SYBASE iAnywhere

MobiLink
Client Administration

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Contents

About This Manual

Subject

This manual describes how to set up, configure, and synchronize MobiLink clients. MobiLink clients can be SQL Anywhere or UltraLite databases.

Audience

This manual is for users who want to add synchronization to their information systems.

Before you begin

For a comparison of MobiLink with other synchronization and replication technologies, see "Overview of Data Exchange Technologies" [*SQL Anywhere 10 - Introduction*].

SQL Anywhere documentation

This book is part of the SQL Anywhere documentation set. This section describes the books in the documentation set and how you can use them.

The SQL Anywhere documentation

The complete SQL Anywhere documentation is available in two forms: an online form that combines all books, and as separate PDF files for each book. Both forms of the documentation contain identical information and consist of the following books:

- **SQL Anywhere 10 - Introduction** This book introduces SQL Anywhere 10—a product that provides data management and data exchange technologies, enabling the rapid development of database-powered applications for server, desktop, mobile, and remote office environments.
- **SQL Anywhere 10 - Changes and Upgrading** This book describes new features in SQL Anywhere 10 and in previous versions of the software, as well as upgrade instructions.
- **SQL Anywhere Server - Database Administration** This book covers material related to running, managing, and configuring SQL Anywhere databases. It describes database connections, the database server, database files, backup procedures, security, high availability, and replication with Replication Server, as well as administration utilities and options.
- **SQL Anywhere Server - SQL Usage** This book describes how to design and create databases; how to import, export, and modify data; how to retrieve data; and how to build stored procedures and triggers.
- **SQL Anywhere Server - SQL Reference** This book provides a complete reference for the SQL language used by SQL Anywhere. It also describes the SQL Anywhere system views and procedures.
- **SQL Anywhere Server - Programming** This book describes how to build and deploy database applications using the C, C++, and Java programming languages, as well as Visual Studio .NET. Users of tools such as Visual Basic and PowerBuilder can use the programming interfaces provided by these tools.
- **SQL Anywhere 10 - Error Messages** This book provides a complete listing of SQL Anywhere error messages together with diagnostic information.
- **MobiLink - Getting Started** This manual introduces MobiLink, a session-based relational-database synchronization system. MobiLink technology allows two-way replication and is well suited to mobile computing environments.
- **MobiLink - Server Administration** This manual describes how to set up and administer MobiLink server-side utilities and functionality.
- **MobiLink - Client Administration** This manual describes how to set up, configure, and synchronize MobiLink clients. MobiLink clients can be SQL Anywhere or UltraLite databases.
- **MobiLink - Server-Initiated Synchronization** This manual describes MobiLink server-initiated synchronization, a feature of MobiLink that allows you to initiate synchronization or other remote actions from the consolidated database.

- **QAnywhere** This manual describes QAnywhere, which is a messaging platform for mobile and wireless clients as well as traditional desktop and laptop clients.
- **SQL Remote** This book describes the SQL Remote data replication system for mobile computing, which enables sharing of data between a SQL Anywhere consolidated database and many SQL Anywhere remote databases using an indirect link such as email or file transfer.
- **SQL Anywhere 10 - Context-Sensitive Help** This manual contains the context-sensitive help for the Connect dialog, the Query Editor, the MobiLink Monitor, MobiLink Model mode, the SQL Anywhere Console utility, the Index Consultant, and Interactive SQL.
- **UltraLite - Database Management and Reference** This manual introduces the UltraLite database system for small devices.
- **UltraLite - AppForge Programming** This manual describes UltraLite for AppForge. With UltraLite for AppForge you can develop and deploy database applications to handheld, mobile, or embedded devices, running Palm OS, Symbian OS, or Windows CE.
- **UltraLite - .NET Programming** This manual describes UltraLite.NET. With UltraLite.NET you can develop and deploy database applications to computers, or handheld, mobile, or embedded devices.
- **UltraLite - M-Business Anywhere Programming** This manual describes UltraLite for M-Business Anywhere. With UltraLite for M-Business Anywhere you can develop and deploy web-based database applications to handheld, mobile, or embedded devices, running Palm OS, Windows CE, or Windows XP.
- **UltraLite - C and C++ Programming** This manual describes UltraLite C and C++ programming interfaces. With UltraLite, you can develop and deploy database applications to handheld, mobile, or embedded devices.

Documentation formats

SQL Anywhere provides documentation in the following formats:

- **Online documentation** The online documentation contains the complete SQL Anywhere documentation, including the books and the context-sensitive help for SQL Anywhere tools. The online documentation is updated with each maintenance release of the product, and is the most complete and up-to-date source of documentation.

  To access the online documentation on Windows operating systems, choose Start ► Programs ► SQL Anywhere 10 ► Online Books. You can navigate the online documentation using the HTML Help table of contents, index, and search facility in the left pane, as well as using the links and menus in the right pane.

  To access the online documentation on Unix operating systems, see the HTML documentation under your SQL Anywhere installation or on your installation CD.

- **PDF files** The complete set of SQL Anywhere books is provided as a set of Adobe Portable Document Format (pdf) files, viewable with Adobe Reader.

On Windows, the PDF books are accessible from the online documentation via the PDF link at the top of each page, or from the Windows Start menu (Start ► Programs ► SQL Anywhere 10 ► Online Books - PDF Format).

On Unix, the PDF books are available on your installation CD.

Documentation conventions

This section lists the typographic and graphical conventions used in this documentation.

Syntax conventions

The following conventions are used in the SQL syntax descriptions:

- **Keywords** All SQL keywords appear in uppercase, like the words ALTER TABLE in the following example:

  ALTER TABLE [*owner*.]*table-name*

- **Placeholders** Items that must be replaced with appropriate identifiers or expressions are shown like the words *owner* and *table-name* in the following example:

  ALTER TABLE [*owner*.]*table-name*

- **Repeating items** Lists of repeating items are shown with an element of the list followed by an ellipsis (three dots), like *column-constraint* in the following example:

  ADD *column-definition* [*column-constraint*, …]

  One or more list elements are allowed. In this example, if more than one is specified, they must be separated by commas.

- **Optional portions** Optional portions of a statement are enclosed by square brackets.

  RELEASE SAVEPOINT [*savepoint-name*]

  These square brackets indicate that the *savepoint-name* is optional. The square brackets should not be typed.

- **Options** When none or only one of a list of items can be chosen, vertical bars separate the items and the list is enclosed in square brackets.

  [**ASC** | **DESC**]

  For example, you can choose one of ASC, DESC, or neither. The square brackets should not be typed.

- **Alternatives** When precisely one of the options must be chosen, the alternatives are enclosed in curly braces and a bar is used to separate the options.

  [**QUOTES** { **ON** | **OFF** }]

  If the QUOTES option is used, one of ON or OFF must be provided. The brackets and braces should not be typed.

Operating system conventions

- **Windows** The Microsoft Windows family of operating systems for desktop and laptop computers. The Windows family includes Windows Vista and Windows XP.

- **Windows CE** Platforms built from the Microsoft Windows CE modular operating system, including the Windows Mobile and Windows Embedded CE platforms.

  Windows Mobile is built on Windows CE. It provides a Windows user interface and additional functionality, such as small versions of applications like Word and Excel. Windows Mobile is most commonly seen on mobile devices.

  Limitations or variations in SQL Anywhere are commonly based on the underlying operating system (Windows CE), and seldom on the particular variant used (Windows Mobile).

- **Unix** Unless specified, Unix refers to both Linux and Unix platforms.

File name conventions

The documentation generally adopts Windows conventions when describing operating system dependent tasks and features such as paths and file names. In most cases, there is a simple transformation to the syntax used on other operating systems.

- **Directories and path names** The documentation typically lists directory paths using Windows conventions, including colons for drives and backslashes as a directory separator. For example,

  ```
  MobiLink\redirector
  ```

  On Unix, Linux, and Mac OS X, you should use forward slashes instead. For example,

  ```
  MobiLink/redirector
  ```

  If SQL Anywhere is used in a multi-platform environment you must be aware of path name differences between platforms.

- **Executable files** The documentation shows executable file names using Windows conventions, with the suffix *.exe*. On Unix, Linux, and Mac OS X, executable file names have no suffix. On NetWare, executable file names use the suffix *.nlm*.

  For example, on Windows, the network database server is *dbsrv10.exe*. On Unix, Linux, and Mac OS X, it is *dbsrv10*. On NetWare, it is *dbsrv10.nlm*.

- **install-dir** The installation process allows you to choose where to install SQL Anywhere, and the documentation refers to this location using the convention *install-dir*.

  After installation is complete, the environment variable SQLANY10 specifies the location of the installation directory containing the SQL Anywhere components (*install-dir*). SQLANYSH10 specifies the location of the directory containing components shared by SQL Anywhere with other Sybase applications.

