait before starting by inserting a **sleep** command at the beginning of the linked `RUN_server_name` file you created.

1. Create a start-up script file with contents such as:

```
$SYBASE/$SYBASE_ASE/install/startserver    -f $SYBASE/
$SYBASE_ASE/install/RUN_servername
```

where `$SYBASE/$SYBASE_ASE/install/startserver` is the full path name of the **startserver** utility, and `$SYBASE/$SYBASE_ASE/install/RUN_servername` is the full path name of the `RUN_server_name` file for the server.

2. Copy the script to the `/etc/init.d` directory, using syntax such as:

```
cp script_name /etc/init.d/script_name
```

3. Review the contents of the `/etc/inittab` file to determine the default run level for your operating system. The **initdefault** entry specifies the default run level, which is usually 2 or 3 for Sun Solaris, and 5 for Linux.

4. Use the **ln** command to create a hard link from the `RUN_server_name` file to the appropriate `run control (rc)` directory, `rc#`, where *#* is the default run level obtained in step 2.

Use Sun Solaris syntax such as:

```
ln /etc/init.d/script_name      /etc/rc#.d/S##script_name
```

```
ln /etc/init.d/script_name      /etc/rc#.d/S##script_name
```

Use Linux syntax such as:

Use **ln -s** to create symbolic links from the script name to the appropriate run control (`rc`) directory, `rc#` where *#* is the run level. Use syntax such as:

```
ln -s /etc/init.d/script_name     /etc/rc#.d/S##script_name
```

When you type the command to create this link, add an uppercase "S" and a two-digit sequence number preceding the name of the script file. "S" indicates a start-up file. The sequence number is necessary because files in the `rc` directory are executed in order of their numbers. This file should be executed last, so use a sequence number that follows all existing numbers in ASCII order.

You can perform an **ls** command on the `rc` directory to view existing sequence numbers. For example:

```
ls /etc/rc3.d/S*
```

returns:

```
/etc/rc3.d/S10syslog
```

```
/etc/rc3.d/S15nfs.server
```

```
/etc/rc3.d/S21rfs
```

If your script is named **sybstart**, enter:

```
ln /etc/init.d/sybstart /etc/rc3.d/S77sybstart
```

In this example, you can use any number greater than 27 in place of 77.

For Linux:

You can perform an **ls** command on the `rc` directory to view existing sequence numbers. For example:

```
ls /etc rc5.d/S*
```

returns:

```
/etc/rc5.d/S12syslog
/etc/rc5.d/S14nfslock
/etc/rc5.d/S27ypbind
```

and so on. If your script is named `sybstart`, enter:

```
ln -s /etc/init.d/sybstart    /etc/rc5.d/S99sybstart
```

In this example, you can use any number greater than 27 in place of 99.

Starting XP Server After Initial Installation

Add information about the XP Server to the `sysservers` table.

If you install SAP ASE and XP Server in the same build session, **srvbuild** automatically adds information about the XP Server to the `sysservers` table of SAP ASE. If you install XP Server in a different build session than the SAP ASE installation, you are prompted during the XP Server installation to supply the name of the related SAP ASE and the system administrator's name and password. This information is required by SAP ASE to start XP Server.

If you do not supply this information during installation, XP Server cannot run. When you execute an extended stored procedure (ESP), you see an error message similar to:

```
Msg 11018, Level 16, State 1:
Procedure 'xp_cmdshell', Line 2
XP Server must be up for ESP to execute.
```

To add this required information to the `sysservers` table manually, enter:

```
sp_addserver SERVERNAME_XP, NULL, SERVERNAME_XP
```

where *servername* is the name of the SAP ASE.

Stop Servers

Only the system administrator can issue a **shutdown** command. Using a **shutdown** command minimizes the amount of work for automatic recovery when servers are restarted.

The preferred method of stopping SAP ASE or Backup Server is to use the Transact-SQL **shutdown** command.

Stopping SAP ASE

Only a system administrator can shut down an SAP ASE.

1. Use **isql** to log in to an SAP ASE account with system administrator privileges:
   ```
   isql -Usa -Ppassword -Sserver_name
   ```
2. Enter:
   ```
   1> shutdown
   2> go
   ```

   The default for **shutdown** uses the **with wait** option, which allows SAP ASE to finish executing SQL statements or procedures, perform a checkpoint in each database, disable new logins, and perform other shutdown tasks.

   Issuing the **shutdown** command prints a message such as this to the sterr file:
   ```
   Server SHUTDOWN by request.The SQL Server is terminating this
   process.
   CT-LIBRARY error:
   ```

   This is normal behavior. If the message indicates that SAP ASE is waiting for processes to complete, and you must stop SAP ASE immediately, you can use **shutdown with nowait** which neither waits for currently executing statements to finish, nor performs checkpoints in every database.

   Note: SAP recommends that you use the **shutdown with nowait** command only when necessary.

Stopping Backup Server

Only a system administrator can shut down a Backup Server.

1. Use **isql** to log in to a server with system administrator privileges.
2. Enter:
   ```
   1> shutdown SYB_BACKUP
   2> go
   ```

   After you shut down a Backup Server, you must wait at least 30 seconds before restarting it.

   Issuing the **shutdown** command prints a message similar to the stderr file:
   ```
   Backup Server: 3.48.1.1: The Backup Server will go down
   immediately.
   Terminating sessions.
   ```

   This is normal behavior. If a message indicates that SAP ASE or Backup Server is waiting for processes to complete, and you must stop SAP ASE or Backup Server immediately, use **shutdown with nowait**, which neither waits for currently executing statements to finish, nor performs checkpoints in every database.

> **Note:** SAP recommends that you use the **shutdown with nowait** command only when necessary.

See the *Reference Manual: Commands*.

Using the kill Command

You can use the **kill** command to stop SAP ASE and Backup Server processes.

> **Warning!** Use the **kill** command to stop SAP ASE and Backup Server only as a last resort.

When possible, use the Transact-SQL **shutdown** or **shutdown with nowait** command. Do not use **kill** with the **-9** flag, because it exits the server without running a checkpoint to ensure that all database changes are written to the database device. SAP ASE may also exit without removing associated shared memory files and network handlers.

Because SAP ASE and Backup Server are background processes, they can be killed from the operating system by their owner or by root with the UNIX **kill** command. The syntax is:

```
kill pid
```

where *pid* is the process identification of any **dataserver** or **backupserver** process, as determined by the **showserver** command. Killing one engine for a particular SAP ASE kills all engines for that server.

If more than one SAP ASE is running on the same system, be careful that the engine you kill is associated with the correct SAP ASE. If your SAP ASE is configured to use multiple engines (CPUs), each engine has an associated operating system process. The correct way to kill a multiengine server is to specify the process ID for engine 0.

This `showserver` output shows the processes for a four-engine server when SAP ASE runs in process kernel mode. In the default threaded mode each engine is not a process, therefore only one process is listed in `showserver`.

```
showserver

UID    PID   PPID  C    STIME     TTY     TIME     COMD
jorge  3320  1     80   10:31:40  pts/4   302:15   dataserver -dteamster
jorge  3321  3320  80   10:31:45  pts/4   324:47   dataserver -ONLINE:1
jorge  3322  3320  80   10:31:45  pts/4   326:02   dataserver -ONLINE:2
jorge  3323  3320  80   10:31:45  pts/4   328:56   dataserver -ONLINE:3
```

This example shows four running **dataserver** processes with operating system process identifications (PID) 3320, 3321, 3322, and 3323 (**dataserver** is the executable form of the SAP ASE program.)

Child engine processes for the dataserver have the **-ONLINE:** argument.

Each child engine has a parent process identification (PPID) that is equal to the process identification (PID) of the parent. In the example above, the PID of the parent server is 3320. The other three engines spawned by the parent process have the same PPID.

If the PPIDs appear to be unrelated, and there is more than one **dataserver** process, then more than one SAP ASE is running on the system.

Shutdown and Shared Memory Files

The method you select to shut down SAP ASE or Backup Server may affect shared memory segments.

When SAP ASE starts, it creates `SERVER_NAME.krg` file in `$SYBASE/$SYBASE_ASE directory` to store information about shared memory segments that it uses.

If SAP ASE is configured with a memory size greater than the MAXSHMSEGSIZE parameter in the operating system, SAP ASE may create additional shared memory segments and for every additional shared memory segment that it creates, an additional file with `SERVER_NAME.srg[N]` (where N ranges from $0 – N$), is created under `$SYBASE/ $SYBASE_ASE`.

When SAP ASE is shut down in a normal manner, the shared memory files are automatically removed. If SAP ASE fails or is stopped with the **kill -9** command, these files are not deleted. You need read and write permissions on these files to restart SAP ASE after a failure or a **kill -9** command, because SAP ASE must be able to overwrite the previously created shared memory files.

Killing SAP ASE or Backup Server abnormally also leaves shared memory segments. Use the **ipcs** and **ipcrm** commands to identify and remove these shared memory segments that show a "NATTACH" count of 0.

See the UNIX man pages for more information about **ipcs** and **ipcrm**.

CHAPTER 8 **Huge Pages on Linux**

SAP ASE supports huge pages for x64 and P-series Linux versions.

The CPU cache translation lookaside buffer (TLB) stores information about conversions from a virtual page address to the physical page address, and every byte access to physical memory requires a conversion (called a "cache miss"). Cache misses are expensive, but you can improve the TLB hits is by enabling "huge pages" on Linux machines.

Huge pages use fewer pages to cover the physical address space, so the size of "bookkeeping" (mapping from the virtual to the physical address) decreases, requiring fewer entries in the TLB and improving the system performance.

By default, SAP ASE versions 15.0.3 and later allocate shared memory using huge pages. However, if the system does not have enough huge pages—or is not configured for huge pages —SAP ASE uses regular pages, and writes this message to the error log:

```
Could not allocate memory using Huge Pages. Allocated using regular
pages. For better performance, reboot the server after configuring
enough Huge Pages
```

SAP ASE adjusts its shared memory up to the nearest multiple of 256MB. For example, if you configure SAP ASE with 800MB of shared memory, it is rounded off to 1GB (some versions of Linux do not allow you to allocate huge pages if the size is not a multiple of **Hugepagesize**).

Before starting SAP ASE, check /proc/meminfo to make sure Linux already has huge pages configured:

```
cat /proc/meminfo
....
HugePages_Total:     32
HugePages_Free:      32
Hugepagesize:     16384 kB
```

Note: Memory you allocate for huge pages is used only for the shared memory. Allocating too many huge pages may lead to SAP ASE excessively swapping physical pages. Allocate only the required number of huge pages.

CHAPTER 9   **Configure the Operating System**

After installing or updating SAP ASE, adjust configuration settings.

You can configure some SAP ASE settings during installation. Unless stated otherwise, configuration information pertains to all supported UNIX platforms. See the *Installation Guide* for more details.

Verifying Environment Variables

Use **env** at the operating system prompt to verify that the SAP ASE environment variables are set correctly.

See also
*   *Environment Variables* on page 2

Using the stty Setting

Set **stty tostop** to stop a background SAP ASE from writing output to the terminal.

To stop background output, enter this command before starting SAP ASE:
```
stty -tostop
```
If you are redirecting all SAP ASE output to files, you need not change the **stty** setting.

Restore Correct Permissions

SAP software files and directories are installed with the correct access permissions. If necessary, you can restore the correct permissions with the script setperm_all, located in $SYBASE/$SYBASE_ASE/install.

File Descriptors and User Connections

The number of user connections used by SAP ASE cannot exceed the number of file descriptors available to SAP ASE on the operating system.

When configuring user connections on SAP ASE, the system administrator should take into account the number of file descriptors available per process. Although most of the open file descriptors are available for user connections, a few are used by SAP ASE for opening files and devices.

File Descriptors and User Connections for HP-UX

Find or change the current file descriptor values.

The kernel parameters **maxfiles** and **maxfiles_lim** control the number of file descriptors available to any one process. The limit is 60,000 on a 64-bit system.

To find the current file descriptor values, use:

```
ulimit -n
```

File Descriptors and User Connections for AIX

Find or change the current file descriptor values.

The number of file descriptors per process is determined by the operating system parameter **open_max**. The default value of **open_max** is 32767. SAP ASE can use a maximum of 65534 file descriptors, regardless of the value of **open_max**. See the AIX operating system documentation.

To obtain the current **open_max** value, use:

```
ulimit -n
```

File Descriptors and User Connections for Linux

Find or change the current file descriptor values.

The number of file descriptors per process is limited to 10,000. You can set the number of file descriptors using **ulimit**. SAP ASE can use a maximum of 40000 file descriptors.

File Descriptors and User Connections for Sun Solaris

Find or change the current file descriptor values.

For Sun Solaris, you can set both soft and hard limits for file descriptors. The soft limit can be increased up to the hard limit by the user, but the hard limit can be increased only by someone with root permissions. The soft limit determines the number of open file descriptors available to an SAP ASE engine. The limit is 10,000.

Although most of the open file descriptors are available for user connections, a few are used by SAP ASE for opening files and devices.

See *Setting Configuration Parameters* in the *System Administration Guide, Volume 1*.

Displaying Current Soft and Hard Limits

You can display the current soft and hard limits for C and Bourne shells.
To display the current soft or hard limits:

*   For soft C shells, enter:
    ```
    limit descriptors
    ```

- For soft Bourne shells, enter:

```
ulimit -n
```

- For hard C shells, enter:

```
limit -h descriptors
```
- For hard Bourne shells, enter:

```
ulimit -Hn
```

Increasing the Soft Limit

Increase the soft limits for C and Bourne shells.

- To increase the soft limit for C shells, enter:

```
limit descriptors n
```
- To increase the soft limit for Bourne shells, enter:

```
ulimit -Sn new_value
```

where *n* is the current value for the soft limit, and *new_value* is the value to which to increase the soft limit.