  For more information on the default location of *install-dir*, by operating system, see "SQLANY10 environment variable" [*SQL Anywhere Server - Database Administration*].

- **samples-dir** The installation process allows you to choose where to install the samples that are included with SQL Anywhere, and the documentation refers to this location using the convention *samples-dir*.

After installation is complete, the environment variable SQLANYSAMP10 specifies the location of the directory containing the samples (*samples-dir*). From the Windows Start menu, choosing Programs ► SQL Anywhere 10 ► Sample Applications and Projects opens a Windows Explorer window in this directory.

For more information on the default location of *samples-dir*, by operating system, see "Samples directory" [*SQL Anywhere Server - Database Administration*].

- **Environment variables** The documentation refers to setting environment variables. On Windows, environment variables are referred to using the syntax *%envvar%*. On Unix, Linux, and Mac OS X, environment variables are referred to using the syntax *$envvar* or *${envvar}*.

  Unix, Linux, and Mac OS X environment variables are stored in shell and login startup files, such as *.cshrc* or *.tcshrc*.

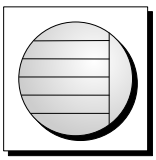
Graphic icons

The following icons are used in this documentation.

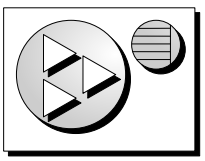
- A client application.

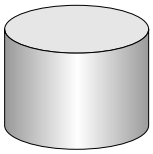
- A database server, such as SQL Anywhere.

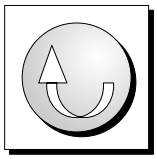
- An UltraLite application.

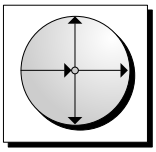
- A database. In some high-level diagrams, the icon may be used to represent both the database and the database server that manages it.



- Replication or synchronization middleware. These assist in sharing data among databases. Examples are the MobiLink server and the SQL Remote Message Agent.



- A Sybase Replication Server



- A programming interface.

Finding out more and providing feedback

Finding out more

Additional information and resources, including a code exchange, are available at the iAnywhere Developer Network at http://www.ianywhere.com/developer/.

If you have questions or need help, you can post messages to the Sybase iAnywhere newsgroups listed below.

When you write to one of these newsgroups, always provide detailed information about your problem, including the build number of your version of SQL Anywhere. You can find this information by entering **dbeng10 -v** at a command prompt.

The newsgroups are located on the *forums.sybase.com* news server. The newsgroups include the following:

- sybase.public.sqlanywhere.general
- sybase.public.sqlanywhere.linux
- sybase.public.sqlanywhere.mobilink
- sybase.public.sqlanywhere.product_futures_discussion
- sybase.public.sqlanywhere.replication
- sybase.public.sqlanywhere.ultralite
- ianywhere.public.sqlanywhere.qanywhere

Newsgroup disclaimer
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iAnywhere Technical Advisors as well as other staff assist on the newsgroup service when they have time available. They offer their help on a volunteer basis and may not be available on a regular basis to provide solutions and information. Their ability to help is based on their workload.

Feedback

We would like to receive your opinions, suggestions, and feedback on this documentation.

You can email comments and suggestions to the SQL Anywhere documentation team at iasdoc@ianywhere.com. Although we do not reply to emails sent to that address, we read all suggestions with interest.

In addition, you can provide feedback on the documentation and the software through the newsgroups listed above.

Part I. Introduction to MobiLink Clients

This part introduces the clients you can use for MobiLink synchronization, and provides information common to all types of MobiLink client.

CHAPTER 1

Introducing MobiLink Clients

Contents

SQL Anywhere clients

Synchronization is initiated by running a command line utility called dbmlsync. This utility connects to the remote database and prepares the upload, typically using information contained in the transaction log of the remote database. (Alternatively, you can implement scripted upload and not use the transaction log.) The dbmlsync utility can use information stored in a synchronization publication and synchronization subscription to connect to the MobiLink server and exchange data.

For more information about SQL Anywhere clients, see "SQL Anywhere Clients" on page 79.

For details of dbmlsync command line options, see "MobiLink SQL Anywhere Client Utility [dbmlsync]" on page 109.

Customizing synchronization

There are dbmlsync programming interfaces that you can use to integrate synchronization into your own applications. See:

- "Dbmlsync Integration Component" on page 306
- "DBTools Interface for dbmlsync" on page 305

There are also client event hooks that you can use to customize dbmlsync. See:

- "Event Hooks for SQL Anywhere Clients" on page 209

You can also override the use of the client transaction log and define your own upload stream. See:

- "Scripted Upload" on page 313

UltraLite clients

UltraLite applications are automatically MobiLink-enabled whenever the application includes a call to the appropriate synchronization function.

The UltraLite application and libraries handle the synchronization actions at the application end. You can write your UltraLite application with little regard to synchronization. The UltraLite runtime keeps track of changes made since the previous synchronization.

When using TCP/IP, HTTP, HTTPS, or ActiveSync, synchronization is initiated from your application by a single call to a synchronization function. The interface for HotSync is slightly different. Once synchronization is initiated from the application or from HotSync, the MobiLink server and the UltraLite runtime control the actions that occur during synchronization.

See also

- UltraLite - Database Management and Reference [*UltraLite - Database Management and Reference*]
- "UltraLite Clients" on page 337
- "Deploying ActiveSync and HotSync for UltraLite clients" on page 357
- "UltraLite Synchronization Parameters and Network Protocol options" on page 369

Specifying the network protocol for clients

The MobiLink server uses the -x command line option to specify the network protocol or protocols for synchronization clients to connect to the MobiLink server. The network protocol you choose must match the synchronization protocol used by the client.

The syntax for the mlsrv10 command line option is:

mlsrv10 -c "*connection-string***" -x** *protocol***(** *options* **)**

In the following example, the TCP/IP protocol is selected with no additional protocol options.

```
mlsrv10 -c "dsn=SQL Anywhere 10 Demo" -x tcpip
```

You can configure your protocol using options of the form:

(*keyword***=***value*;…**)**

For example:

```
mlsrv10 -c "dsn=SQL Anywhere 10 Demo" -x tcpip(
   host=localhost;port=2439)
```

See also

Complete details about MobiLink network protocols and protocol options can be found in the following locations:

To find...	See...
How to set network options for the MobiLink server	"-x option" [*MobiLink - Server Administration*]
All the network protocol options available to MobiLink client applications	"MobiLink Client Network Protocol Options" on page 31
How to set options for SQL Anywhere clients	"CommunicationAddress (adr) extended option" on page 165 "CommunicationType (ctp) extended option" on page 167
How to set options for UltraLite clients	"Stream Parameters synchronization parameter" on page 387 "Stream Type synchronization parameter" on page 386

System tables in MobiLink

MobiLink server system tables

When you set up a database for use as a consolidated database, MobiLink system tables are created that are required by the MobiLink server.

See "MobiLink Server System Tables" [*MobiLink - Server Administration*].

Client system tables

SQL Anywhere and UltraLite databases have system tables.

For information about UltraLite system tables, see "UltraLite system tables" [*UltraLite - Database Management and Reference*].

SQL Anywhere system tables cannot be accessed directly, but are accessed via system views. See "System views in Sybase Central" [*SQL Anywhere Server - SQL Reference*].

The following SQL Anywhere system views are of particular interest to MobiLink users:

- "SYSSYNC system view" [*SQL Anywhere Server - SQL Reference*]
- "SYSPUBLICATION system view" [*SQL Anywhere Server - SQL Reference*]
- "SYSSUBSCRIPTION system view" [*SQL Anywhere Server - SQL Reference*]
- "SYSSYNCSCRIPT system view" [*SQL Anywhere Server - SQL Reference*]

SQL Anywhere also provides consolidated views that query system views to provide information that you might need. See "Consolidated views" [*SQL Anywhere Server - SQL Reference*].

CHAPTER 2

MobiLink Users

Contents

Introduction to MobiLink users

A **MobiLink user**, also called a **synchronization user**, is the name you use to authenticate when you connect to the MobiLink server. For a user to be part of a synchronization system, a MobiLink user name must be created on the remote database and the MobiLink user name must be registered with the MobiLink server.

MobiLink user names and passwords are not the same as database user names and passwords. MobiLink user names are used to authenticate the connection from the remote database to the MobiLink server.

You can also use user names to control the behavior of the synchronization server. You do so using the **username** parameter in synchronization scripts.

See "Using remote IDs and MobiLink user names in scripts" on page 14.

The MobiLink user name is stored in the name column of the ml_user MobiLink system table in the consolidated database.