Note: You can use the preceding commands in your RUN_server_name file to increase the hard and soft limits. The RUN_server_name file is a Bourne shell script, so be sure to use the Bourne shell versions of these commands in the RUN_server_name file.

Increasing the Hard Limit

Set up a program to increase the hard limit.

1. Create file_name.c, (where file_name is the name you give the file.
2. Enter the text shown below, making the appropriate modifications for your situation. .

   Note: This is an sample script; modify it as necessary.

```
#include <sys/time.h>
#include <sys/resource.h>
#include <sys/types.h>
/*
** define MAX_CONNECTIONS to a number less than
** 10000. The number defined will then become the maximum
** number of connections allowed by an SAP ASE.
*/
#define MAX_CONNECTIONS 9999
extern int errno;

main(argc,argv)
char **argv;
{
    struct rlimit rlp;
    uid_t uid;

    rlp.rlim_cur = MAX_CONNECTIONS;
```

```
    rlp.rlim_max = MAX_CONNECTIONS;
/* set the number of open file descriptors to
   MAX_CONNECTIONS */
   if (setrlimit (RLIMIT_NOFILE,&rlp) == -1)
   {
       perror("setrlimit");
       exit(1);
   }

  /* reset the user id to disable superuser
   privileges */
   uid = getuid();
   setuid(uid);
  /* run the program indicated as arguments to
   this program */
   execv(*++argv, argv);
}
```

3. Compile the file:

```
cc file_name.c -o program_name
```

where *program_name* is the compiled file name.

4. Change the program's permissions and ownership:

```
chmod 755 program_name
chown root program_name
```

5. The root user can start SAP ASE with increased user connections by entering this command at the operating system prompt.

```
# program_name dataserver -d master_device_name
```

where *master_device_name* is the full path of the SAP ASE master device.Alternatively, you can add *program_name* preceding the **dataserver** command line in the SAP ASE RUN_server_name file.

See *Setting Configuration Parameters* in the *System Administration Guide, Volume 1.*

Enable Asynchronous Disk I/O

Enable asynchronous disk I/O on Linux, IBM, and HP-UX.

SAP recommends that you do not use block devices as database devices on UNIX and Linux systems; a system failure may lead to loss of data integrity if you do so.

If you are using raw devices on a UNIX platform, you cannot:

* Set the **disk init...directio** or **dsync** parameter to **true**
* Set the **sp_deviceattr...directio** or **dsync** parameter to **true**

If either of these are set to **true**, SAP ASE returns a message similar to:

```
You cannot set directio option for raw device '/dev/raw/raw235' or
You cannot set attribute dsync for raw device
```

Enabling Asynchronous Disk I/O on Linux

Enable asynchronous I/O on Linux.

Prerequisites

Before starting SAP ASE, verify there are sufficient system resources for kernel asynchronous I/O.

The total number of system-wide reservable I/O descriptors (`aio-max-nr`) minus the current number of descriptors reserved by all processes (`aio-nr`) must be sufficient to accommodate the value for **max async i/os per engine**.

Task

1. To determine the values for `aio-max-nr` and `aio-nr`, use:
   ```
   cat /proc/sys/fs/aio-max-nr
   cat /proc/sys/fs/aio-nr
   ```
2. Modify the number of reservable descriptors by setting `fs.aio-max-nr` with the **sysctl** operating system command. See your operating system documentation for information.

   SAP ASE may issue messages similar to these in the error log if there are insufficient number of I/O descriptors during start-up, or when an engine is brought online:
   ```
   kernel KAIO not initialized because the requested number of async
   I/Os(%d) will exceed the resources available on the operating
   system.

   kernel Kernel asynchronous I/O not initialized. The io_setup()
   system call returned %d.
   ```

   See **max async i/os per engine** in *Setting Configuration Parameters* in the *System Administration Guide, Volume 1*.

Enabling Asynchronous Disk I/O on IBM AIX

On IBM AIX, enable asynchronous I/O by adjusting the kernel parameters, using the System Management Interface Tool (SMIT).

1. Enter `smit` at the UNIX prompt.
2. From the Devices menu, select **Asynchronous I/O**.
3. Select **Change/Show Characteristics of Asynchronous I/O.**

Enabling Asynchronous Disk I/O HP-UX

To improve I/O performance on character or raw and block devices, enable asynchronous I/O by installing the HP asynchronous I/O driver from SAM.

1. Shut down SAP ASE.
2. From the SAM Kernel Configuration menu, choose **Drivers** and set the pending state for *asyncdisk* to In by adding the driver. Alternatively, add the *asyncdisk* subsystem keyword to */stand/system*.
3. Rebuild the kernel, and restart the system.
4. Using the `userid` root, execute:

```
#/etc/mknod/dev/async c 101 4
#chmod 0660/dev/async
#chown <uid> /dev/async
#/etc/setprivgrp <ugrp> MLOCK
```

where:

- *<uid>* is the identification (user ID) used by the user who is restarting SAP ASE. This user must be the owner of the `/dev/async` directory.
- *<ugrp>* is the user group for the *<uid>* user ID.

Enabling Asynchronous I/O for File System Devices

Enable asynchronous I/O for file system devices on HP-UX.

Prerequisites

SAP recommends that you adjust these operating system parameters to their maximum values:

```
# kctune aio_max_ops=0x100000
# kctune aio_proc_threads=2048
```

Task

1. Enable the **allow sql server async i/o** configuration parameter.
2. Enable the **enable hp posix async i/o** configuration parameter. This parameter is static.
   ```
   sp_configure 'enable hp posix async i/o', 1
   ```
3. Restart SAP ASE.
   See *Setting Configuration Parameters* in the *System Administration Guide, Volume 1.*

Enabling Asynchronous I/O for File Systems

Enable asynchronous I/O for file systems on HP-UX.

Prerequisites

SAP recommends that you enable VxFS Concurrent I/O (CIO) on HP-UX file systems to take advantage of its performance benefits. VxFS Concurrent I/O is available with OnlineJFS (VxFS-Full) version 5.0.1 and later for HP-UX 11.31.

Task
To verify that OnlineJFS is installed and enabled, enter:

```
# vxlicrep | grep -i onlinejfs
```

or:

```
#  swlist -l product |grep -i onlinejfs
```

See your operating system documentation.

Adjust the Client Connection Timeout Period

SAP ASE uses the **KEEPALIVE** option of the TCP/IP protocol to detect inactive clients.

When a connection to a client is inactive for a period of time (the *timeout period*), the operating system sends **KEEPALIVE** packets at regular intervals. If it does not receive a response from the client machine for any of these packets, the operating system notifies SAP ASE that the client is no longer responding. SAP ASE then terminates the client's connection.

The **KEEPALIVE** default timeout period is 2 hours (7,200,000 ms). To display the current time value, use the appropriate command for your platform.

Adjusting the Client Connection Timeout for HP-UX

Display or change the current timeout period.

1. To display the current timeout period, enter:
   ```
   /ndd -get/set /dev/tcp tcp_keepalive_interval
   ```

   The **tcp_keepalive_interval** parameter specifies the length of time (measured in seconds) to keep an idle connection active before the system checks to see if the connection died.
2. Use the **nettune -s** or **ndd -set** commands to change the timeout period.

Adjusting the Client Connection Timeout for IBM RS/6000

Display, and if necessary, adjust the current timeout period.
To display the current timeout value, enter:
```
/usr/sbin/no -o tcp_keepidle
```

The **tcp_keepidle** parameter specifies the length of time (measured in half seconds) to keep an idle connection active before the system checks to see if the connection died. The default is 14,400 half seconds (7200 seconds, or 2 hours).

IBM recommends you use a value of at least 15 minutes.

Adjusting the Client Connection Timeout for Linux

Display or change the current timeout period.

1. To display or change the timeout value, enter:
   ```
   /sbin/sysctl -e net.ipv4.tcp_keepalive_time
   ```
2. If necessary, adjust the timeout perod.

   For example, to reduce the timeout period to 15 minutes (900 seconds,) enter:
   ```
   /sbin/sysctl -w net.ipv4tcp_keepalive_time=900
   ```

Check for Hardware Errors

Check for hardware errors on a regular basis.

These error messages indicate problems that may lead to database corruption:

- Disk read, write, or retry errors
- Timeouts
- System panics
- Memory problems of any type

- For HP-UX:
  Check the `/var/adm/syslog/syslog.log` file on a regular basis. You can view the file directly, or you can use the HP-UX **dmesg** command. See your operating system documentation for more information.
- For IBM RS/6000:
  The **errpt** command includes several options for limiting the report to events that match certain criteria. Use the **errpt** command on a regular basis. If errors appear, use the diagnostic tool **diag** to check your memory and disks. Or use the System Management Interface Tool (SMIT) to run the **errpt** command. This command may produce a lot of output.
- For Sun Solaris:
  Check the `/var/adm/messages` file on a regular basis. If you see any of the types of hardware errors described above, use the Sun Microsystems diagnostic tool, **sundiag**, to check memory and disks. See the operating system documentation for more information.
- For Linux:
  Check the `/var/log/messages` file on a regular basis. See the operating system documentation for more information.

Monitor the Use of Operating System Resources

Monitor operating system performance.

Managing Multiprocessor Servers in the *System Administration Guide: Volume 2* discusses the optimal number of SAP ASE engines for your workload and system configuration.

Monitor Operating System Resources for HP-UX

Use HP-UX tools to help monitor performance.

- **sar** – reports relative and absolute I/O throughput rates to each disk and controller.
- **vmstat** – monitors virtual memory usage.
- **netstat** – monitors network status.
- **ps** – provides a snapshot of accumulated CPU time and usage for individual processes.
- **time** – can be useful in determining the various user, system, and real-time resources used over a complete run.

For details about these tools, see your operating system documentation.

Monitor Operating System Resources for IBM RS/6000

Use IBM RS/6000 tools for monitoring performance.

- **iostat** – reports the amount of I/O on terminals and hard disks and how CPU time is spent.
- **vmstat** – monitors virtual memory usage.
- **netstat** – monitors network status.
    - **netstart -v** – displays Transmit/Receive Statistics. It is also used to determine if enough buffers have been configured for network traffic.
    - **no -a** – displays current network options. It is also used for tuning mbuf pools.
- **ps** – provides a snapshot of accumulated CPU time and usage for individual processes.
- **time** – determines the various user, system, and real-time resources during a complete run.

For details about these tools, see your operating system documentation.

Monitor Operating System Resources for Sun Solaris and Linux

Use Sun Solaris and Linux tools to help monitor performance.

- **iostat** – reports the amount of I/O on terminals and hard disks and how CPU time is spent.
- **vmstat** – monitors virtual memory usage.
- **netstat** – monitors network status.

- **ps** – gives you an accurate snapshot of accumulated CPU time and usage for individual processes. This can be very helpful in determining the dataserver-, engine-, and process-specific loading.
- **time** – can be useful in determining the various user, system, and real-time resources used over a complete run.

For details about these tools, see your operating system documentation.

Check Database Integrity

Run **dbcc** checks and perform database backups to protect the integrity and recoverability of your SAP ASE databases.

Use **dbcc checkstorage** to run regular consistency checks on large databases when the amount of time you require to perform consistency checks is less than the amount of time required for **dbcc checkalloc** or **dbcc checkdb** to complete. **dbcc checkstorage** performs a fast consistency check, but it is not as thorough as **dbcc checkalloc** or **dbcc checkdb**. See *Preparing to use dbcc checkstorage* and *Checking Database Consistency* in the *System Administration Guide, Volume 2*, and the *Reference Manual: Commands*.

You can also run this sample C shell script, which calls several **isql** scripts:

```
#!/bin/csh -f
 if ( -e dbcc_mail.out) then
   rm dbcc_mail.out
 endif
 foreach i (*.dbcc)
 isql -Usa -Ppassword < $i > dbcc_out
 if ( 'grep -c 'Msg 25[0-9][0-9]' dbcc_out' ) then
   echo "There are errors in" $i >> dbcc_mail.out
   cat dbcc_out >> dbcc_mail.out
 else
   echo "Backing up " $i:r >> dbcc_mail.out
   isql -Usa -Ppassword < $i:r.backup
 endif
 end
 mail -s "Backup Report" jjones < dbcc_mail.out
```

The first set of scripts (one for each database with a file name appended with `.dbcc`) runs **dbcc checkalloc** and **dbcc checkdb** for each database and sends the messages to an output file called `dbcc_out`.

For example, the script `master.dbcc` runs **dbcc** to check the `master` database:

```
dbcc checkalloc (master)
go
dbcc checkdb (master)
go
```

The C shell script then runs the **grep** command to find 2500-level error messages in **dbcc** output. The results of the **grep** command are sent to an output file called `dbcc_mail.out`.

Next, the script invokes an **isql** backup script for each database for which no 2500-level errors occurred and adds the "Backing up *database_name*" line to dbcc_mail.out. For example, the script master.backup backs up the master database:

```
use master
go
dump database master to master_dump
go
```

You may want to add appropriate **dump transaction** commands to your scripts.

If there are 2500-level error messages, the script does not back up the database. At the end of the script, dbcc_mail.out is mailed to the system administrator "jjones," who then has a record of fatal **dbcc** errors and successful backups.

You can tailor the sample shell and **isql** scripts to suit the needs of your installation.

To have the scripts execute automatically, edit the crontab file, and add an entry similar to this, which executes a C shell script called dbcc_ck daily at 2:00 a.m.:

```
00 02 * * * /usr/u/sybase/dbcc_ck 2>&1
```

This example executes a C shell script called **dbcc_ck** every morning at 2:00 a.m.

CHAPTER 10   **Configuring New Servers with srvbuild**

Use **srvbuild** to configure a new server with default or user-specified values for key configuration attributes.

Note: Use **srvbuildres** in non-GUI mode, to configure a new server using a resource file. See *Utility Commands Reference* in the *Utility Guide*.

1. Source SYBASE.csh or SYBASE.sh file in $SYBASE to set up the environment variables.
2. Run $SYBASE/$SYBASE_ASE/bin/srvbuild.
3. Click the server types to configure. When you select each type, the server name is enabled where you can enter the server name. Click **OK**.