The MobiLink user name does not have to be unique within your synchronization system. If security is not an issue, you can even assign the same MobiLink user name to every remote database.

UltraLite user authentication

Although UltraLite and MobiLink user authentication schemes are separate, you may want to share the values of UltraLite user IDs with MobiLink user names for simplicity. This only works when the UltraLite application is used by a single user.

See "The role of user authentication" [*UltraLite - Database Management and Reference*].

Creating and registering MobiLink users

You create a MobiLink user in the remote database and register it in the consolidated database.

Creating MobiLink users in the remote database

To add users to the remote database, you have the following options:

- For SQL Anywhere remote databases, use Sybase Central or the CREATE SYNCHRONIZATION USER statement.

  See "Creating MobiLink users in a SQL Anywhere remote database" on page 91.

- For UltraLite remote databases, you set the User Name and Password synchronization parameters.

  See "User Name synchronization parameter" on page 392 and "Password synchronization parameter" on page 379.

Adding MobiLink user names to the consolidated database

Once user names are created in the remote database, you can use any of the following methods to register the user names in the consolidated database:

- Use the mluser utility.

See "MobiLink user authentication utility [mluser]" [*MobiLink - Server Administration*].

- Use Sybase Central.
- Implement a script for the authenticate_user or authenticate_user_hashed events. When either of these scripts are invoked, the MobiLink server automatically adds users that successfully authenticate.
- Specify the -zu+ command line option with mlsrv10. In this case, any existing MobiLink users that have not been added to the consolidated database are added when they first synchronize. This option is useful during development but is not recommended for deployed applications.

  See "-zu option" [*MobiLink - Server Administration*].

Providing initial passwords for users

The password for each user is stored along with the user name in the ml_user table. You can provide initial passwords from Sybase Central, or using the mluser command line utility.

Sybase Central is a convenient way of adding individual users and passwords. The mluser utility is useful for batch additions.

If you create a user with no password, then MobiLink performs no user authentication for that user: they can connect and synchronize without supplying a password.

♦ To provide an initial MobiLink password for a user (Sybase Central Admin mode)

1. Connect to the consolidated database from Sybase Central using the MobiLink plug-in.
2. Select Admin mode:

   Choose Mode ► Admin.
3. Open the Users folder.
4. Choose File ► New ► User.

   The Create User wizard appears.
5. Follow the prompts in the wizard.

♦ To provide initial MobiLink passwords (command line)

1. Create a file with a single user name and password on each line, separated by white space.
2. Open a command prompt, and execute the mluser command line utility. For example:

   ```
   mluser -c "dsn=my_dsn" -f password-file
   ```

   In this command line, the -c option specifies an ODBC connection to the consolidated database. The -f option specifies the file containing the user names and passwords.

   See "MobiLink user authentication utility [mluser]" [*MobiLink - Server Administration*].

Synchronizations from new users

Ordinarily, each MobiLink client must provide a valid MobiLink user name and password to connect to a MobiLink server.

Setting the –zu+ option when you start the MobiLink server allows the server to accept and respond to synchronization requests from unregistered users. When a request is received from a user not listed in the ml_user table, the request is serviced and the user is added to the ml_user table.

When you use -zu+, if a MobiLink client synchronizes with a user name that is not in the current ml_user table, MobiLink, by default, takes the following actions:

- **New user, no password** If the user supplied no password, then by default the user name is added to the ml_user table with a NULL password. In future, this user will be allowed to synchronize without a password.
- **New user, password** If the user supplies a password, then the user name and password are both added to the ml_user table and the new user name becomes a recognized name in your MobiLink system. In future, this user must specify the same password to synchronize.
- **New user, new password** A new user may provide information in the new password field, instead of or as well as in the password field. In either case, the new password setting overrides the password setting, and the new user is added to the MobiLink system using the new password. In future, this user must specify the same password to synchronize.

See "-zu option" [*MobiLink - Server Administration*].

Preventing synchronization by unknown users

By default, the MobiLink server only recognizes users who are registered in the ml_user table. This default provides two benefits. First, it reduces the risk of unauthorized access to the MobiLink server. Second, it prevents authorized users from accidentally connecting using an incorrect or misspelled user name. Such accidents should be avoided because they can cause the MobiLink system to behave in unpredictable ways.

Prompting end users to enter passwords

Each end user must supply a MobiLink user name and password each time they synchronize from a MobiLink client, unless you choose to disable user authentication on your MobiLink server.

To prompt your end users to enter their MobiLink passwords

- The mechanism for supplying the user name and password is different for UltraLite and SQL Anywhere clients.
  - **UltraLite** When synchronizing, the UltraLite client must supply a valid value in the password field of the synchronization structure. For built-in MobiLink synchronization, a valid password is one that matches the value in the ml_user MobiLink system table.

    Your application should prompt the end user to enter their MobiLink user name and password before synchronizing.

See “UltraLite Synchronization Parameters and Network Protocol options” on page 369.

- **SQL Anywhere** Users can supply a valid password on the dbmlsync command line. If they do not, they are prompted for one in the dbmlsync connection dialog. The latter method is more secure because command lines are visible to other processes running on the same computer.

  If authentication fails, the user is prompted to re-enter the user name and password.

  See “-c option” on page 122.

Changing passwords

MobiLink provides a mechanism for end users to change their password. The interface differs between UltraLite and SQL Anywhere clients.

To prompt your end users to enter MobiLink passwords

- The mechanism for supplying the user name and password is different for UltraLite and SQL Anywhere clients.

  - **SQL Anywhere** Supply a valid existing password together with the new password on the dbmlsync command line, or in the dbmlsync connection dialog if you do not supply command line parameters.

    See “-mp option” on page 137 and “-mn option” on page 136.

  - **UltraLite** When synchronizing, the application must supply the existing password in the password field of the synchronization structure and the new password in the new_password field.

    See “Password synchronization parameter” on page 379 and “New Password synchronization parameter” on page 377.

An initial password can be set in the consolidated server or on the first synchronization attempt. See “Providing initial passwords for users” on page 11 and “Synchronizations from new users” on page 12.

Once a password is assigned, you cannot reset the password to an empty string from the client side.

Remote IDs

The **remote ID** uniquely identifies a remote database in a MobiLink synchronization system.

When a SQL Anywhere or UltraLite database is created, it is given a remote ID of NULL. When the database synchronizes with MobiLink, MobiLink checks for a NULL remote ID and if it finds one, it assigns a GUID as the remote ID. Once set, the database maintains the same remote ID until it is manually changed.

The MobiLink server tracks synchronization progress by remote ID and subscription for SQL Anywhere remote databases, and by remote ID and publication for UltraLite remote databases. This information is stored in the ml_subscription system table. The remote ID is also recorded in the MobiLink server log for each synchronization.

The MobiLink server issues an error if the same remote ID is used in two or more concurrent synchronizations.

Setting the MobiLink remote ID

The remote ID is created as a GUID, but you can change it to a more meaningful name. For both SQL Anywhere and UltraLite databases, the remote ID is stored in the database as a property called ml_remote_id.

For SQL Anywhere clients, see "Setting remote IDs" on page 82.

For UltraLite clients, see "UltraLite ml_remote_id option" [*UltraLite - Database Management and Reference*].

When deploying a starter database to multiple locations, it is safest to deploy databases that have a NULL remote ID. If you have synchronized the databases to pre-populate them, you can set the remote ID back to NULL before deployment. This method ensures that the remote ID will be unique because the first time the remote database synchronizes, a unique remote ID is assigned. Alternatively, the remote ID can be set as a remote setup step, but it must be unique.

Example

To simplify administrative duties when defining a MobiLink setup where you have one user per remote, you might want to use the same number for all three MobiLink identifiers on each remote database. For example, in a SQL Anywhere remote database you can set them as follows:

```
-- Set the MobiLink user name:
  CREATE SYNCHRONIZATION USER "1" ... ;

-- Set the partition number for DEFAULT GLOBAL AUTOINCREMENT:
  SET OPTION PUBLIC.GLOBAL_DATABASE_ID = '1';

-- Set the MobiLink remote ID:
  SET OPTION PUBLIC.ml_remote_id = '1';
```

Using remote IDs and MobiLink user names in scripts

The MobiLink user identifies a person and is used for authentication. The remote ID uniquely identifies a MobiLink remote database.

In many synchronization scripts, you have the option of identifying the remote database by the remote ID (with the named parameter s.remote_id) or by the MobiLink user name (with s.username). Using the remote ID has some advantages, especially in UltraLite.

When deployments have a one-to-one relationship between a remote database and a MobiLink user, and when the MobiLink user name uniquely identifies a remote database, you can ignore the remote ID. In this case, MobiLink event scripts can reference the username parameter, which is the MobiLink user name used for authentication.

If a MobiLink user wants to synchronize data in different databases but each remote has the same data, the synchronization scripts can reference the MobiLink user name. But if the MobiLink user wants to synchronize different sets of data in different databases, the synchronization scripts should reference the remote ID.

In UltraLite databases, the same database can also be synchronized by different users, even if the previous upload state is unknown, because the MobiLink server tracks synchronization progress by remote ID. In this case, you can no longer reference the MobiLink user name in download scripts for timestamp-based downloads, because some rows for each of the other users may be missed and never downloaded. To prevent this, you need to implement a mapping table in the consolidated database with one row for each user using the same remote database. You can make sure that all data for all users is being downloaded with a join of the consolidated table and mapping table that is based on the remote ID for the current synchronization.

You can also use different script versions to synchronize different data to different remote databases. See “Script versions” [*MobiLink - Server Administration*].

Choosing a user authentication mechanism

User authentication is one part of a security system for protecting your data.

MobiLink provides you with a choice of user authentication mechanisms. You do not have to use a single installation-wide mechanism; MobiLink lets you use different authentication mechanisms for different script versions within the installation for flexibility.

- **No MobiLink user authentication** If your data is such that you do not need password protection, you can choose not to use any user authentication in your installation. In this case, the MobiLink user name must still be included in the ml_user table, but the hashed_password column is NULL.
- **Built-in MobiLink user authentication** MobiLink uses the user names and passwords stored in the ml_user MobiLink system table to perform authentication.

  The built-in mechanism is described in the following sections.
- **Custom authentication** You can use the MobiLink script authenticate_user to replace the built-in MobiLink user authentication system with one of your own. For example, depending on your consolidated database management system, you may be able to use the database user authentication instead of the MobiLink system.

  See "Custom user authentication" on page 20.

For information about other security-related features of MobiLink and its related products, see:

- "Encrypting MobiLink client/server communications" [*SQL Anywhere Server - Database Administration*]
- UltraLite clients: "UltraLite security considerations" [*UltraLite - Database Management and Reference*]
- SQL Anywhere clients:"Keeping Your Data Secure" [*SQL Anywhere Server - Database Administration*]

User authentication architecture

The MobiLink user authentication system relies on user names and passwords. You can choose either to let the MobiLink server validate the user name and password using a built-in mechanism, or you can implement your own custom user authentication mechanism.

In the built-in authentication system, both the user name and the password are stored in the ml_user MobiLink system table in the consolidated database. The password is stored in hashed form so that applications other than the MobiLink server cannot read the ml_user table and reconstruct the original form of the password. You add user names and passwords to the consolidated database using Sybase Central, using the mluser utility, or by specifying -zu+ when you start the MobiLink server.

See "Creating and registering MobiLink users" on page 10.

When a MobiLink client connects to a MobiLink server, it provides the following values.

- **user name** The MobiLink user name. Mandatory. To synchronize, the user name must be stored in the ml_user system table, or you must start the MobiLink server with the -zu+ option to add new users to the ml_user table.
- **password** The MobiLink password. Optional only if the user is unknown or if the corresponding password in the ml_user MobiLink system table is NULL.
- **new password** A new MobiLink password. Optional. MobiLink users can change their password by setting this value.

Custom authentication

Optionally, you can substitute your own user authentication mechanism.

See "Custom user authentication" on page 20.

Authentication process

Following is an explanation of the order of events that occur during authentication.

1. A remote application initiates a synchronization request using a remote ID, a MobiLink user name, and optionally a password and new password. The MobiLink server starts a new transaction and triggers the begin_connection_autocommit event and begin_connection event.
2. MobiLink verifies that the remote ID is not currently synchronizing and presets the authentication_status to be 4000.
3. If you have defined an authenticate_user script, then the following occurs:
   a. If the authenticate_user script is written in SQL, then this script is called with the preset authentication_status of 4000, the MobiLink user name you provided, and optionally the password and new password.

      If the authenticate_user script is written in Java or .NET and returns a SQL statement, then this SQL statement is called with the preset authentication_status of 4000, the MobiLink user name you provided, and optionally the password and new password.

   b. If the authenticate_user script throws an exception or an error occurs in executing the script, the synchronization process stops.

   The authenticate_user script or the returned SQL statement must be a call to a stored procedure taking two to four arguments. The preset authentication_status value is passed as the first parameter and may be updated by the stored procedure. The returned value of the first parameter is the authentication_status from the authenticate_user script.
4. If an authenticate_user_hashed script exists, then the following occurs:
   a. If a password was provided, a hashed value is calculated for it. If a new password was provided, a hashed value is calculated for it.

   b. The authenticate_user_hashed script is called with the current value of authentication_status (either the preset authentication_status if the authenticate_user script doesn't exist, or the authentication_status returned from the authenticate_user script) and the hashed passwords. The behavior is identical to step 3. The returned value of the first parameter is used as the authentication_status of the authenticate_user_hashed script.
5. The MobiLink server takes the greater value of the auth_user status returned from the authenticate_user script and authenticate_user_hashed script, if they exist, or the preset authentication_status if neither of the scripts exist.
6. The MobiLink server queries the ml_user table for the MobiLink user name you provided.
   a. If either of the custom scripts authenticate_user or authenticate_user_hashed was called but the MobiLink user name you provided is not in the ml_user table and the authentication_status is valid (1000 or 2000), the MobiLink user name is added to the MobiLink system table ml_user. If authentication_status is not valid, ml_user is not updated and an error occurs.

b. If the custom scripts were not called and the MobiLink user name you provided is not in the ml_user table, the MobiLink user name you provided is added to ml_user if you started the MobiLink server with the -zu+ option. Otherwise, an error occurs and authentication_status is set to be invalid.

c. If the custom scripts were called and the MobiLink user name you provided is in the ml_user table, nothing happens.

d. If the custom scripts were *not* called and the MobiLink user name you provided is in the ml_user table, the password is checked against the value in the ml_user table. If the password matches the one in the ml_user table for the MobiLink user, the authentication_status is set to be valid. Otherwise the authentication_status is set to be invalid.

7. If that authentication_status is valid and neither of the scripts authenticate_user or authenticate_user_hashed was called and you provided a new password in the ml_user table for this MobiLink user, the password is changed to the one you provided.

8. If you have defined an authenticate_parameters script and the authentication_status is valid (1000 or 2000), then the following occurs:

   a. The parameters are passed to the authenticate_parameters script.

   b. If the authenticate_parameters script returns an authentication_status value greater than the current authentication_status, the new authentication_status overwrites the old value.

9. If authentication_status is not valid, the synchronization is aborted.

10. If you have defined the modify_user script, it is called to replace the MobiLink user name you provided with a new MobiLink user name returned by this script.

11. The MobiLink server always commits the transaction after MobiLink user authentication, regardless of the authentication_status. If the authentication_status is valid (1000 or 2000), the synchronization will continue. If the authentication_status is invalid, the synchronization is aborted.

Custom user authentication

You can choose to use a user authentication mechanism other than the built-in MobiLink mechanism. Reasons for using a custom user authentication mechanism include integration with existing DBMS user authentication schemes or external authentication mechanisms; or supplying custom features, such as minimum password length or password expiry, that do not exist in the built-in MobiLink mechanism.

There are three custom authentication tools:

- mlsrv10 -zu+ option
- authenticate_user script
- authenticate_parameters script

The mlsrv10 -zu+ option allows you to control the automatic addition of users. For example, specify -zu+ to have all unrecognized MobiLink user names added to the ml_user table when they first synchronize. The -zu+ option is only needed for built-in MobiLink authentication.

The authenticate_user script and authenticate_parameters script both override the default MobiLink user authentication mechanism. Any user that successfully authenticates is automatically added to the ml_user table

There are several predefined scripts for the authenticate_user event that are installed with MobiLink. These make it easier for you to authenticate using LDAP, POP3, and IMAP servers. See "Authenticating to external servers" on page 21.

Use authenticate_user to create custom authentication of user IDs and passwords. If this script exists, it is executed instead of the built-in password comparison. The script must return error codes to indicate the success or failure of the authentication.

Use authenticate_parameters to create custom authentication that depends on values other than user IDs and passwords.

See:

- "-zu option" [*MobiLink - Server Administration*]
- "authenticate_user connection event" [*MobiLink - Server Administration*]
- "authenticate_parameters connection event" [*MobiLink - Server Administration*]

Java and .NET user authentication

User authentication is a natural use of Java and .NET synchronization logic, as Java and .NET classes allow you to reach out to other sources of user names and passwords used in your computing environment, such as application servers.