   The available server types depend on what you have installed in $SYBASE.

   The screen you see next depends on the server types you selected.
4. On the SAP ASE type screen, select the:
   - SAP ASE Application type – based on how you plan to use the new server, choose:
     - MIXED – for both OLTP and DSS.
     - OLTP – for online transaction processing. This is generally used for a high rate of smaller, less complex transactions.
     - DSS – for decision-support systems. Generally, these systems have less update activity with large complex queries.
   - Server page size – depending on the SAP ASE application type, select:
     - 4K– for MIXED and OLTP
     - 8K– for DSS
   - Master device path
   - Master device size
   - Master database size
   - Sybsystemprocs device path
   - Sybsystemprocs device size
   - Sybsystemprocs database size
   - Error log
   - Transport type
   - Host name
   - Port number

   In the Edit Advance SAP ASE Attributes tab, enter:

- SAP ASE configuration file
- `sybsystemdb` device path
- `sybsystemdb` device size
- `sybsystemdb` database size
- Share memory file directory
- Default Backup Server
- **tempdb** information – SAP ASE 15.0.3 ESD #1 and later create `tempdb` on a specified separate device. The default `tempdb` device and database size is 100MB. Specify these attributes for `tempdb`:
  - `tempdb` device path
  - `tempdb` device size
  - `tempdb` database size
- Enable PCI in SAP ASE
  If you enable PCI in SAP ASE, also set:
  - `sybpcidb` device path
  - `sybpcidb` device size
  - `sybpcidb` database size
- Optimize SAP ASE configuration values. After configuring a server, **srvbuild** prompts you for these values:
  - Available physical memory for SAP ASE
  - Available CPU for SAP ASE

  The default configuration may not optimally use all the resources available on the system. Input new values based on the system resource usage. If the value specified is larger than the available resource for allocation to the server, the optimization may fail, causing the server to not start. The current default input values for available physical memory and available CPU are 80% of the physical memory and CPU number.

Note: The SAP ASE 15.0.3 and later installerThe installer from versions 15.0.3 and later allows you to tune basic configuration settings during installation, instead of as a postinstallation task. See the *Installation Guide*.

5. To configure Backup Server, in the Backup Server configuration screen, select the:
   - Error log
   - Tape configuration file
   - Language
   - Character set
   - Maximum number of network connections
   - Maximum number of server connections
   - Transport type
   - Host name
   - Port number

6. In the XP Server type screen, select:
   - Transport type
   - Host name
   - Port number

7. To configure Job Scheduler specify:
   - `sybmgmtdb` device path
   - `sybmgmtdb` device size
   - `sybmgmtdb` database size
   - Transport type
   - Host name
   - Port number

8. In Configure Self Management, enter:
   - Enable Self Management
   - Self Management user name
   - Self Management user password

   If you change the Self Management user password after configuring Self Management, execute:

   ```
   sp_addexternlogin loopback, <Self Management user name>, <Self
   Management user name>, <new Self Management user password>
   ```

9. Click **Build Servers!** to proceed with configuration. **srvbuild** displays the configuration status as it builds the servers you selected. After the server configuration completes, click **Exit** to quit **srvbuild**.

CHAPTER 11 **Optimize the SAP ASE Configuration**

The **optase** script is added to SAP ASE 15.0.3 ESD #1 and later to reconfigure SAP ASE optimization anytime.

The script location is `$SYBASE/ASE-16_0/bin/optase.sh`.

The syntax is:

```
optase [memory] [cpus] [pagesize] [ase editon] [application type]
[output sql file]
```

where:

- *memory* - memory for SAP ASE in MB
- *cpus* - number of CPUs for ASE
- *pagesize* - The SAP ASE's page size as 2 / 4 / 8 / 16. This is the actual configured SAP ASE value and should not be changed.
- *ase edition* - SAP ASE Edition type as EE / SE / DE / XE. This is the actual configured SAP ASE value and should not be changed.
- *application type* - type of usage: MIXED / OLTP / DSS
- *output sql file* - output file to write SQL script

In this example, SAP ASE "Enterprise Edition" with 4KB page size is configured to use 2048 MB of memory, 2 CPUs and a mixed workload:

```
cd $SYBASE/ASE-16_0/bin
  ./optase.sh 2048 2 4 EE MIXED /tmp/optase.sql
  isql -Usa -P -S myserver -i /tmp/optase.sql -o /tmp/optase.out
```

CHAPTER 12   **SAP ASE Default Configuration**

Installing or updating SAP ASE automatically sets some default parameters and settings, and includes several auxiliary programs.

After installing and testing this "default" SAP ASE, you must configure it to your system's needs and install other optional features.

For information about configuring SAP ASE and Backup Server, see *Setting Configuration Parameters* in the *System Administration Guide, Volume 1*.

For information about configuring languages, character sets, and sort orders, as well as optional features, see *Configuring Character Sets, Sort Orders, and Languages* in the *System Administration Guide, Volume 1*.

Default Settings

You may need to configure the default settings to suit your computer and database needs.

Table 3. Defaults for SAP ASE Parameter Settings

Item	Default Value
Name	*Servername*
Transport Type	TCP/IP
Port number	5000
Error log path	*$SYBASE/$SYBASE_ASE/install/servername.log*
Event logging	Not configured
Language	us_english
Character set	HP – Roman8
	IBM – ISO 8859-1
	Sun – ISO 8859-1
	Linux – iso_1
Sort order	Linux – binary ordering
Login security mode	Standard

Table 4. Defaults for Backup and XP Servers

Server	Item	Default Value
Backup Server	Name	*AdaptiveServername*_back
	Network support	(TCP/IP)
	Socket number	5001
	Error log path	`$SYBASE/$SYBASE_ASE/install/Adaptive-Servername_back.log`
XP Server	Name	$SYBASE/$SYBASE_ASE/ADAPTIVESERVERNAME_XP
	Network support	(TCP/IP)
	Socket number	5002
	Error log path	N/A

CHAPTER 13   **Set Up Communications Across the Network**

SAP ASE can communicate with other SAP ASE servers, Open Server applications, and client software across a network.

Clients can communicate with one or more servers, and servers can communicate with other servers via remote procedure calls.

Directory services contain information about the network locations of all SAP ASE servers, Backup Servers, and other server products on the network.

In the SAP client/server environment, a client can connect with SAP ASE if it knows where the server resides on the network and if the server supports the client's language or character set. When a client initiates a connection, it looks in its directory services for the network location of the target server.

When you are using a client program, and you want to connect with a particular server, the client program looks up the server name in the directory services and connects to that server.

Servers also need network information. When a server starts, it looks in its interfaces file to determine where to listen for client connection requests. In addition, SAP ASE can take on a client role when it makes remote procedure calls to other SAP ASE servers.

How SAP ASE Determines Which Directory Service Entry to Use

SAP ASE uses directory services to determine the address at which to listen for clients.

When you start SAP ASE, it:

1. Looks for the server name supplied in the command line **-s** option. If the server name is not supplied in the command line, it determines its own name by checking the value of the DSLISTEN environment variable. If the DSLISTEN environment variable is not set, SAP ASE assumes that the server name is SYBASE.
2. Looks in directory services for an entry that matches the name found in the steps above.
3. Uses the network information provided by the directory services entry it has found to listen for client connections.

How a Client Uses Directory Services

Clients use directory services to determine how to connect to a server.

When a client connects to a server, it:

- Determines the name of the server either programmatically or by referring to the DSQUERY environment variable. If the application user has not set DSQUERY, the runtime value for the server name defaults to the SYBASE environment variable.
- Looks in directory services for an entry that matches the name of the server.
- Uses the network information provided by the directory services entry to connect to the server. If the client cannot connect the first time, it makes additional attempts according to the delay and retry numbers indicated in directory services. If no matching entry is found, an error message is written to the client's standard error file. If multiple networks are supported, the client attempts to connect using the information in the second network address entry for the server.

See the *Open/Client Programmer's Supplement* for your client platform or the appropriate Open/Client documentation for a more detailed discussion about client connections.

Create a Directory Services Entry

Use SAP ASE utilities to edit the network information in directory services.

The installation program, **srvbuild**, automatically creates a directory services entry for each server installation. Use these SAP utilities to edit the network information in directory services.

- **dsedit** – an X-Windows GUI utility.
- **dscp** – a UNIX command line utility.

For details on using these utilities, see the SAP ASE *Utility Guide*.

Supported Directory Drivers

SAP supports several directory drivers: interfaces, Lightweight Directory Services (LDAP), and Cell Directory Services (CDS).

- interfaces driver
- LDAP driver
- CDS provided by Distributed Computing Environment (DCE)

See the *Open Client/Server Configuration Guide* for your platform.

Contents of the interfaces File

An interfaces file contains network information about all servers on your network, including SAP ASE, Backup Server, and XP Server, plus any other server applications, such as Replication Server, and any Open Server applications.

The network information in the file includes the server name, network name, or address of the host machine, and the port, object, or socket number (depending on the network protocol) on which the server listens for queries.

Each entry in an interfaces file can contain two types of lines:

- Master lines – used by server applications to listen for queries over the network. This information is called a *listener service*.
- Query lines – used by client applications to connect to servers over the network. This information is called a *query service*.

The network information contained in the master and query lines for a server is identical because a server listens for connection requests on the same port that clients use to request connections.

A server needs both master and query lines in its `interfaces` file, since servers sometimes act as clients to other servers.

A client's interfaces file does not need a master line. It functions correctly with only a query line.

If Your Site has Multiple Installations

If you have more than one SAP ASE installation, each server's interfaces file should contain information about all servers on the network.

If all of your server products are running on the same platform, you can create one master `interfaces` file and copy that file to each machine.

Heterogeneous and Homogeneous Environments

If the platforms are different, each platform may require a different format and configuration for its `interfaces` file. For example, a PC client uses network information in its interfaces file (`sql.ini`) to connect to SAP ASE running under UNIX, and how SAP ASE uses its `interfaces` file to connect to another server during a remote procedure call.

Figure 1: Establishing Network Connections in a Heterogeneous Environment
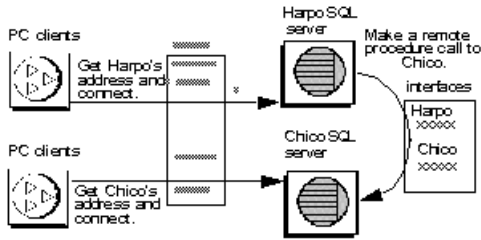
If both a client and a server are running under UNIX, the same interfaces file is valid for both. For example, clients and SAP ASE servers running in a homogeneous environment can use copies of the interfaces file to establish connections. Because the two SAP ASE servers are running under the same operating system, they can use the same interfaces file or exact copies of the same file.

Figure 2: Establishing Network Connections in a Homogeneous Environment
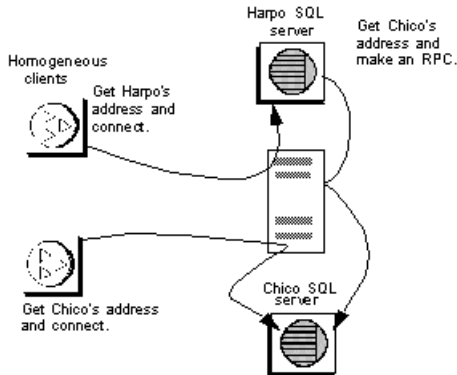
interfaces File Format

The format for the `interfaces` file supports the TLI and TCP style entry.

These rules apply:

- Each SAP ASE has only one entry, although there may be multiple lines in the entry.
- Each line that follows the *servername* line must begin with a space or a tab.
- Each element on the line must be separated by a single space.
- Each entry is separated by a blank line.

- You can add comments to an interfaces file by adding a pound sign (#) at the beginning of the line and a line break at the end.

There are two `interfaces` file entry formats, TLI and TCP.

Note: SAP ASE does not support the TLI interface in threaded mode.

A TLI-style entry uses this format:

```
servername retry_attempts delay_interval<newline>
 <tab>service_type api protocol device address filter<newline>
 <tab>ha_failover servername<newline>
```

For example:

```
harpo_server1
```

```
master tli tcp /dev/tcp 0x0002333337f00001
```

```
query tli tcp /dev/tcp 0x0002333337f00001
```

A TCP-style entry uses this format:

```
servername retry_attempts delay_interval<newline>
 <tab>service_type protocol network machine port filter<newline>
 <tab>ha_failover servername<newline>
```

For example:

```
chico_server1
```

```
 master tcp ether chico 5678 ssl
```

```
 query tcp ether chico 5678 ssl
```

Components of an interfaces File Entry

The `interfaces` file consists of entries that define server attributes.

Component	Value
servername	Name of SAP ASE or Backup Server. Requirements for a server name are: • The name cannot be more than 30 characters long. • The first character must be a letter (ASCII a through z, A through Z). • The characters that follow must be letters, numbers, or underscores (_).
retry_attempts (optional)	Number of times you want the client to try to connect to a server after initial failure. Default is 0.
delay_interval (optional)	Number of seconds between connection attempts. Default is 0.

Component	Value
service_type	Type of service defined by entry. Must be either: • master • query
api	Application programming interface available to the network. The only supported value is "tli".
protocol	The only available protocol type is: • TCP/IP, represented by the letters "tcp".
network	Name of the network; not currently used by SAP ASE. **srvbuild** enters "ether" as a placeholder.
host	Network name or address of server's host machine. • For TCP/IP, use either the host name or Internet address. Maximum size of entry is 32 bytes. To determine the host name of a machine, log in to that machine and enter: `/bin/hostname`
machine	Network name or address of server's host machine. You can use either the host name or Internet address. The maximum size of entry is 32 bytes. To determine the host name of a machine, log in to that machine and enter: `/bin/hostname`
device	The network device endpoint. For TCP networks, the device varies according to the vendor supplying the networking software. Check the vendor-specific documentation for the name of the device. Your network may provide multiple stream devices corresponding to different protocols in the TCP protocol suite. Choose the TCP streams device. Common TCP streams devices is `/dev/tcp`.

Component	Value
address for a TLI protocol entry	Address consists of: • Address prefix, "\x" for TLI. • Network type, always 0002. • Port number converted to four digits, hexadecimal. Must be a unique number between 1025 and 65535. Check the `/etc/services` file on each machine on the network to see what port numbers are in use. Enter the SAP ASE port number in a new section of `/etc/services`. You do not have to make this entry for the operating system to function properly, but the presence of the port number in the file may prevent other users from using the port number. • IP network node address of the host machine converted to 8 digits, hexadecimal. • Trailing zeros, optional, 16 digits.
port	A unique port number between 1025 and 65535. Check the `/etc/services` file on each machine on the network to see what port numbers are in use. Enter the SAP ASE port number in a new section of `/etc/services`. You do not have to make this entry for the operating system to function properly, but the presence of the port number in the file may prevent other users from using that port number.
ha_failover	An entry created in directory services or the interfaces file for high availability.
filter	SAP ASE supports Secure Sockets Layer (SSL) as a filter, which is appended to the master and query lines of the directory services. SSL is the standard for securing the transmission of sensitive information.

Create a Master interfaces File

A master `interfaces` file contains entries for all SAP servers on the network.

The master `interfaces` file can be used with every server and client connected to the network. By distributing copies of a master `interfaces` file, you can ensure that all SAP products on the network interact with one another. Distributing copies of one interfaces file (a master file) with entries for all Adaptive Servers is the easiest way to maintain consistency in the interfaces files in a homogeneous environment on a network.

You can make all changes to one version of the file and then copy the updated master file to all appropriate SAP directories.

You can make a master file using either:

• **dsedit** or **dscp**, or,

- A text editor

Using dsedit or dscp to Create a Master interfaces File

You can use the **dsedit** or **dscp** utility to create a master `interfaces` file, which you can then distribute to all servers.

If you are not an experienced SAP user, you may find that using **dsedit** or **dscp** is easier than using a text editor. Using **dsedit** or **dscp** also ensures that your `interfaces` file is consistent in format.

1. Select the `interfaces` file that contains the most complete, up-to-date information.
2. Begin a **dsedit** or **dscp** session in your most recently updated SAP installation.
3. Add entries for any SAP ASE servers or Backup Servers that are not listed in this file. See the *SAP ASE Utility Guide*.

Using a Text Editor to Create a Master interfaces File

Use an ASCII text editor to modify a concatenated `interfaces` file.

1. Concatenate all individual `interfaces` files.
2. Make a copy of the file.
3. Use an ASCII text editor to modify the copy of the concatenated file.

   When you manually edit an `interfaces` file, be sure that, for each entry, each line following the first line begins with a <tab> character.

   These elements must be correct and unique in the resulting file:
   - *servername* – each server entry in the `interfaces` file must be unique. During the **srvbuild** session, you had the choice of entering a server name or accepting the default server name, SYBASE, for those servers. Find any duplicate SYBASE entries in your merged file, and rename them.
   - A combination of the host machine's network name or address and the SAP ASE port or object number.
   - If the original `interfaces` file was created when there was only one machine on the network, its entries may have the word "loghost" in place of the machine name (address). If *loghost* is present, replace it with the machine name.

Configure the interfaces File for Multiple Networks

On some platforms, SAP ASE can accommodate multiple networks. This allows SAP ASE to listen for clients over multiple network interfaces. You must add an entry for each network interface to the `interfaces` file.

Configuring the Server for Multiple Network Handlers

Configure multiple network listeners.

1. Define a unique host name for each network interface in your operating system's host database.
2. In your `interfaces` file, use a text editor to add copies of the "master" line for your SAP ASE; one for each additional interface you want the server to listen on.
3. Include a unique host name on each line to configure a network handler for each network interface.
4. Port numbers within the interface need not be the same, but they can be. They fall under the same rules for naming and numeric range as the primary network interface.
   This example shows an `interfaces` file for an SAP ASE with two network interfaces. The server host machine is known as SERV_CORPNET on the corporate network and SERV_ENGNET on the engineering network.

```
# PRODUCTION server with two network listeners
 PRODUCTION<tab>3<tab>3<newline>
 <tab>master tcp ether SERV_CORPNET 4559
 <tab>master tcp ether SERV_ENGNET 5479
 <tab>query tcp ether SERV_CORPNET 4559
```

When SAP ASE restarts, it spawns a network handler process for each master line in the entry that corresponds to the server's DSLISTEN value. Connections made on each interface are handled equally, as peers.

Configure Client Connections

When an SAP ASE client scans the interfaces file for a server name, the client uses the first "query" entry it encounters for the server's entry. This makes configuring clients to use multiple network connections less straightforward than configuring the server ports.

You have two options:

* Use the same DSQUERY name for all clients. The interfaces files on the different machines contain different network names.
* Use different DSQUERY names for the clients. The interfaces files on all the machines are the same, but they contain multiple DSQUERY names.

Manage One Network-Independent DSQUERY Name

You can maintain one DSQUERY name for all clients, on all networks, and alter each network's interfaces file accordingly.

If uniform client DSQUERY naming is important, you can make the necessary changes in the network addressing of the clients in the interfaces file. You can install separate SAP installation directories and distinct interfaces files on client file servers on each network to allow users to connect to the correct network address. Instead of altering the DSQUERY name

the clients use, you maintain one DSQUERY name for all clients, on all networks, and alter each network's interfaces file accordingly.

This method assumes that:

- You have complete control over what the SAP installation clients see on each network.
- The interfaces file (at the very least) is not shared or copied among SAP installations on different networks.

The interfaces file looks like this on the "engineering" network:

```
PRODUCTION<tab>3<tab>3<newline>
<tab>query tcp ether SERV_ENGNET 5470
<tab>master tcp ether SERV_CORPNET 4559
<tab>master tcp ether SERV_ENGNET 5479
```

The interfaces file looks like this example on the "corporate" network:

```
PRODUCTION<tab>3<tab>3<newline>
<tab>query tcp ether SERV_CORPNET 4559
<tab>master tcp ether SERV_CORPNET 4559
<tab>master tcp ether SERV_ENGNET 5479
```

The "query" line in each file name is different, depending on the network to be used.

The full "master" entry is present in both files. This is allowed because only SAP ASE uses the "master" lines. Assuming that the server host machine can see both networks (both host names are interchangeable), it does not matter which interfaces file is used for SAP ASE start-up.

Using Different DSQUERY Names
You can use different DSQUERY names for each network listener.

1. Choose an additional server name.

   You can concatenate the original server name and the network name. For example, if your server is named PRODUCTION, you could choose the names PRODUCTION_network1 and PRODUCTION_network2.

2. Do one of the following:

   - For PC clients, use **sqledit** to create multiple `sql.ini` file entries for the server, one for each network. In the following example, you create one entry for PRODUCTION_network 1 and one for PRODUCTION_network2. For more information, see the Open Client documentation for your client platform.
   - For UNIX clients, you can use an ASCII text editor to edit the `interfaces` files. From the server's `interfaces` files, copy the server name line and the "master" line for each network into the client interfaces file. Add the appropriate server name for each entry, and change "master" to "query."

   Clients on each network must use the DSQUERY value that corresponds to the network the client is on. In the following example, either PRODUCTION_network1 or PRODUCTION_network2 can be used.

```
# Client entry for PRODUCTION on network1
PRODUCTION_network1<tab>3<tab>3<newline>
<tab>query tcp ether serv_corpnet 4559
# Client entry for PRODUCTION on network2
PRODUCTION_network2<tab>3<tab>3<newline>
<tab>query tcp ether serv_engnet 5479
```

Configuring for Query Port Backup

If a client is connected to a server via two networks, the client can establish a connection via the second network if the first one goes down.

1. Install multiple "master" and "query" lines in a server entry in the `interfaces` file.

2. SAP ASE listens for connections at both ports. Clients looking for a host name and a port number for a connection to an SAP ASE try the port on each "query" line in order, until they establish a connection.

    This example shows how to configure a backup network that is used only if the normal connection fails. The primary network is "corporate network" and the backup is "engineering network."

    ```
    # PRODUCTION server with two network listeners
    PRODUCTION<tab>3<tab>3<newline>
    <tab>master tcp ether SERV_CORPNET 4559
    <tab>master tcp ether SERV_ENGNET 5479
    <tab>query tcp ether SERV_CORPNET 4559
    <tab>query tcp ether SERV_ENGNET 5479
    ```

3. Configure PC-client `interfaces` files with the appropriate multiple "query" entries, as described in the Open Client documentation. For client `interfaces` files in a homogeneous environment, you can copy the entire file entry for the SAP ASE into the client `interfaces` file.

4. A connection on the secondary port occurs only if the corporate network is disabled, or if the corporate network interface on the host machine fails or is shut down due to a network-related failure.

IPv6 Support

SAP ASE supports IPv6 technology.

IPv6 terminology:

*   Link-local address – an IPv6 address that is usable only over a single link.
*   Site-local address – an IPv6 address that can be used within a single site.
*   Global address – an IPv6 address that can be used across the Internet.

Interfaces files also provide IPv6 support. An example `interfaces` file entry is:

```
RHAM0_10778_XP  query tcp sun-ether fd77:55d:
459d9:169:250:56ff:feb3:4246 19560  master tcp sun-ether
fd77:55d:59d9:169:250:56ff:feb3:4246 19560
```

IPv6 application types:

- IPv6-unaware – an application that cannot handle IPv6 addresses.
- IPv6-aware – an application that can communicate with nodes that do not have IPv4 addresses. In some cases, this might be transparent to the application, for instance when the API hides the content and format of the actual addresses.
- IPv6-enabled – an application that, in addition to being IPv6-aware, takes advantage of some IPv6 features.
- IPv6-required – an application that requires some IPv6 features and cannot operate over IPv4.

IPv6 Infrastructure

A dual-stack infrastructure implements both IPv4 and IPv6. This is the SAP-recommended infrastructure implementation for using SAP ASE as an IPv6-aware server.

SAP applications are IPv6-aware.

Table 5. IPv6 Support

Platform	SAP ASE IPv6 Awareness	Open Client/Server IPv6 Awareness
Sun Solaris 8 32- and 64- bit	12.5.3a and 15.0	15.7
HP-UX 11i(v1) 32- and 64-bit	12.5.3a and 15.0	15.7
Microsoft Server 2003	12.5.3a and 15.0	15.7
Linux RHEL 3.0	15.0	15.7

Many SAP products that are Open Client/Server-based, such as XP Server, Backup Server, Replication Server, and Open Switch, became automatically IPv6-aware due to the layered Open Client Transport Control Layer (DB-Library-based) which is IPv6-aware for network-socket operations. Open Client products are not IPv6-aware.

For SAP ASE, being IPv6-aware is a complex issue because some third-party components within SAP ASE are not yet IPv6-aware. The functional mechanisms of SAP ASE Enterprise that are IPv6-aware with respect to the supported platforms and versions include:

- Connection handler
- RPC mechanisms
- Job Scheduler task / agent session connection
- Network Host API
- UDP message support for `sybsendmsg`

- Component Integration Services connectivity
- Host / name resolving
- XML URL connection handler
- Auditing for client address data

These functional mechanisms in SAP ASE do not currently support IPv6, but are scheduled to do so in future versions:

- Java support
- License Management Server
- LDAP driver

By default, SAP ASE is IPv6-unaware.

Before starting SAP ASE for IPv6-aware operations, make sure your infrastructure is correctly set up. Once your operating system is correctly configured, you can configure and enable an IPv6 **connection handler** by adding an additional DCL entry. A single SAP ASE configuration can typically carry up to 32 **connection handler** assignments within the DCL.

For example, if you have a site-local setup with two domains administrated under the names:

```
sybase.com - being responsible for all IPv4 networking applications
v6.sybase.com - being responsible for all IPv6 networking
applications
```

The DCL entry named "SYBASE" on the host "revival" for port 17100 looks similar to:

```
SYBASE
master tcp ether revival.sybase.com 17100
query tcp ether revival.sybase.com 17100
master tcp ether revival.v6.sybase.com 17100
query tcp ether revival.v6.sybase.com 17100
```

In this example, when SAP ASE is started with IPv6-awareness, it creates two **connection handlers**. One listens on port 17100 for incoming IPv4 client connection requests, and the other listens on port 17100 for incoming IPv6 client connection requests.

Note: When you start SAP ASE, set trace flag 7815 to capture and log IPv4 and IPv6 client address connection requests and host and name lookups.

CHAPTER 14 **Troubleshoot**

Troubleshoot common situations that may cause a server to not start.

Troubleshooting when the Server Fails to Start

If the server fails to start, check that the port number specified in the interfaces file is available.

When a server fails to start, and issues this message, the port number specified in the interfaces file may be in use:

```
00:00000:00002:2003/09/22 12:37:23.63 kernel  network name
SERV_CORPNET, type ether, port 4559, filter NONE
00:00000:00002:2003/09/22 12:37:23.65 kernel  ninit: bind, Address
already in use
00:00000:00002:2003/09/22 12:37:23.68 server  Error: 1602, Severity:
18, State: 2
00:00000:00002:2003/09/22 12:37:23.68 server  Unable to initialize
network 0
00:00000:00002:2003/09/22 12:37:23.68 kernel  ninit: All master
network
listeners have failed.  Shutting down.
00:00000:00002:2003/09/22 12:37:23.68 kernel  ueshutdown: exiting
00:00000:00016:2003/09/22 16:11:35.46 server  SQL Server shutdown by
request.
```

1. Investigate the port assignment:
   a) Look in the interfaces file to identify the port number assigned to the server.
   b) Determine whether another process is using the same port number by entering:
      ```
      netstat -a
      ```
      If the port number is presented as a local address in the **netstat** output, you cannot use that port for the server. Another process is already using that port.
   c) To verify that the server port is in use, start the server manually. The server does not start if its assigned port number is already in use.