A simple sample is included in the directory *samples-dir\MobiLink\JavaAuthentication*. The sample code in *samples-dir\MobiLink\JavaAuthentication\CustEmpScripts.java* implements a simple user authentication

system. On the first synchronization, a MobiLink user name is added to the login_added table. On subsequent synchronizations, a row is added to the login_audit table. In this sample, there is no test before adding a user ID to the login_added table. (For information about *samples-dir*, see "Samples directory" [*SQL Anywhere Server - Database Administration*].)

For a .NET sample that explains user authentication, see ".NET synchronization example" [*MobiLink - Server Administration*].

SQL user authentication

A typical authenticate_user SQL script is a call to a stored procedure that uses the parameters authentication_status, ml_username, user_password, and user_new_password. The order of the parameters in the call must match this. For example, in a SQL Anywhere consolidated database, the format is:

```
call my_authentication( ?, ?, ?, ? )
```

where the first argument is the authentication code, and so on. The authentication code is an integer type, and the other parameters are VARCHAR(128).

In Transact-SQL, the format is:

```
execute ? = my_authentication( ?, ?, ? )
```

where the authentication code is the parameter on the left hand side.

See "authenticate_user connection event" [*MobiLink - Server Administration*].

Authenticating to external servers

Predefined Java synchronization scripts are included with MobiLink that make it simpler for you to authenticate to external servers using the authenticate_user event. Currently, predefined scripts are available for the following authentication servers:

- POP3 or IMAP servers using the JavaMail 1.2 API
- LDAP servers using the Java Naming and Directory Interface (JNDI)

How you use these scripts is determined by whether your MobiLink user names map directly to the user IDs in your external authentication system.

> **Note**
> You can also set up authentication to external servers in Sybase Central Model mode, using the Authentication tab. See "MobiLink Models" [*MobiLink - Getting Started*].

If your MobiLink user names map directly to your user IDs

In the simple case where the MobiLink user name maps directly to a valid user ID in your authentication system, the predefined scripts can be used directly in response to the authenticate_user connection event. The authentication code initializes itself based on properties stored in the ml_property table.

♦ **To use predefined scripts directly in authenticate_user**

1. Add the predefined Java synchronization script to the ml_scripts MobiLink system table. You can do this using a stored procedure or in Sybase Central.

   ♦ To use the ml_add_java_connection_script stored procedure, enter the following at a command prompt:

   ```
   call ml_add_java_connection_script(
     'MyVersion',
     'authenticate_user',
     'ianywhere.ml.authentication.ServerType.authenticate' )
   ```

   where *MyVersion* is the name of a script version, and *ServerType* is **LDAP**, **POP3**, or **IMAP**.

   ♦ To use the Add Connection Script wizard in Sybase Central, choose authenticate_user as the script type, and enter the following in the Code Editor:

   ```
   ianywhere.ml.authentication.ServerType.authenticate
   ```

   where *ServerType* is **LDAP**, **POP3**, or **IMAP**.

   See “ml_add_java_connection_script” [*MobiLink - Server Administration*].

2. Add properties for this authentication server.

   Use the ml_add_property stored procedure for each property you need to set:

   ```
   call ml_add_property(
     'ScriptVersion',
     'MyVersion',
     'property_name',
     'property_value' )
   ```

   where *MyVersion* is the name of a script version, *property_name* is determined by your authentication server, and *property_value* is a value appropriate to your application. Repeat this call for every property you want to set.

   See “External authenticator properties” on page 23 and “ml_add_property” [*MobiLink - Server Administration*].

If your MobiLink user names do not map directly to your user IDs

If your MobiLink user names are not equivalent to your user IDs, the code must be called indirectly and you must extract or map the user ID from the ml_user value. You do this by writing a Java class.

See “Writing Synchronization Scripts in Java” [*MobiLink - Server Administration*].

Following is a simple example. In this example, the code in the extractUserID method has been left out because it depends on how the ml_user value maps to a userid. All the work is done in the "authenticate" method of the authentication class.

```
package com.mycompany.mycode;

import ianywhere.ml.authentication.*;
import ianywhere.ml.script.*;
```



```
public class MLEvents
{
    private DBConnectionContext _context;
    private POP3 _pop3;

    public MLEvents( DBConnectionContext context )
    {
        _context = context;
        _pop3 = new POP3( context );
    }


    public void authenticateUser(
      InOutInteger status,
      String userID,
      String password,
      String newPassword )
    {
        String realUserID = extractUserID( userID );
        _pop3.authenticate( status, realUserID, password, newPassword );
    }

    private String extractUserID( String userID )
    {
        // code here to map ml_user to a "real" POP3 user
    }
}
```

In this example, The POP3 object needs to be initialized with the DBConnectContext object so that it can find its initialization properties. If you do not initialize it this way, you must set the properties in code. For example,

```
POP3 pop3 = new POP3();
pop3.setServerName( "smtp.sybase.com" );
pop3.setServerPort( 25 );
```

This applies to any of the authentication classes, although the properties vary by class.

External authenticator properties

MobiLink provides reasonable defaults wherever possible, especially in the LDAP case. The properties that can be set vary, but following are the basic ones.

POP3 authenticator

mail.pop3.host	the hostname of the server
mail.pop3.port	the port number (can be omitted if default 110 is used)

See http://java.sun.com/products/javamail/javadocs/com/sun/mail/pop3/package-summary.html.

IMAP authenticator

mail.imap.host	the hostname of the server

mail.imap.port	the port number (can be omitted if default 143 is used)

See http://java.sun.com/products/javamail/javadocs/com/sun/mail/imap/package-summary.html.

LDAP authenticator

java.naming.provider.url	the URL of the LDAP server, such as `ldap://ops-yourLocation/dn=sybase,dn=com`

For more information, see the JNDI documentation.

CHAPTER 3

MobiLink Client Utilities

Contents

Introduction to MobiLink client utilities

There are two MobiLink client utilities:

- "ActiveSync provider installation utility [mlasinst]" on page 27
- "MobiLink file transfer utility [mlfiletransfer]" on page 29

In addition, see:

- UltraLite utilities: "UltraLite Utilities Reference" [*UltraLite - Database Management and Reference*]
- MobiLink server utilities: "MobiLink Utilities" [*MobiLink - Server Administration*]
- Other SQL Anywhere utilities: "Database Administration Utilities" [*SQL Anywhere Server - Database Administration*]

ActiveSync provider installation utility [mlasinst]

Installs a MobiLink provider for ActiveSync, or registers and installs UltraLite applications on Windows CE devices.

Syntax

mlasinst [*options*] [[*src*] *dst name class* [*args*]]

Options	Description
-k *path*	Specify the location of the desktop provider *mlasdesk.dll*. By default the file is looked for in the *win32* subdirectory of your SQL Anywhere installation directory. End users (who generally do not have the full SQL Anywhere install) may need to specify -k when installing the MobiLink ActiveSync provider.
-n	Register the application but do not copy it to the device. In addition to installing the MobiLink ActiveSync provider, this option registers an application but do not copy it to the device. This is appropriate if the application includes more than one file (for example, if it is compiled to use the UltraLite runtime library DLL rather than a static library) or if you have an alternative method of copying the application to the device.
-u	Uninstall the MobiLink provider for ActiveSync. This option unregisters all applications that have been registered for use with the MobiLink ActiveSync provider and uninstall the MobiLink ActiveSync provider. No files are deleted from the desktop machine or the device by this operation. If the device is not connected to the desktop, an error is reported.
-v *path*	Specify the location of the device provider *mlasdev.dll*. By default the file is looked for in a platform-specific directory under the *CE* subdirectory of your SQL Anywhere directory. End users (who generally do not have the full SQL Anywhere install) may need to specify -v when installing the MobiLink ActiveSync provider.

Other parameters	Description
src	Specify the source file name and path for copying an application to the device. Supply this parameter only if you are registering an application and copying it to the device: do not supply the parameter if you use the -n option.
dst	Specify the destination file name and path on the device for an application.
name	Specify the application name. This is the name by which ActiveSync refers to the application.
class	Specify the registered Windows class name of the application.
args	Specify command line arguments to pass to the application when ActiveSync starts the application.

Remarks

This utility installs a MobiLink provider for ActiveSync. The provider includes both a component that runs on the desktop (*mlasdesk.dll*) and a component that is deployed to the Windows CE device (*mlasdev.dll*). The mlasinst utility makes a registry entry pointing to the current location of the desktop provider; and copies the device provider to the device.

If additional arguments are supplied, the *mlasinst* utility can also be used to register and install UltraLite applications onto a Windows CE device. Alternatively, you can register and install UltraLite applications using the ActiveSync software.

Subject to licensing requirements, you may supply this application together with the desktop and device components to end users so that they can prepare their copies of your application for use with ActiveSync.