   See the installation documentation for your platform and the *Utility Guide*.

2. If a stale server process is retaining use of the port number, either:

   • Use the operating system **kill** command to terminate the process, or,
   • Use another port number for the server by modifying the interfaces file.

3. Start the server manually to confirm that the port number is available.

   See the installation documentation for your platform and the *Utility Guide*.

Troubleshooting an Error when Executing an ESP

If you receive an error when executing an ESP, check for processes that might be using the same port number.

Prerequisites

Use the **netstat** command to determine if the port number specified for XP Server is in use.

Task

If you attempt to execute an ESP (extended stored procedure), you may see:

```
00:00000:00008:1997/09/10 12:52:53.03 kernel  XP Server failed to
start. Try bringing up XP Server manually. Check SQL Server
documentation for more information on how to bring XP Server up.
```

1. If you find no processes using the same port number:
   a) Restart SAP ASE.
   b) Execute the ESP that you attempted earlier.
      XP Server should start automatically.
2. If you find a process using the same port number, you can:
   a) Change the interfaces file to use a new port number for the XP Server.
   b) Stop the process using the port number allotted to XP Server.
   c) Restart SAP ASE, and execute the ESP that you attempted earlier. XP Server should start automatically.

CHAPTER 15 **Use the Lightweight Directory Access Protocol as a Directory Service**

Lightweight Directory Access Protocol (LDAP) is an industry standard for accessing directory services. Directory services allow components to look up information by a distinguished name (DN) from an LDAP server that stores and manages server, user, and software information that is used throughout the enterprise or over a network.

SAP ASE uses directory services to establish client and RPC connections over the Internet. LDAP directory services are used to establish connections. LDAP is a licensed feature of SAP ASE.

The LDAP server can be located on a different platform from the one on which SAP ASE or the clients are running. LDAP defines the communication protocol and the contents of messages exchanged between clients and servers. Messages are operators, such as client requests for read, write and query, and server responses, including data-format information.

The LDAP server stores and retrieves information about:

* SAP ASE, such as IP address, port number, and network protocol
* Security mechanisms and filters
* High availability companion server name

You can Configure the LDAP server with these access restrictions:

* Anonymous authentication – all data is visible to any user.
* User name and password authentication – SAP ASE uses the default user name and password for UNIX platforms:
    * `$SYBASE/$SYBASE_OCS/config/libtcl.cfg` on 32-bit platforms
    * `$SYBASE/$SYBASE_OCS/config/libtcl64.cfg` on 64-bit platforms

User name and password authentication properties establish and end a session connection to an LDAP server.

Note: The user name and password that are passed to the LDAP server for user authentication purposes are distinct and different from those used to access SAP ASE.

When an LDAP server is specified in the `libtcl.cfg or libtcl64.cfg` file (collectively the `libtcl*.cfg` file), the server information is accessible only from the LDAP server. SAP ASE ignores the interfaces file.

If multiple directory services are supported in a server, the order in which they are searched is specified in `libtcl*.cfg`. You cannot specify the search order with the `dataserver` command line option.

See the *Security Administration Guide*.

See also
* *Chapter 3, Client/Server Communication* on page 11

LDAP Directory Services Versus the SAP Interfaces File

The LDAP driver implements directory services for use with an LDAP server.

LDAP directories provide:

* A network-based alternative to the traditional SAP interfaces file
* A single, hierarchical view of information, including users, software, resources, networks, files, and so on

interfaces File	Directory Services
Platform-specific	Platform-independent
Specific to each SAP installation	Centralized and hierarchical
Contains separate master and query entries	One entry for each server that is accessed by both clients and servers
Cannot store metadata about the server	Stores metadata about the server

LDAP directory services support more attributes than the SAP interfaces file. These attributes can include server version, server status, and so on.

Note: LDAP is supported only with reentrant libraries. Use **isql_r** instead of **isql**.

Table 6. SAP LDAP Directory Definitions

Attribute name	Value type	Description
ditbase	`inter-faces` file or `libtcl.cfg`	DIT base for object tree. If the `libtcl.cfg` file is specified, the `interfaces` file is ignored. You can use **ct_con_prop**() to override the `libtcl.cfg` file for a specified connection.

Attribute name	Value type	Description
dn	Character string	Distinguished name. Must be a unique name that identifies the object.
sybaseVersion	Integer	Server version number.
sybaseServername	Character string	Server name.
sybaseService	Character string	Service type: SAP ASE
sybaseStatus	Integer	Status: 1 = Active, 2 = Stopped, 3 = Failed, 4 = Unknown.
sybaseAddress	String	Each server address includes: • Protocol: TCP, NAMEPIPE, SPX DECNET (entry is case sensitive). • Address: any valid address for the protocol type. `dscp` splits this attribute into Transport type and Transport address.
sybaseSecurity (op-tional)	String	Security OID (object ID).
sybaseRetryCount	Integer	This attribute is mapped to CS_RETRY_COUNT, which specifies the number of times that **ct_connect** retries the sequence of network addresses associated with a server name.
sybaseRetryDelay	Integer	This attribute is mapped to CS_LOOP_DELAY, which specifies the delay, in seconds, that **ct_connect** waits before retrying the entire sequence of addresses.
sybaseHAservername (optional)	String	A secondary server for failover protection.

The traditional interfaces file with TCP connection and a failover machine looks like:

```
master tcp ether huey 5000
query tcp ether huey 5000
hafailover secondary
```

An example of an LDAP entry with TCP and a failover machine looks like:

```
dn: sybaseServername=foobar, dc=sybase,dc=com
objectClass: sybaseServer
sybaseVersion: 1500
sybaseServername: foobar
sybaseService: ASE
sybaseStatus: 4
sybaseAddress: TCP#1#foobar 5000
```

```
sybaseRetryCount: 12
sybaseRetryDelay: 30
sybaseHAServernam: secondary
```

All entries in the LDAP directory service are called entities. Each entity has a distinguished name (DN) and is stored in a hierarchical tree structure based on its DN. This tree is call the *directory information tree* (DIT). Client applications use a DIT base to specify where entities are stored.

In the example above, the entry describes an SAP ASE named "foobar" listening on a TCP connection with a port number of 5000. This entity also specifies a retry count of 12 (times) and a retry delay of 30 (seconds). Once a client has found an address where a server responds, the login dialog between the client and the server begins.

You can find a complete list of the SAP LDAP directory schema in UNIX in a file called `sybase.schema` in the directory `$SYBASE/$SYBASE_OCS/config`.In the same directory, there is also a file called `sybase-schema.conf`, which contains the same schema, but uses a Netscape-specific syntax.

Since LDAP supports multiple entries for each attribute, each address attribute must contain the address of a single server, including protocol, access type, and address.

For example, this is an LDAP entry for an Windows server listening on two addresses, with different connection protocols:

```
sybaseAddress = TCP#1#TOEJAM 4444
sybaseAddress = NAMEPIPE#1#\pipe\sybase\query
```

Note: Each entry in the address field is separated by the # character.

You can edit these entries with **dsedit**.

To ensure cross-platform compatibility for all SAP products, the protocol and address attribute fields should be in a platform- and product-independent format.

The libtcl*.cfg File

Use the `libtcl*.cfg` file to specify the LDAP server name, port number, DIT base, user name, and password to authenticate the connection to an LDAP server.

The purpose of the `libtcl*.cfg` file is to provide configuration information such as driver, directory, and security services for Open Client/Open Server and Open Client/Open Server-based applications. 32-bit utilities, such as **dsedit** and **srvbuild**, look up the `libtcl.cfg`, while 64-bit applications use the `libtcl64.cfg` file for configuration information.

Edit both the `libtcl.cfg` and the `libtcl64.cfg` files to ensure compatibility between 32- and 64-bit applications.

The default `libtcl.cfg` file is located in `$SYBASE/$SYBASE_OCS/config`.

If LDAP is specified in the `libtcl.cfg` file, the interfaces file is not used.

Note: Open Client/Open Server applications that use the **-I** option at start-up override the `libtcl.cfg` file and use the interfaces file.

In its simplest form, the `libtcl.cfg` file is in this format:

```
[DIRECTORY]
```

```
ldap=libsybdldap.dll  ldapurl
```

where the *ldapurl* is defined as:

```
ldap://host:port/ditbase
```

This LDAP entry, using these same attributes, is an anonymous connection and works only if the LDAP server allows read-only access.

```
ldap=libsybdldap.dll ldap://ldaphost/d=sybase,dc=com
```

To enable password authentication at connection time, you can specify a user name and password in the `libtcl.cfg` file as extensions to the LDAP URL.

Enabling LDAP Directory Services

Enable LDAP directory service.

1. Install the "Security and directory services" license package ASE_SECDIR.
2. Add the location of the LDAP libraries to the UNIX load library path environment variable for your platform.
3. Configure the `libtcl.cfg` file to use directory services.

   Use any standard ASCII text editor to:
   - Remove the semicolon (;) comment markers from the beginning of the LDAP URL lines in the `libtcl.cfg` file under the [DIRECTORY] entry.
   - Add the LDAP URL under the [DIRECTORY] entry.

   Warning! The LDAP URL must be on a single line.

   ```
   libtcl.cfg
   ldap=libsybdldap.so ldap://host:port/ditbase??scope??
   bindname=username
   password

   libtcl64.cfg
   ldap=libsybdldap64.so ldap://host:port/ditbase??scope??
   bindname=username
   password
   ```

   For example:

```
[DIRECTORY]
ldap=libsybdldap.so ldap:///huey:11389/dc=sybase,dc=com??one??
bindname=cn=Manager,dc=sybase,dc=com secret
```

"*one*" indicates the scope of a search that retrieves entries one level below the DIT base.

4. Verify that the appropriate environment variable points to the required third-party libraries. The Netscape LDAP SDK libraries are located in $SYBASE/$SYBASE_OCS/ lib3p or lib3p64.The UNIX load library path environment variable must point to this directory.

5. Add your server entry to the LDAP server using **dscp** or **dsedit**.

Keywords for the LDAP URL Variables

Configure the libtcl.cfg file DIRECTORY section.

Keyword	Description	Default
host (required)	The host name or IP address of the machine running the LDAP server	None
port	The port number that the LDAP server is listening on	389
ditbase (required)	The default DIT base	None
username	Distinguished name (DN) of the user to authenticate	NULL (anonymous authentication)
password	Password of the user to be authenticated	NULL (anonymous authentication)

Adding a Server to the Directory Services

Use **dsedit** to add a new server entry.

Each server entry is made up of a set of attributes. When you add or modify a server entry, you are prompted for information about server attributes. Some attributes are provided by default, others require user input. When a default value is provided, it appears in brackets "[ ]". See SAP LDAP directory definitions for accepted values.

Use **srvbuild** to add entries, but not modify or delete them.

Warning! Most LDAP servers have an **ldapadd** utility for adding directory entries. SAP recommends you use **dsedit** instead since it has built-in semantic checks that generic tools do not provide.

SAP Adaptive Server Enterprise

1. Source `SYBASE.csh` or `SYBASE.sh` to set the environment variables.

2. **cd** to `$SYBASE/$SYBASE_OCS/bin`.

3. Execute **dsedit**.

4. Select **LDAP** from the list of servers, and click **OK.**

5. Click **Add New Server Entry**.

6. Enter:

    • The server name – required.
    • The security mechanism – optional. This is the name of the high-availability failover server, if you have one.

7. Click **Add New Network Transport** and:

    • Select the transport type.
    • Enter the host name.
    • Enter the port number.

8. Click **OK** twice to exit **dsedit**.
    To view the server entries, enter this URL in Netscape

    ```
    http://host:port/ditbase??one.
    ```

    For example:

    ```
    ldap://huey:11389/dc=sybase,dc=com??one
    ```

    Note: Microsoft Internet Explorer does not recognize LDAP URLs.

    For more information about `dscp`, see the *Open Client/Server Configuration Guide*.

See also
• *Migrating from the interfaces File to LDAP* on page 79
• *Chapter 7, Start and Stop Servers* on page 23

Multiple Directory Services

You can specify multiple directory services for high availability failover protection.

Not every directory service in the list must be an LDAP server. Any type of LDAP service, whether it is an actual server or a gateway to other LDAP services, is called an LDAP server.

For example:

```
[DIRECTORY]

ldap=libsybdladp.so ldap://test:389/dc=sybase,dc=com
ldap=libsybdldap.so ldap://huey:11389/dc=sybase,dc=com
```

In this example, if the connection to *test:389* fails, the connection fails over to the DCE driver with the specified DIT base. If this also fails, a connection to the LDAP server on *huey:11389* is attempted. Different vendors employ different DIT base formats.

Note: For more information, see the *Open Client Client-Library/C Programmer Guide* and the *Open Client Client-Library/C Reference Manual*

Encrypting the Password

Entries in the `libtcl.cfg` file are in human-readable format. SAP provides a **pwdcrypt** utility for basic password encryption.

pwdcrypt is a simple algorithm that, when applied to keyboard input, generates an encrypted value that can be substituted for the password. **pwdcrypt** is located in `$SYBASE/ $SYBASE_OCS/bin`.

1. From the `$SYBASE/$SYBASE_OCS` directory, enter:
   ```
   bin/pwdcrypt
   ```
2. Enter your password twice when prompted.
   pwdcrypt generates an encrypted password. For example:
   ```
   0x01312a775ab9d5c71f99f05f7712d2cded2i8d0ae1ce78868d0e8669313d1bc
   4c706
   ```
3. Copy and paste the encrypted password into the `libtcl.cfg` file using any standard text editor. Before encryption, the file entry appears as:
   ```
   ldap=libsybdldap.so
   ldap://ldaphost/dc=sybase,dc=com??one??
   bindname=uid=Manager,dc=sybase,
   dc=com?password
   ```
4. Replace the password with the encrypted string:
   ```
   ldap=libsybdldap.so
   ldap://ldaphost/dc=sybase,dc=com??one??
   bindname=uid=Manager,dc=sybase,dc=com?
   0x01312a775ab9d5c71f99f05f7712d2cded2i8d0ae1ce78868d0e8669313d1bc
   4c706
   ```

   Warning! Even if your password is encrypted, you should still protect it using file-system security.

Performance

Performance when using an LDAP server may be slower than when using an interfaces file because the LDAP server requires time to make a network connection and retrieve data.

Since this connection is made when SAP ASE is started, any performance degradation is seen at login, if at all. During normal system load, the delay should not be noticeable. During high

system load with many connections, especially repeated connections with short duration, the overall performance difference of using an LDAP server versus the traditional interfaces file might be noticeable.

Migrating from the interfaces File to LDAP

Once you have upgraded SAP ASE, configure the server to use LDAP service.

There is no direct method to upgrade an existing server using the `interfaces` file to one that uses lightweight directory services. To upgrade the SAP ASE version, see the *Installation Guide*.

1. Shut down the server.
2. Edit the `$SYBASE/$SYBASE_OCS/config/libtcl.cfg` or `libtcl64.cfg` file to add the directory service.
3. Use **dsedit** and add the server entry to directory service.
4. Restart your server.

See also
- *Adding a Server to the Directory Services* on page 76
- *Chapter 7, Start and Stop Servers* on page 23

SAP Adaptive Server Enterprise

CHAPTER 16 **Localization Support**

SAP ASE supports localization for international customers and for customers with heterogeneous environments.

Localization is setting up an application to run in a particular language or country environment, including translated system messages and correct formats for date, time, and currency.

By default, the SAP ASE and Backup Server configurations use the English locale settings, which include:

- Character set definition files for Western European character sets
- Sort-order definition files for Western European character sets
- US English system message files

During installation or through reconfiguration, you can specify a different language, character set, and sort order.

SAP ASE supports localization for international customers and for customers with heterogeneous environments. This support includes:

- Data processing support – SAP ASE comes with character set and sort order definition files it uses to process the characters used in different languages.
  SAP provides support for the major languages in:
  - Western Europe
  - Eastern Europe
  - Middle East
  - Latin America
  - Asia
- Translated system messages – SAP ASE includes language modules for:
  - Brazilian Portuguese
  - Chinese (Simplified)
  - French
  - German
  - Japanese
  - Korean
  - Polish
  - Spanish
  - Thai
- Translated documentation – translated documentation is available in:

- Chinese (Simplified)
- French
- German
- Japanese
- Korean
- Polish
- Spanish

Language Modules

SAP ASE stores its localized software messages in separate language modules.

When you install a language module, the installation program loads the messages, character set, and sort-order files that support the new language in the correct locations.

When you install SAP ASE and Backup Server, system messages in English are installed by default.

Default Character Sets

The default character set is the one in which data is encoded and stored on the SAP ASE databases.

Change the Default Language and Character Set

Warning! Make all changes to the character set and sort order for a new SAP ASE before creating any user databases or making any changes to the SAP-supplied databases. Changing the character set and sort order after data or data structures have been added to SAP ASE may require additional, time-consuming steps. To change the character set or sort order after you have added data, see the *System Administration Guide: Volume 1*.

After **srvbuild** configures a new SAP ASE, you are asked whether to localize your SAP ASE to a language other than us_english and whether to use a character set or sort order other than the default.

The default SAP ASE uses:

- us_english language
- iso_1 character set (on HP-UX platforms, use Roman8)
- Binary sort order

Valid language options depend on the language modules that were unloaded from the distribution media onto your system.

By default, all character sets are copied from the distribution media.

You can:

- Click **No** to accept the defaults.
- Click **Yes** to change the defaults.
  You see **sqlloc** menu, which is the GUI utility used to change default languages, character sets, and sort orders.

By default, when SAP ASE and Backup Server are installed on IBM, and (Sun) Solaris systems, the installation installs the character set files for ISO 8859-1, which supports the Western European languages.

By default, when SAP ASE and Backup Server are installed on HP systems, the installation installs the character set files for Roman8, which supports the Western European languages.

Change the Default Character Set for Servers
You can select any character set as the default on SAP ASE, including character sets that are not the platform default character sets. Keep these guidelines in mind when selecting a new default character set:

- To avoid conversion errors or overhead, determine the default character set based on the character set used by your clients.
  For example, if most of your clients use ISO 8859-1, you can minimize the amount of data conversion by specifying ISO 8859-1.
- If your server is operating in a heterogeneous language environment, choose a character set that works with all the character sets needed. Often, this is Unicode (UTF-8).

Warning! Make all changes to the default character set and sort order for a new SAP ASE before creating any user databases or making any changes to the SAP-supplied databases. Changing the character set and sort order after data or data structures have been added to SAP ASE can cause incorrect behavior. To change the character set or sort order after you have added data, see the *System Administration Guide: Volume 1*.

Supported Character Sets

SAP ASE supports many languages, scripts and character sets.

Arabic Character Sets

SAP ASE supports Arabic character sets.

- X – requires Unilib® conversion.
- No X – may use either the Unilib conversion or the built-in conversion.

Character Set	Unilib Required	Description
cp864	X	PC Arabic
cp1256	X	Microsoft Windows Arabic
iso88596	X	ISO 8859-6 Latin/Arabic

Baltic Character Set

SAP ASE supports the Baltic character set.

- X – requires Unilib® conversion.
- No X – may use either the Unilib conversion or the built-in conversion.

Character Set	Unilib Required	Description
cp1257	X	Microsoft Windows Baltic

Simplified Chinese Character Sets

SAP ASE supports Simplified Chinese character sets.

- X – requires Unilib® conversion.
- No X – may use either the Unilib conversion or the built-in conversion.

Character Set	Unilib Required	Description
eucgb	X	EUC GB encoding = Simplified Chinese character sets
cp936	X	Microsoft Simplified Chinese character sets
gb18030	X	RC 18030 standard

Traditional Chinese Character Set

SAP ASE supports Traditional Chinese character sets.

- X – requires Unilib® conversion.
- No X – may use either the Unilib conversion or the built-in conversion.

Character Set	Unilib Required	Description
cp950	X	PC (Microsoft) Traditional Chinese
euccns	X	EUC CNS encoding = Traditional Chinese with extensions
big5	X	Big 5 Traditional Chinese

Character Set	Unilib Required	Description
big5hk	X	Big 5 with HKSCS extensions

Cyrillic Character Sets

SAP ASE supports Cyrillic character sets.

- X – requires Unilib® conversion.
- No X – may use either the Unilib conversion or the built-in conversion.

Character Set	Unilib Required	Description
cp855		IBM PC Cyrillic
cp866		PC Russian
cp1251		Microsoft Windows 3.1 Cyrillic
iso88595		ISO 8859-5 Latin/Cyrillic
koi8		KOI-8 Cyrillic
mac_cyr		Macintosh Cyrillic
kz1048		Kazakhstan Cyrillic

Eastern European Character Sets

SAP ASE supports Eastern European character sets.

- X – requires Unilib® conversion.
- No X – may use either the Unilib conversion or the built-in conversion.

Character Set	Unilib Required	Description
cp852		PC Eastern Europe
cp1250		Microsoft Windows 3.1 Eastern European
iso88592		ISO 8859-2 Latin-2
mac_ee		Macintosh Eastern European

Greek Character Sets

SAP ASE supports Greek character sets.

- X – requires Unilib® conversion.
- No X – may use either the Unilib conversion or the built-in conversion.

Character Set	Unilib Required	Description
cp869		IBM PC Greek
cp1253		MS Windows Greek
greek8		HP GREEK8
iso88597		ISO 8859-7 Latin/Greek
macgrk2		Macintosh Greek

Hebrew Character Sets

SAP ASE supports Hebrew character sets.

- X – requires Unilib® conversion.
- No X – may use either the Unilib conversion or the built-in conversion.

Character Set	Unilib Required	Description
cp1255	X	Microsoft Windows Hebrew
iso88598	X	ISO 8859-8 Hebrew

Japanese Character Sets

SAP ASE supports Japanese character sets.

- X – requires Unilib® conversion.
- No X – may use either the Unilib conversion or the built-in conversion.

Character Set	Unilib Required	Description
cp932	X	IBM J-DBCS:CP897 + CP301 (Shift-JIS)
deckanji		Digital UNIX JIS encoding
eucjis		EUC-JIS encoding
sjis		Shift-JIS (no extensions)

Korean Character Set

SAP ASE supports the Korean character set.

- X – requires Unilib® conversion.
- No X – may use either the Unilib conversion or the built-in conversion.

Character Set	Unilib Required	Description
eucksc	X	EUC KSC Korean encoding = CP949

Thai Character Sets

SAP ASE supports Thai character sets.

- X – requires Unilib® conversion.
- No X – may use either the Unilib conversion or the built-in conversion.

Character Set	Unilib Required	Description
tis620	X	TIS-620 Thai standard
cp874	X	Microsoft Windows Thai

Turkish Character Sets

SAP ASE supports Turkish character sets.

- X – requires Unilib® conversion.
- No X – may use either the Unilib conversion or the built-in conversion.

Character Set	Unilib Required	Description
cp857		IBM PC Turkish
cp1254		Microsoft Windows Turkish
iso88599		ISO 8859-9 Latin-5 Turkish
macturk		Macintosh Turkish
turkish8		HP TURKISH8

Unicode Character Set

SAP ASE supports the Unicode character set (which supports over 650 languages).

- X – requires Unilib® conversion.
- No X – may use either the Unilib conversion or the built-in conversion.

Character Set	Unilib Required	Description
utf8	X	Unicode UTF-8 encoding

Vietnamese Character Set

SAP ASE supports Vietnamese character sets.

- X – requires Unilib® conversion.
- No X – may use either the Unilib conversion or the built-in conversion.

Character Set	Unilib Required	Description
cp1258	X	Microsoft Windows Vietnamese

Western European Character Sets

SAP ASE supports Western European character sets.

- X – requires Unilib® conversion.
- No X – may use either the Unilib conversion or the built-in conversion.

Character Set	Unilib Required	Description
ascii8	X	US ASCII, with 8-bit data, ISO 646
cp437		IBM CP437 – US code set
cp850		IBM CP850 – European code set
cp860	X	PC Portuguese
cp863	X	IBM PC Canadian French code page
cp1252	X	Microsoft Windows US (ANSI)
iso_1		ISO 8859-1 Latin-1
mac		Standard Macintosh coding
roman8		HP ROMAN8
iso 885915	X	ISO 8859-15 Latin-1 with Euro support

Character Set Names

Supported character sets and their SAP name.

Character Sets	SAP Name
ASCII 8	acsii_8
Big 5	big5
Big 5HK	big5hk
CP 437	cp437
CP 850	cp850
CP 852	cp852
CP 855	cp855

Character Sets	SAP Name
CP 857	cp857
CP 858	cp858
CP 860	cp860
CP 864	cp864
CP 866	cp866
CP 869	cp869
CP 874	cp874
CP 932	cp932
CP 936	cp936
CP 950	cp950
CP 1250	cp1250
CP 1251	cp1251
CP 1252	cp1252
CP 1253	cp1253
CP 1254	cp1254
CP 1255	cp1255
CP 1256	cp1256
CP 1257	cp1257
CP 1258	cp1258
DEC Kanji	deckanji
EUC-CNS	euccns
EUC-GB	eucgb
EUC-JIS	eucjis
EUC-KSC	eucksc
GB 18030	gb18030
GREEK8	greek8
ISO 8859-1	iso_1
ISO 8859-2	iso88592

Character Sets	SAP Name
ISO 8859-5	iso88595
ISO 8859-6	iso88596
ISO 8859-7	iso88597
ISO 8859-8	iso88598
ISO 8859-9	iso88599
ISO 8859-15	iso15
Kazakhstan Cyrillic	kz1048
Koi8	koi8
ROMAN8	roman8
ROMAN9	roman9
Shift-JIS	sjis
TIS 620	tis620
TURKISH8	turkish8
UTF-8	utf8

Load Character Sets

Use the **charset** utility to load character sets and sort orders into SAP ASE. If you are using **charset** to load the default character set and sort order, this should be done only during installation.

To change the default character set and sort order of SAP ASE, see the *System Administration Guide: Volume 1*.

Syntax

```
charset

[ -U username ]

[ -P password ]

[ -S server ]

[ -I interfaces ]

[ -v version ]

sort_order
```

```
[ charset ]
```

Table 7. Keywords and Options for Charsets

Key-words and Op-tions	Description
-U	If you are not already logged in to your operating system as "sa", you must specify "-Usa" or "/username = sa" in the command line.
-P	Specifies the "sa" password on the command line. If not specified, the user is prompted for the "sa" password.
-S	Specifies the name of the server. If not specified, **charset** uses the DSQUERY environment variable to identify the server name. If there is no DSQUERY environment variable, **charset** attempts to connect to a server named "SYBASE."
-I	Specifies the interfaces file to use. If not specified, **charset** uses the interfaces file in the SYBASE directory.
-v	Prints the SAP version, then exits. Use with no other options specified.
sort_order	When **charset** is used to load the default character set and sort order, *sort_order* is a mandatory parameter specifying the name of the sort order file to be used by SAP ASE. When loading additional character sets, use `charset.loc` to indicate the name of the character set files.
charset	Specifies the directory of the character set to be used by SAP ASE.

Language Definition Files Sort Order

Supported sort orders.

Languages not list listed do not have a language-specific sort order; use a binary sort order.