You must be connected to a remote device to install the ActiveSync provider.

For complete instructions on using the ActiveSync provider installation utility, see:

- SQL Anywhere: "Installing the MobiLink provider for ActiveSync" on page 102
- UltraLite: "ActiveSync on Windows CE" on page 364

Examples

The following command installs the MobiLink provider for ActiveSync using default arguments. It does not register an application. The device must be connected to your desktop for the installation to succeed.

```
mlasinst
```

The following command uninstalls the MobiLink provider for ActiveSync. The device must be connected to your desktop for the uninstall to succeed:

```
mlasinst -u
```

The following command installs the MobiLink provider for ActiveSync, if it is not already installed, and registers the application *myapp.exe*. It also copies the *c:\My Files\myapp.exe* file to *\Program Files \myapp.exe* on the device. The -p -x arguments are command line options for myapp.exe when started by ActiveSync. The command must be entered on a single line:

```
mlasinst "C:\My Files\myapp.exe" "\Program Files\myapp.exe"
   "My Application" MYAPP -p -x
```

See also

- "Using ActiveSync synchronization" on page 101
- "UltraLite Synchronization Parameters and Network Protocol options" on page 369

MobiLink file transfer utility [mlfiletransfer]

Downloads a file through MobiLink.

Syntax

mlfiletransfer [*options*] [*transfer-file*]

Option	Description
-ap *param1*, ...	MobiLink authentication parameters. See "Authentication parameters" [*MobiLink - Server Administration*].
-dp *path*	The local path where the downloaded file is to be stored. By default, the downloaded file is stored in the root directory on Windows CE, and in the current directory on other platforms.
-df *filename*	The local name of the downloaded file. Use this option if you want to have a different name for the file on the client than is used on the server. By default, the server name is used.
-f	Forces a download, even the local file is up to date. Any previous partial download is discarded.
-g	Shows download progress.
-p *password*	The password for the MobiLink user name.
-r	Enables download resumption. When set, the utility will resume a partial previous download that was interrupted because of a communication error or because it was cancelled by the user. When the file on the server is newer than the partial file, the partial file is discarded. The -f option overrides this option.
-u *username*	MobiLink user name. This option is required.
-v *version*	The script version. This option is required.
-x *protocol***(***options***)**	The *protocol* can be one of **tcpip**, **tls**, **http**, or **https**.This option is required. The protocol-options you can use depend on the protocol. For a list of options for each protocol, see "MobiLink client network protocol options" on page 32.
transfer-file	The file to be transferred as named on the server. Do not include a path. The location of the file is determined by the mlsrv10 -ftr option (which must be used when you start the MobiLink server). MobiLink looks for the file in the username subdirectory of the -ftr directory; if it doesn't find it there, it looks in the -ftr directory. If the file is not in either place, MobiLink generates an error. See "-ftr option" [*MobiLink - Server Administration*].

Remarks

This utility is useful for downloading files when you first create a remote database, when you need to upgrade software on your remote device, and so on.

To use this utility, you must start the MobiLink server with the -ftr option. The -ftr option creates a root directory for the file to be transferred, and creates a subdirectory for every registered MobiLink user.

UltraLite users can also use the MLFileTransfer method in the UltraLite runtime. See "Using MobiLink file transfers" on page 354.

See also

- "-ftr option" [*MobiLink - Server Administration*]
- "authenticate_file_transfer connection event" [*MobiLink - Server Administration*]

CHAPTER 4

MobiLink Client Network Protocol Options

Contents

MobiLink client network protocol options

This section describes the network protocol options you can use when connecting a MobiLink client to the MobiLink server. Several MobiLink client utilities use the MobiLink client network protocol options:

To use client network protocol options with...	See...
dbmlsync	"CommunicationAddress (adr) extended option" on page 165
MobiLink file transfer utility	"MobiLink file transfer utility [mlfiletransfer]" on page 29
MobiLink Listener	-x in "Listener syntax" [*MobiLink - Server-Initiated Synchronization*]
MobiLink Monitor	"Starting the MobiLink Monitor" [*MobiLink - Server Administration*]
QAnywhere Agent	"-x option" [*QAnywhere*]
Redirector	ML directive in "Configuring Redirector properties (for Redirectors that support server groups)" [*MobiLink - Server Administration*] or "Configuring Redirector properties (for Redirectors that don't support server groups)" [*MobiLink - Server Administration*]
UltraLite	"Stream Parameters synchronization parameter" on page 387

The network protocol you choose must match the synchronization protocol used by the client. For information about how to set connection options for the MobiLink server, see "-x option" [*MobiLink - Server Administration*].

Protocol options

- **TCP/IP protocol options** If you specify the tcpip protocol, you can optionally specify the following protocol options:

TCP/IP protocol option	For more information, see...
buffer_size=*bytes*	"buffer_size" on page 37
client_port=*nnnnn*[*-mmmmm*]	"client_port" on page 43
compression={**zlib**|**none**}	"compression" on page 44
host=*hostname*	"host" on page 48
network_leave_open={**off**|**on**}	"network_leave_open" on page 53
network_name=*name*	"network_name" on page 54

TCP/IP protocol option	For more information, see...
port=*portnumber*	“port” on page 56
timeout=*seconds*	“timeout” on page 60
zlib_download_window_size=*window-bits*	“zlib_download_window_size” on page 68
zlib_upload_window_size=*window-bits*	“zlib_upload_window_size” on page 69

- **TLS protocol** If you specify the tls protocol, which is TCP/IP with TLS security, you can optionally specify the following protocol options:

TLS protocol option	For more information, see...
buffer_size=*bytes*	“buffer_size” on page 37
certificate_company=*company_name*	“certificate_company” on page 38
certificate_name=*name*	“certificate_name” on page 40
certificate_unit=*company_unit*	“certificate_unit” on page 42
client_port=*nnnnn*[*-mmmmm*]	“client_port” on page 43
compression={**zlib**|**none**}	“compression” on page 44
host=*hostname*	“host” on page 48
fips={**y**|**n**}	“fips” on page 46
network_leave_open={**off**|**on**}	“network_leave_open” on page 53
network_name=*name*	“network_name” on page 54
port=*portnumber*	“port” on page 56
timeout=*seconds*	“timeout” on page 60
tls_type={**rsa**|**ecc**}	“tls_type” on page 61
zlib_download_window_size=*window-bits*	“zlib_download_window_size” on page 68
zlib_upload_window_size=*window-bits*	“zlib_upload_window_size” on page 69

- **HTTP protocol** If you specify the http protocol, you can optionally specify the following protocol options:

HTTP protocol option	For more information, see...
buffer_size=*number*	“buffer_size” on page 37

HTTP protocol option	For more information, see...
client_port=*nnnnn*[**-***mmmmm*]	“client_port” on page 43
compression={**zlib**|**none**}	“compression” on page 44
custom_header=*header*	“custom_header” on page 45
http_password=*password*	“http_password” on page 49
http_proxy_password=*password*	“http_proxy_password” on page 50
http_proxy_userid=*userid*	“http_proxy_userid” on page 51
http_userid=*userid*	“http_userid” on page 52
host=*hostname*	“host” on page 48
network_leave_open={**off**|**on**}	“network_leave_open” on page 53
network_name=*name*	“network_name” on page 54
persistent={**off**|**on**}	“persistent” on page 55
port=*portnumber*	“port” on page 56
proxy_host=*proxy-hostname-or-ip*	“proxy_host” on page 57
proxy_port=*proxy-portnumbe*r	“proxy_port” on page 58
set_cookie=*cookie-name***=***cookie-value*	“set_cookie” on page 59
timeout=*seconds*	“timeout” on page 60
trusted_certificates=*filename*	“trusted_certificates” on page 63
url_suffix=*suffix*	“url_suffix” on page 65
version=*HTTP-version-number*	“version” on page 67
zlib_download_window_size=*window-bits*	“zlib_download_window_size” on page 68
zlib_upload_window_size=*window-bits*	“zlib_upload_window_size” on page 69

- **HTTPS protocol** The HTTPS protocol uses RSA encryption.

Separately licensed component required
ECC encryption and FIPS-certified encryption require a separate license. All strong encryption technologies are subject to export regulations.
See “Separately licensed components” [*SQL Anywhere 10 - Introduction*].