Table 8. Available Sort Orders

Language or Script	Sort Orders	File Name	ID
All languages	Binary order	`bina-ry.srt`	50
Cyrillic	Dictionary order, case sensitive, accent sensi-tive	`cy-rdict.srt`	63

Language or Script	Sort Orders	File Name	ID
	Dictionary order, case insensitive, accent sensitive	`cyrnocs.srt`	64
English French German These sort orders work with all Western European character sets.	Dictionary order, case sensitive, accent sensitive	dictiona.srt	51
	Dictionary order, case insensitive, accent sensitive	`nocase.srt`	52
	Dictionary order, case insensitive, accent sensitive, with preference	`nocasepr.srt`	53
	Dictionary order, case insensitive, accent insensitive	`noaccent.srt`	54
English French German These sort orders work only with CP 850.	Alternate dictionary order, case sensitive	`altdict.srt`	45
	Alternate dictionary order, case sensitive, accent insensitive	`altnoacc.srt`	39
	Alternate dictionary order, case sensitive, with preference	`altnocsp.srt`	46
Greek This sort order works only with ISO 8859-7.	Dictionary order, case sensitive, accent sensitive	`elldict.srt`	65
Hungarian These sort orders work only with ISO 8859-2.	Dictionary order, case sensitive, accent sensitive	`hundict.srt`	69
	Dictionary order, case insensitive, accent sensitive	`hunnoac.srt`	70
	Dictionary order, case insensitive, accent insensitive	`hunnocs.srt`	71

Language or Script	Sort Orders	File Name	ID
Russian This sort order works with all Cyrillic character sets except CP 855.	Dictionary order, case sensitive, accent sensitive	`rus-dict.srt`	58
	Dictionary order, case insensitive, accent sensitive	`rus-nocs.srt`	59
Scandinavian These sort orders work only with CP 850.	Dictionary order, case sensitive, accent sensitive	`scan-dict.srt`	47
	Dictionary order, case insensitive, with preference	`scan-nocp.srt`	48
Spanish	Dictionary order, case sensitive, accent sensitive	`es-pdict.srt`	55
	Dictionary order, case insensitive, accent sensitive	`es-pnocs.srt`	56
	Dictionary order, case insensitive, accent insensitive	`es-pnoac.srt`	57
Thai	Dictionary order	`dic-tion-ary.srt`	51
Turkish These sort orders work only with ISO 8859-9.	Dictionary order, case sensitive, accent sensitive	`tur-dict.srt`	72
	Dictionary order, case insensitive, accent insensitive	`turn-oac.srt`	73
	Dictionary order, case insensitive, accent sensitive	`turn-ocs.srt`	74

Character Set Conversion

Backup Server passes messages to SAP ASE in the client's language and in the SAP ASE character set. SAP ASE converts the messages and issues them in the client's language and character set.

Keep these requirements in mind when selecting a character set:

- In a heterogeneous environment, SAP ASE and Backup Server may need to communicate with clients running on different platforms and using different character sets. To maintain data integrity, the server converts the code between the character sets.
- To use the built-in conversion, install the character set definition files on the server for all the character sets being used by your clients. Built-in conversion support is available for many character sets.
- Unilib conversion support is available for all character sets supported by SAP. To enable Unilib conversion, you must use **sp_configure** and turn **enable unicode conversions** on. See the *System Administration Guide: Volume 1.*

If either SAP ASE or Backup Server does not support a client's language or character set, the server issues a warning message. Errors also occur when the Backup Server character set is incompatible with the SAP ASE character set. By default, Unicode conversion is enabled.

Character set conversion is supported only between character sets for the same language or between character sets in the same language group.

For example, automatic character set conversion is supported between the character sets for the Western European languages: ASCII 8, CP 437, CP 850, CP 860, CP 863, CP 1252, ISO 8859-1, ISO 8859-15, and ROMAN8. Similarly, conversion is supported between the character sets for Japanese: CP 932, EUC-JIS, Shift-JIS, and DEC-Kanji.

However, code conversion is not supported between any of the Western European language character sets and the Japanese character sets. For more information about supported conversions, see the *System Administration Guide: Volume 1.*

Conversions Between Server and Client

If SAP ASE does not support the client's language or character set, the client can connect with the server, but no character conversions occur.

When a localized client application connects to SAP ASE, the server checks to see if it supports the client's language and character set.

- If SAP ASE supports the language, it automatically performs all character set conversions and displays its messages in the client's language and character set.
- If SAP ASE does not support the language, it uses the user's default language or SAP ASE default language.

- If SAP ASE does not support the character set, it issues a warning to the client, turns conversion off, and sets the language to US English.

Sort Orders

Each character set comes with one or more sort orders (collating sequences), which are located in the sort-order definition files (.srt files). These files accompany the character set definition files and can be found in the same directory.

You can select a sort order for your data according to the needs at your site. The server can support only one sort order at a time, so select one that works for all of your clients.

Warning! Make all changes to the default character set and sort order for a new SAP ASE before creating any user databases or making any changes to the SAP-supplied databases. Changing the character set and sort order after data or data structures have been added to SAP ASE may cause incorrect behavior. To change the character set or sort order after you have added data, see the *System Administration Guide: Volume 1*.

Available Sort Orders for Character Sets

The sort order determines the collating sequence SAP ASE uses to order, compare, and index character data. Each character set comes with one or more sort orders.

Sort orders are located in sort order definition files (.srt files) that accompany your character set definition files.

Note: Available sort orders vary according to the character set installed on SAP ASE.

You can see the available sort orders for your character set by looking in the .srt file for your language. Sort orders are stored in:

$SYBASE/charsets/<*charset_name*>/*.srt

You can specify sort orders during installation, or later, using the **sqlloc** utility.

Sort Order Name	Description
Binary order	Sorts all data according to numeric byte values for that character set. Binary order sorts all ASCII uppercase letters before lowercase letters. Accented or ideographic (multibyte) characters sort in their respective standards order, which may be arbitrary. All character sets have binary order as the default. If binary order does not meet your needs, specify one of the other sort orders during installation, or by, using the **sqlloc** utility.
Dictionary order, case sensitive, accent sensitive	Sorts each uppercase letter before its lowercase counterpart, including accented characters. Recognizes the various accented forms of a letter and sorts them after the associated unaccented letter.

Sort Order Name	Description
Dictionary order, case insensitive, accent sensitive	Uppercase letters are equivalent to their lowercase counterparts and are intermingled in sorting results.
Dictionary order, case insensitive, accent in-sensitive	Diacritical marks are ignored.
Dictionary order, case insensitive with pref-erence	A word written with uppercase letters is equivalent to the same word written with lowercase letters. Uppercase and lowercase letters are distinguished only when you use an **order by** clause. The **order by** clause sorts uppercase letters before it sorts lowercase. Do not select this sort order unless your installation requires that uppercase letters be sorted before lowercase letters in otherwise equivalent strings for **order by** clauses. Using this sort order may reduce performance in large tables when the columns specified in an **order by** clause match the key of the table's clustered index.
Alternate dictionary order, case sensitive	Use with several of the Western European languages.
Alternate dictionary order, case insensi-tive, accent insensi-tive	Use with several of the Western European languages.
Alternate dictionary order, case insensi-tive, uppercase prefer-ence	Use with several of the Western European languages.
Spanish dictionary or-der, case sensitive	Use with Spanish and for most Latin American locales.
Spanish dictionary or-der, case insensitive	Use with Spanish and for most Latin American locales.
Spanish dictionary or-der case insensitive, accent insensitive	Use with Spanish and for most Latin American locales.
Scandinavian diction-ary order, case sensi-tive	Case-sensitive dictionary sort order. Use with Scandinavian languages.

Sort Order Name	Description
Scandinavian dictionary order, case insensitive, uppercase preference	Use with Scandinavian languages.

Use **sqlloc** to display the sort orders for the character sets you plan to use. See *Configuring Character Sets, Sort Orders*, and *Languages* in the *System Administration Guide: Volume 1*.

Language Modules

SAP ASE stores its localized software messages in separate language modules.

When you install a language module, the installation program loads the messages, character set, and sort-order files that support the new language in the correct locations.

By default, SAP ASE and Backup Server installs English system messages in English are installed by defaut.

Installing a New Language Module

A full installation of SAP ASE installs all the language components automatically. If you did not select a full installation, manually install additional language modules as required.

1. Load the language module software from the distribution media. You must load this software into the same directory in which you loaded SAP ASE.
2. Reconfigure the language and, if necessary, the character set and sort order for SAP ASE.

Message Languages

By default, US English is installed as the language for messages in SAP ASE.

These rules apply to language modules:

- During SAP ASE installation or reconfiguration, you can specify a default language other than US English. Make sure you have also installed the language module for the language you specify.
- If your clients require SAP ASE messages in a language other than US English, you must load the language module for those languages. You can then configure SAP ASE to the language used by your clients.
- If SAP ASE does not support messages in a client's language, these clients receive messages in the server default language.

  For example, if your client's language is Latin, the Spanish language module is installed, and if Spanish is specified as the SAP ASE default language, the client receives messages in Spanish.

Localization Directories

SAP localization configuration involves the `locales` and `charsets` directories.

The table illustrates the structure of the localization files. It does not show a complete list of all the files.

%SYBASE%/ or $SYBASE/	charsets	charset_name	*.srt files
		charset_name...	charset.loc
		unicode	*.uct files
	locales	language_name	charset_name
		language_name...	charset_name...
		locales.dat	
		message	language_name
			language_name...

About the locales Directory

The `$SYBASE/locales` directory contains a subdirectory for each available language. Each language subdirectory contains a subdirectory for each available character set for that language.

- The `.loc` files in these subdirectories enable SAP ASE or Backup Server to report errors in a specific language, encoded in a specific character set.
  There are a variety of `.loc` files in each subdirectory. Most of these files contain translated error messages for a specific product or utility.
- The `common.loc` file in the `utf8` subdirectory for each language contains localized information, such as local date, time, and currency formatting, that is used by all products.
- The `locales.dat` file contains entries that associate platform-specific locale names with SAP language and character set combinations.

About the charsets Directory

The files in `$SYBASE/charsets/charset_name` contain information related to each particular character set, such as the definition of any available sort order.

Format of locales.dat File Entries

You can edit the `locales.dat` file to change the default language or character set for a platform, or to add new associations between platform locale names and SAP language and character set names.

Each entry in the `locales.dat` file links a platform-specific locale definition to a SAP language and character set combination. Each entry has this format:

```
locale = platform_locale, syb_language, syb_charset
```

where:

- *platform_locale* is the platform-specific keyword for a locale. For acceptable values, see your operating system documentation.
  When the locale being defined as the default for the site, *platform_locale* is "default."
- *syb_language* is the name of the language directory to be used from within `$SYBASE/locales/language_name`.
- *syb_charset* is the character set that determines the character set conversion method and identifies the directory location of the message files for clients from within `$SYBASE/locales/language_name/charset_name`.

For example, this entry specifies that the default locale uses us_english for the language and iso_1 for the character set:

```
locale = default, us_english, iso_1
```

How Client Applications Use locales.dat

Client applications use the `locales.dat` file to identify the language and character set to use.

1. When a client application starts, it checks the operating system locale setting and the `locales.dat` file to see if the setting is appropriate for SAP ASE. For example, a locale entry for French looks like:
   ```
   locale = fr_FR, french, iso_1
   ```
2. When the client connects to SAP ASE, the language and character set information is passed to SAP ASE in the login record.
3. SAP ASE then uses:
   - The character set information, for example, iso_1, to identify the client's character set and verify whether it can convert character data to this character set
   - The language (in the preceding example, French) and character set information to see if it has messages in the client's language

Note: SAP ASE software includes some locale entries already defined in the `locales.dat` file. If these entries do not meet your needs, you can either modify them or add new locale entries.

Changing SAP ASE Localization Configuration

Each language module uses approximately 2MB database space. If necessary, use the **alter database** command to increase the size of the `master` database before adding another language.

If you want to install more than one language on SAP ASE, and the `master` database is not large enough to manage more than one language, the transaction log may become too full. You can expand the `master` database only on the master device. See the *System Administration Guide*.

1. Source `SYBASE.csh` or `SYBASE.sh` if you have not set up the SAP environment variables.
2. To configure localization for SAP ASE on the server, start **sqlloc**:

    `$SYBASE/$SYBASE_ASE/bin/sqlloc`
3. Select **Localize an Existing Server**.
4. Select the server.
5. Supply the user name and password. The user must have sa privileges.
6. Next, supply the:
    *   Default language
    *   Default character set
    *   Default sort order
7. Select any other languages you want to install. You may select only languages that are supported by the default character set.

    The Add and Remove Languages window lists all SAP supported languages.
8. The Localization Summary window summarizes the configuration options you selected. Click **OK** to confirm your selections.

    The Status Output window notifies you upon completing the installation.

See also
*   *Chapter 4, About Changing SAP ASE Configuration* on page 13

Configuring SAP ASE for Other Character Sets

Configure SAP ASE with the character set and sort order for your language.

Prerequisites

The server must be running and you must have system administrator privileges.

Task

1. Use the **charset** utility to load the default character set and sort order.

```
$SYBASE/$SYBASE_ASE/bin/charset -Usa -Ppassword
-Sserver_name sort_order_file character_set
```

   Replace `sort_order_file` with the name of the sort order file. Replace `character_set` with the SAP name for your character set.

2. Use **charset** utility to load any additional character sets.

   To use the SAP ASE built-in character set conversions, you must load the character set definition files for all the characters set on your client platforms. If you are using the Unilib character set conversions, you do not need to do this.

3. Using **isql**, log in to your server as "sa" and select the master database.

```
1> use master
2> go
```

4. Configure your server for the new character set and sort order:

```
1> sp_configure "default sortorder_id",
2> sort_order_id, "character_set"
3> go
```

   Replace *sort_order_id* with the ID for your sort order. Replace *character_set* with the SAP name for your character set.

5. Shut down the server to start the reconfiguration process.

6. Use your normal process on your UNIX system to restarts the server, usually by invoking one of the `RUN_xxx` scripts from `$SYBASE/$SYBASE_ASE/install`.

7. The server starts, rebuilds all the system indexes, then shuts down. Restart a second time to bring the server up in a stable state. Your system messages appear in the default language, English.

Editing the locales.dat File

Use a text editor to make edits to the `locales.dat` file.

Prerequisites

Make a copy of the original file, in case you have problems with the resulting edited version.

Task

1. Using a text editor such as Notepad, open the `locales.dat` file copy.

2. Find the section enclosed in brackets:

   • For Sun Solaris, `[sun_svr4]`
   • For HP, `[hp ux]`

- For IBM, `[aix]`

3. Make sure the section contains an entry for the language (*syb_language*) and character set (*syb_charset*) combination you want to use.

Note: The value for *platform_locale* must match the value required by your operating system. If the locales definitions in your system configuration files do not match the SAP locale definitions, your applications do not run properly.

For example, for Open Client messages to appear in French, when SAP ASE is using the Roman8 character set, check the `locales.dat` entries for your platform and look for:

```
locale = fr_FR, french, roman8
```

4. Add the required entry or modify an existing entry.
5. Save the changes, if any, and exit the text editor.

Changing Backup Server Localization Configuration

Localize Backup Server by modifying the `RUN_<backup_server_name>` file.

See the *Utility Guide* for more information on the **backupserver** command arguments.

CHAPTER 17   **SAP ASE Error Logging**

Upon start-up, SAP ASE, it writes information to a local error log file, called the SAP ASE error log.

Logging to the SAP ASE error log is always enabled. However, when you create or modify a specific user-defined message, you can set it to be omitted from the log.

The error log file,`$SYBASE/$SYBASE_ASE/install/server_name.log`:

- Stores information about the success or failure of each start-up attempt
- Logs error and informational messages generated by the server during its operations
- Remains open until you stop the server process
- Contains start-up messages from SAP ASE

If the error log become too large, you can:

- Use **sp_errorlog** to dynamically change its path. Once the older error log is not being used by SAP ASE, you can move it, and make space available.
- Stop the SAP ASE and delete logged messages.

See *Diagnosing System Problems* in the *System Administraton Guide* for a description of the error log format.

Set Error Log Paths

The installation program sets the error log location in the SAP installation directory when you configure a new SAP ASE. Backup Server has its own error log.

The default location for each server's error log is:

- SAP ASE: `$SYBASE/$SYBASE_ASE/install/servername.log`
- Backup Server: `$SYBASE/$SYBASE_ASE/install/servername_back.log`

At start-up, you can reset the name and location of the SAP ASE error log file from the command line. Use the **-e** start-up parameter and value in the **dataserver** command to start SAP ASE.

Note: Multiple SAP ASE servers cannot share the same error log. If you install multiple SAP ASE servers, specify a unique error log file name for each server.

Set the SAP ASE Error Log Path

Change the error log path by editing the RUN_*server_name* file.

You can change the error log path by editing the `$SYBASE/$SYBASE_ASE/install/RUN_server_name` file. For example:

```
$SYBASE/ASE-15_0/bin/dataserver -d/Devices/ASE_2K.dat -sASE_2K -i/
ASE_150 -e$SYBASE/ASE_2K.log -M/ASE_150
```

For information about using the `RUN_server_name` file, see the *Utility Guide*.

See also

Manage Messages

Manage event logging by controlling whether a message is logged, or by adding user messages.

When event logging is enabled, you can:

• Use **sp_addmessage** to add a user message, or **sp_altermessage** to control whether a specific message is logged in the SAP ASE error log.
  See the *Reference Manual: Procedures*.
• Use configuration parameters to specify whether auditing events are logged. Auditing events pertain to a user's success (**log audit logon success**) or failure (**log audit logon failure**) in logging in to SAP ASE.

Log User-Defined Messages

You can write a user-defined messages to the SAP ASE error log.

SAP ASE lets you manage:

• New messages – include the **with_log** option in **sp_addmessage** when you add a new user-defined message to sysusermessages. This parameter sets the SAP ASE to log the message each time that the message appears.
• Existing messages – include the **with_log** option in **sp_altermessage** to change an existing user-defined message. This parameter alters the reporting status of that message:
  • TRUE – to enable logging.
  • FALSE – to disable logging.

See **sp_addmessage** and **sp_altermessage** in the *Reference Manual: Procedures*.

Log Auditing Events

Use **sp_configure** parameters to specify whether SAP ASE writes auditing events, such as logins, to the SAP ASE error log.

By default, SAP ASE does not log auditing events. To log events, you can use **sp_configure** with these possible parameters and values:

- **log audit logon success** at 1 – to enable logging of successful SAP ASE logins:
  ```
  sp_configure "log audit logon success", 1
  ```
- **log audit logon failure** at 1 – to enable logging of unsuccessful SAP ASE logins:
  ```
  sp_configure "log audit logon failure", 1
  ```
- Either parameter at 0 – to disable logging of that message type:
  ```
  sp_configure "log audit logon success", 0
  sp_configure "log audit logon failure", 0
  ```

See the *System Administration Guide: Volume 1*.

CHAPTER 18   **Manage Database Devices**

database device is a disk or a portion of a disk that stores SAP ASE databases and database objects.

The administration of SAP ASE databases includes both routine tasks and performance and tuning considerations.

*   The *System Administration Guide Volume 1* and *Volume 2* discuss most of the administrative tasks in detail.
*   The *Performance and Tuning Series* provides in-depth explanations of performance issues.

Device Requirements

SAP ASE devices and databases are subject to maximum and minimum values.

*   The maximum device size is 4TB.
*   The minimum usable device size depends on the server's logical page size. Databases manage space in groups of 256 logical pages, and the smallest specifiable disk piece size is 1MB, so the smallest usable device is the larger of 1MB or 256 logical pages:
    *   The minimum device size for a 2K page server is 1MB.
    *   The minimum device size for a 4K page server is 1MB.
    *   The minimum device size for an 8K page server is 2MB.
    *   The minimum device size for a 16K page server is 4MB.
*   The maximum number of database devices is 2,147,483,647. However, SAP ASE must retain a description of each device in memory, so in practice this number is limited by your system's memory. Your operating system also limits how many devices one program can open simultaneously.
*   A database can contain up to 2,147,483,648 logical pages, so its maximum size depends on its logical page size:
    *   The maximum database size on a 2K page server is 8TB.
    *   The maximum database size on a 4K page server is 16TB.
    *   The maximum database size on an 8K page server is 32TB.
    *   The maximum database size on a 16K page server is 64TB.
*   The minimum database size is the size of the installation's model database.
*   Each database is stored on one or more database devices, in one or more disk pieces. The maximum number of disk pieces in one database is 8,388,608. However, SAP ASE must retain a description of all active databases, so in practice this number is also limited by your operating system memory.

> **Note:** By default, **srvbuild** creates the devices in `$SYBASE/data` directory.

Create Files for Database Devices

You can create new database devices using **disk init**.

You can specify a raw partition or operating system file. When using a raw partition, you must specify the full path to the partition. When using an operating system file, use the full path or a relative path. Path names are relative to your server's current working directory.

SAP recommends that you specify the full path to all database devices. Do not use environment variables when specifying path names with **disk init**.

An example of creating a database device using **disk init**:

```
disk init name = "user_device1",
physname = "/work/data/device1.dat",
size = 2048
```

`"size = 2048"` allocates 2048 "virtual" pages to the device. A virtual page is 2048 bytes, so this command creates a 4MB device.

The example command does not specify a device number, instead letting the server choose one. Unless you need to assign a specific number to a given device, SAP recommends you use this method. If you do need an explicit device number, use the parameter `"vdevno = N"`, where *N* is the device number you want to use. You cannot specify a device number that is in use by any other device on this server. Use **sp_helpdevice** to see what device numbers have already been used.

If you find that an existing database device is too small, use the **disk resize** command to make the device larger. This command takes the same "name" and "size" parameters as **disk init**, except the size parameter specifies how much larger you want the device to be.

disk resize allows you to dynamically increase the size of your database devices, rather than initializing a new device. You can use disk resize to increase the size for devices on raw partitions and file systems. The minimum increase on a device is 1MB or an allocation unit, whichever is greater.

> **Note:** Operating system constraints limit how much larger you can make any given device. For example, you cannot make a device on a UNIX raw partition larger if you have already allocated the full defined size of that partition.

See the *System Administration Guide, Volume 1* and the *Reference Manual: Commands*.

For more information about device files, see the *Performance and Tuning Series: Physical Database Tuning*.

CHAPTER 19   **Database Management System Auditing**

Auditing is optional functionality for the SAP ASE that tracks security-related system activity in an audit trail, which can be used to detect system penetration and system abuse.

By examining the audit trail, the system security officer can inspect patterns of access to objects in databases and can monitor the activity of specific users. Audit records can be traced to specific users, enabling the audit system to act as a deterrent to users who are attempting to misuse the system.

A system security officer manages the audit system and is the only user who can start and stop auditing, set up auditing options, and process audit data.

See the *Security Administration Guide* for installation and configuration instructions.

See also
- *sybsecurity Device and Database* on page 7
- *Determine the Size of a Database Device* on page 9

Audit System Devices and Databases

The audit system includes several components.

- The sybsecurity device and the `sybsecurity` database – stores audit information.

  The `sybsecurity` database is created as part of the auditing configuration process. It contains all the system tables in the `model` database as well as a system table for tracking server-wide auditing options and system tables for the audit trail.

- The audit trail – comprises several audit devices and tables that you configure.

  SAP ASE stores the audit trail in as many as eight system tables, named `sysaudits_01` through `sysaudits_08`.

  For example, if you have two audit tables, they are named `sysaudits_01` and `sysaudits_02`. At any given time, only one is current. SAP ASE writes all audit data to the current audit table. A system security officer can use **sp_configure** to set or change the current audit table.

  When you configure SAP ASE for auditing, determine the number of audit tables for your installation. Plan to use at least two or three system tables for the audit trail and to put each system table on its own device, separate from the master device. This allows you to use a

threshold procedure that archives the current audit table automatically, before it fills up and switches to a new, empty table for subsequent audit records.

- The syslogs transaction log device – stores transaction logs.
  When you configure for auditing, you must specify a separate device for the `syslogs` system table, which contains the transaction log. The `syslogs` table, which exists in every database, contains a log of transactions that are executed in the database.

CHAPTER 20 **Install Online Help for Transact-SQL Syntax**

The `$SYBASE/$SYBASE_ASE/scripts` directory contains scripts for installing the syntax help database, `sybsyntax`.

You can retrieve this data using **sp_syntax**. See the *Reference Manual: Procedures*.

The `scripts` directory contains one or more of the **sp_syntax** scripts shown in, depending on which SAP products are included with your server:

Table 9. sp_syntax Installation Scripts

Script	Product
ins_syn_cl	Open Client Client-Library[TM]
ins_syn_esql	Embedded SQL[TM]
ins_syn_os	Open Server
inssynsq	Transact-SQL

All SAP ASE installations include the **inssynsq** script, which includes syntax information for Transact-SQL, the system procedures, and the SAP utilities. Execute this script to install the SQL portion of the `sybsyntax` database.

You can install any of these scripts, depending on the need for SAP information on your server. The first script you execute creates the `sybsyntax` database and the necessary tables and indexes. Any scripts that you execute after the first one add to the existing information in the database. If you reexecute a script, the previously installed rows of information are deleted from the table in the database and then reinstalled.

Warning! The `ins_syn_cl` and `ins_syn_os` scripts conflict. If you execute both scripts, errors occur.

Default Device for the sybsyntax Database

By default, the `sybsyntax` installation scripts install the `sybsyntax` database on the device that is designated as the default database device.

If you have not used **sp_diskdefault** to change the status of the master device (which is installed as the default disk) or to specify another default device, the scripts install `sybsyntax` on the master device. SAP recommend that you do not use this configuration

because sybsyntax uses valuable space, which is best left available for future expansion of the master database.

To avoid installing sybsyntax on the master device, either:

- Use **sp_diskdefault** to specify a default device other than the master device. For information about **sp_diskdefault**.
- Modify each sybsyntax installation script that you plan to execute to specify a different device.

See the *Reference Manual: Procedures*.

Installing sybsyntax

The sybsyntax installation script installs the database and the necessary tables and indexes.

1. Determine the type (raw partition, logical volume, operating system file, and so on) and location of the device where you plan to store the sybsyntax database.

2. Make a copy of the original script. Be sure you can access this copy, in case you experience problems with the edited script.

3. Use a text editor to edit the script, if necessary, to change the default device from the master device to the device created in step 1.

    Comment out this section, which specifies the default device:

```
/* create the database, if it does not exist */
 if not exists (select name from sysdatabases
 where name = "sybsyntax")
 begin
     /* create the sybsyntax table if it doesn't exist */
     /* is the space left on the default database
     devices > size of model? */
     if (select sum (high-low +1) from sysdevices where status
     & 1 = 1) - (select sum(size) from sysusages, sysdevices
         where vstart >= sysdevices.low
         and vstart <= sysdevices.high
         and sysdevices.status &1 = 1) >
         (select sum(sysusages.size) from sysusages
         where dbid = 3)
     begin
         create database sybsyntax
     end
     else
     begin
         print "There is not enough room on the default
         devices to create the sybsyntax database."
     return
     end
 end
```

4. After you have commented out this entire section, add a line like this to the script:

```
create database sybsyntax on device_name
```

where *device_name* is the name of the device where you want to install sybsyntax.

5. Execute the script:

```
isql -Usa -Ppassword -Sservername < $SYBASE/$SYBASE_ASE/scripts/
inssynsq
```

where *sa* is the user ID of the system administrator, *password* is the system administrator's password, and *servername* is the SAP ASE where you plan to install the database.

If you have set the DSQUERY environment variable to *servername*, you can replace the server name with $DSQUERY.

6. To ensure that you have installed the sybsyntax database and that it is working correctly, use **isql** to log in to the server on which you installed the database, and execute **sp_syntax**:

```
isql -Usa -Ppassword -Sservername

1> sp_syntax "select"
2> go
```

SAP ASE displays a list of commands that contain the word or word fragment "select."