If you specify the HTTPS protocol, you can optionally specify the following protocol options:

HTTPS protocol option	For more information, see...
buffer_size=*number*	“buffer_size” on page 37
certificate_company=*company_name*	“certificate_company” on page 38
certificate_name=*name*	“certificate_name” on page 40
certificate_unit=*company_unit*	“certificate_unit” on page 42
client_port=*nnnnn*[**-***mmmmm*]	“client_port” on page 43
compression={**zlib**|**none**}	“compression” on page 44
custom_header=*header*	“custom_header” on page 45
fips={**y**|**n**}	“fips” on page 46
host=*hostname*	“host” on page 48
http_password=*password*	“http_password” on page 49
http_proxy_password=*password*	“http_proxy_password” on page 50
http_proxy_userid=*userid*	“http_proxy_userid” on page 51
http_userid=*userid*	“http_userid” on page 52
network_leave_open={**off**|**on**}	“network_leave_open” on page 53
network_name=*name*	“network_name” on page 54
persistent={**off**|**on**}	“persistent” on page 55
port=*portnumber*	“port” on page 56
proxy_host=*proxy-hostname-or-ip*	“proxy_host” on page 57
proxy_port=*proxy-portnumber*	“proxy_port” on page 58
set_cookie=*cookie-name***=***cookie-value*	“set_cookie” on page 59
timeout=*seconds*	“timeout” on page 60
tls_type={**rsa**|**ecc**}	“tls_type” on page 61
trusted_certificates=*filename*	“trusted_certificates” on page 63
url_suffix=*suffix*	“url_suffix” on page 65
version=*HTTP-version-number*	“version” on page 67
zlib_download_window_size=*window-size*	“zlib_download_window_size ” on page 68

HTTPS protocol option	For more information, see...
zlib_upload_window_size=*window-bits*	“zlib_upload_window_size ” on page 69

buffer_size

Specify the maximum number of bytes to buffer before writing to the network. For HTTP and HTTPS, this translates to the maximum HTTP request body size.

Syntax

buffer_size=*bytes*

Protocols

- TCPIP, TLS, HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.

Default

- CE, Palm, Symbian - 2K
- All other platforms - 16K

Remarks

In general for HTTP and HTTPS, the larger the buffer size, the fewer the number of HTTP request-response cycles, but the more memory required.

For TCPIP and TLS, it is also the case that a larger size performs faster but requires more memory; however, the performance difference is less significant than for HTTP.

Units are in bytes. Specify K for kilobytes.

The maximum value is 64K.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

certificate_company

If specified, the application only accepts server certificates when the Organization field on the certificate matches this value.

Separately licensed component required
ECC encryption and FIPS-certified encryption require a separate license. All strong encryption technologies are subject to export regulations.
See "Separately licensed components" [*SQL Anywhere 10 - Introduction*].

Syntax

certificate_company=*organization*

Protocols

- TLS, HTTPS

Default

None

Remarks

MobiLink clients trust all certificates signed by the certificate authority, so they may also trust certificates that the same certificate authority has issued to other companies. Without a means to discriminate, your clients might mistake a competitor's MobiLink server for your own and accidentally send it sensitive information. This option specifies a further level of verification, that the Organization field in the identity portion of the certificate also matches a value you specify.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

See also

- "Encrypting MobiLink client/server communications" [*SQL Anywhere Server - Database Administration*]
- "Verifying certificate fields" [*SQL Anywhere Server - Database Administration*]
- "-x option" [*MobiLink - Server Administration*]
- "trusted_certificates" on page 63
- "certificate_name" on page 40
- "certificate_unit" on page 42

Example

The following examples tell a SQL Anywhere client to check all three identity fields and to accept only the named values. This example verifies all three fields. You can instead choose to verify only one or two fields.

For example, if you have SQL Anywhere clients you can set up certificate verification in the subscription as follows:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
FOR 'user01'
TO test_pub
ADDRESS 'port=3333;
  trusted_certificates=certicom.crt;
  certificate_company=Sybase, Inc.;
  certificate_unit=iAnywhere;certificate_name=sample'
```

In an UltraLite application written in embedded SQL in C or C++, you can set up certificate verification as follows, assuming that the trusted certificate was installed in the database when the database was created:

```
ul_synch_info info;
info.stream = "tls";
info.stream_parms = UL_TEXT("port=9999;")
   UL_TEXT ( "certificate_company=Sybase, Inc.;" )
   UL_TEXT ( "certificate_unit=iAnywhere;" )
   UL_TEXT ( "certificate_name=sample;" );
. . .
ULSynchronize( &info );
```


certificate_name

If specified, the application only accepts server certificates when the Common Name field on the certificate matches this value.

Separately licensed component required
ECC encryption and FIPS-certified encryption require a separate license. All strong encryption technologies are subject to export regulations.
See "Separately licensed components" [*SQL Anywhere 10 - Introduction*].

Syntax

certificate_name=*common-name*

Protocols

- TLS, HTTPS

Default

None

Remarks

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

See also

- "Encrypting MobiLink client/server communications" [*SQL Anywhere Server - Database Administration*]
- "Verifying certificate fields" [*SQL Anywhere Server - Database Administration*]
- "-x option" [*MobiLink - Server Administration*]
- "trusted_certificates" on page 63
- "certificate_company" on page 38
- "certificate_unit" on page 42

Example

The following example sets up RSA encryption for an HTTPS protocol. This requires setup on the server and client. Each command must be written on one line.

On the server, the implementation is:

```
mlsrv10
   -c "dsn=SQL Anywhere 10 Demo;uid=DBA;pwd=sql"
   -x https(
     port=9999;
     certificate=c:\sa10\win32\rsaserver.crt;
     certificate_password=test)
```


On a SQL Anywhere client, the implementation is:

```
dbmlsync
   -c "dsn=mydb;uid=DBA;pwd=sql"
   -e "ctp=https;
       adr='port=9999;
         trusted_certificates=c:\sa10\win32\rsaroot.crt;
         certificate_name=RSA Server'"
```

On an UltraLite client, the implementation is:

```
info.stream = "https";
info.stream_parms = TEXT(
  "port=9999;
   trusted_certificates=\sa10\win32\rsaroot.crt;
   certificate_name=RSA Server");
```


certificate_unit

If specified, the application only accepts server certificates when the Organization Unit field on the certificate matches this value.

Separately licensed component required
ECC encryption and FIPS-certified encryption require a separate license. All strong encryption technologies are subject to export regulations.
See "Separately licensed components" [*SQL Anywhere 10 - Introduction*].

Syntax

certificate_unit=*organization-unit*

Protocols

- TLS, HTTPS

Default

None

Remarks

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

See also

- "Encrypting MobiLink client/server communications" [*SQL Anywhere Server - Database Administration*]
- "Verifying certificate fields" [*SQL Anywhere Server - Database Administration*]
- "-x option" [*MobiLink - Server Administration*]
- "trusted_certificates" on page 63
- "certificate_company" on page 38
- "certificate_name" on page 40

Example

For examples of security, see "certificate_name" on page 40 and "trusted_certificates" on page 63.

client_port

Specify a range of client ports for communication.

Syntax

client_port=*nnnnn*[**-***mmmmm*]

Protocols

- TCPIP, TLS, HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.

Default

None

Remarks

Specify a low value and a high value to create a range of possible port numbers. To restrict the client to a specific port number, specify the same number for *nnnnn* and *mmmmm*. If you specify only one value, the end of the range is 100 greater than the initial value, for a total of 101 ports.

The option can be useful for clients inside a firewall communicating with a MobiLink server outside the firewall.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

compression

Turns on or off compression of the synchronization stream between the MobiLink server and MobiLink clients.

Syntax

compression= { **zlib** | **none** }

Protocols

- TCPIP, TLS, HTTP, HTTPS

Support notes

- Not supported on Palm OS or Symbian.
- Cannot be used in the ML directive of the Redirector.

Default

For UltraLite, compression is off by default.

For dbmlsync, zlib compression is used by default.

> In SQL Anywhere clients, if you turn off compression the data is completely unobfuscated; if security is an issue, you should encrypt the stream.
> See "Transport-Layer Security" [*SQL Anywhere Server - Database Administration*].

Remarks

When you use zlib compression, you can configure the upload and download compression using the zlib_download_window_size option and zlib_upload_window_size option. Using these options, you can also turn off compression for either the upload or the download.

To use zlib compression in UltraLite, an application must call `ULEnableZlibSyncCompression ( sqlca )` and *mlczlib10.dll* must be deployed.

See also

- "zlib_download_window_size" on page 68
- "zlib_upload_window_size" on page 69

Example

The following option sets compression for upload only, and sets the upload window size to 9:

```
"compression=zlib;zlib_download_window_size=0;zlib_upload_window_size=9"
```


custom_header

Specify a custom HTTP header.

Syntax

custom_header=*header*

HTTP headers are of the form *header_name*: *header_value*.

Protocols

- HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.

Default

None

Remarks

When you specify custom HTTP headers, the client includes the headers with every HTTP request it sends. To specify more than one custom header, use custom_header multiple times.

Custom headers are useful when your synchronization client interacts with a third-party tool that requires custom headers.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

Example

Some HTTP proxies require all requests to contain special headers. The following example sets a custom HTTP header called MyProxyHdr to the value ProxyUser in an embedded SQL or C++ UltraLite application:

```
info.stream = "http";
info.stream_parms = TEXT(
  "host=www.myhost.com;proxy_host=www.myproxy.com;
  custom_header=MyProxyHdr:ProxyUser");
```


fips

Use FIPS-approved encryption implementations for communication encryption.

Separately licensed component required
ECC encryption and FIPS-certified encryption require a separate license. All strong encryption technologies are subject to export regulations.
See "Separately licensed components" [*SQL Anywhere 10 - Introduction*].

Syntax

fips={ **y** | **n** }

Protocols

HTTPS, TLS

Default

No

Remarks

FIPS is only supported for RSA encryption.

Non-FIPS clients can connect to FIPS servers and vice versa.

See also

- "tls_type" on page 61

Example

The following example sets up FIPS-approved RSA encryption for a TCP/IP protocol. This requires setup on the server and client. Each command must be written on one line.

On the server, the implementation is:

```
mlsrv10
  -c "dsn=SQL Anywhere 10 Demo;uid=DBA;pwd=sql"
  -x tls(
    port=9999;
    tls_type=rsa;
    fips=y;
    certificate=c:\sa10\win32\rsaserver.crt;
    certificate_password=test )
```

On a SQL Anywhere client, the implementation is:

```
dbmlsync -e
   "CommunicationType=tls;
    CommunicationAddress=
       'tls_type=rsa;
        fips=y;
        trusted_certificates=\rsaroot.crt;
        certificate_name=RSA Server'"
```


In an UltraLite application written in embedded SQL in C or C++, the implementation is:

```
info.stream = "tls";
info.stream_parms = TEXT(
  "tls_type=rsa;
   fips=y;
   trusted_certificates=\rsaroot.crt;
   certificate_name=RSA Server");
```

host

Specify the host name or IP number for the machine on which the MobiLink server is running, or, if you are synchronizing through a web server, the computer where the web server is running.

Syntax

host=*hostname-or-ip*

Protocols

- TCPIP, TLS, HTTP, HTTPS

Default

- Windows CE - the default value is the IP address of the desktop machine the device has an ActiveSync partnership with.
- All other devices - the default is **localhost**.

Remarks

On Windows CE, do not use localhost, which refers to the remote device itself. The default value allows a Windows CE device to connect to a MobiLink server on the desktop machine to which the Windows CE device has an ActiveSync partnership.

For the Palm Computing Platform, the default value of localhost refers to the device. You should supply an explicit host name or IP address to connect to a desktop machine.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

http_password

Authenticate to third-party HTTP servers and gateways using RFC 2617 Basic or Digest authentication.

Syntax

http_password=*password*

Protocols

- HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.

Default

None

Remarks

This feature supports Basic and Digest authentication as described in RFC 2617.

With Basic authentication, passwords are included in HTTP headers in clear text; however, you can use HTTPS to encrypt the headers and protect this password. With Digest authentication, headers are not sent in clear text but are hashed.

You must use http_userid with this option.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

See also

- "http_userid" on page 52
- "http_proxy_password" on page 50
- "http_proxy_userid" on page 51

Example

The following example of an embedded SQL or C++ UltraLite application provides a user ID and password for basic authentication to a web server.

```
synch_info.stream = "https";
synch_info.stream_parms = TEXT("http_userid=user;http_password=pwd");
```


http_proxy_password

Authenticate to third-party HTTP proxies using RFC 2617 Basic or Digest authentication.

Syntax

http_proxy_password=*password*

Protocols

- HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.

Default

None

Remarks

This feature supports Basic and Digest authentication as described in RFC 2617.

With Basic authentication, passwords are included in HTTP headers in clear text; you can use HTTPS, but the initial connection to the proxy is through HTTP, so this password is clear text. With Digest authentication, headers are not sent in clear text but are hashed.

You must use http_proxy_userid with this option.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

See also

- "http_password" on page 49
- "http_userid" on page 52
- "http_proxy_userid" on page 51

Example

The following example of an embedded SQL or C++ UltraLite application provides a user ID and password for basic authentication to a web proxy.

```
synch_info.stream = "https";
synch_info.stream_parms = TEXT
("http_proxy_userid=user;http_proxy_password=pwd");
```


http_proxy_userid

Authenticate to third-party HTTP proxies using RFC 2617 Basic or Digest authentication.

Syntax

http_proxy_userid=*userid*

Protocols

- HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.

Default

None

Remarks

This feature supports Basic and Digest authentication as described in RFC 2617.

With Basic authentication, passwords are included in HTTP headers in clear text; you can use HTTPS, but the initial connection to the proxy is through HTTP, so the password is clear text. With Digest authentication, headers are not sent in clear text but are hashed.

You must use http_proxy_password with this option.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

See also

- "http_password" on page 49
- "http_userid" on page 52
- "http_proxy_password" on page 50

Example

The following example of an embedded SQL or C++ UltraLite application provides a user ID and password for basic authentication to a web proxy.

```
synch_info.stream = "https";
synch_info.stream_parms = TEXT
("http_proxy_userid=user;http_proxy_password=pwd");
```


http_userid

Authenticate to third-party HTTP servers and gateways using RFC 2617 Basic or Digest authentication.

Syntax

http_userid=*userid*

Protocols

- HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.

Default

None

Remarks

This feature supports Basic and Digest authentication as described in RFC 2617.

With Basic authentication, passwords are included in HTTP headers in clear text; however, you can use HTTPS to encrypt the headers and protect the password. With Digest authentication, headers are not sent in clear text but are hashed.

You must use http_password with this option.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

See also

- "http_password" on page 49
- "http_proxy_password" on page 50
- "http_proxy_userid" on page 51

Example

The following example of an embedded SQL or C++ UltraLite application provides a user ID and password for basic authentication to a web server.

```
synch_info.stream = "https";
synch_info.stream_parms = TEXT("http_userid=user;http_password=pwd");
```


network_leave_open

When you specify network_name, you can optionally specify that the network connectivity should be left open after the synchronization finishes.

Syntax

network_leave_open={ **off** | **on** }

Protocols

- TCPIP, TLS, HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.

Default

On devices other than Palm, the default is **off**.

On the Palm, the default is **on**.

Remarks

You must specify network_name to use this option.

When this option is set to on, network connectivity is left open after the synchronization finishes.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

See also

- "network_name" on page 54

network_name

Specify the network name to start if an attempt to connect to the network fails.

Syntax

network_name=*name*

Protocols

- TCPIP, TLS, HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.

Default

None

Remarks

Specify the network name so that you can use the MobiLink auto-dial feature. This allows you to connect from a Windows CE device or Windows desktop computer without manually dialing. Auto-dial is a secondary attempt to connect to the MobiLink server; first, the client attempts to connect without dialing, and if that fails and a network_name is specified, auto-dial is activated. When used with scheduling, your remote can synchronize unattended. When used without scheduling, this allows you to run dbmlsync without manually dialing a connection.

On Windows CE, the *name* should be one of the network profiles from the dropdown list in Settings ► Connections ► Connections. To use whatever you have set as your default for the internet network or work network, set the name to the keyword **default_internet** or **default_work**, respectively.

On Windows desktop platforms, the *name* should be one of the network profiles from Network & Dialup Connections.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

See also

- "Scheduling synchronization" on page 105
- "network_leave_open" on page 53

persistent

Use a single TCP/IP connection for all HTTP requests in a synchronization.

Syntax

persistent={ **off** | **on** }

Protocols

- HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.

Default

Off

Remarks

On means that the client will attempt to use the same TCP/IP connection for all HTTP requests in a synchronization. A setting of off is usually more compatible with intermediate agents.

Except on Palm devices, you should only set persistent to on if you are connecting directly to MobiLink. If you are connecting through an intermediate agent such as a proxy or redirector, a persistent connection may cause problems.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

port

Specify the socket port number of the MobiLink server.

Syntax

port=*port-number*

Protocols

- TCPIP, TLS, HTTP, HTTPS

Default

For TCP/IP, the default is **2439**, which is the IANA-registered port number for the MobiLink server.

For HTTP, the default is **80**.

For HTTPS, the default is **443**.

Remarks

The port number must be a decimal number that matches the port the MobiLink server is set up to listen on.

If you are synchronizing through a web server, specify the web server port accepting HTTP or HTTPS requests.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

proxy_host

Specify the host name or IP address of the proxy server.

Syntax

proxy_host=*proxy-hostname-or-ip*

Protocols

- HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.

Default

None

Remarks

Use only if going through an HTTP proxy.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

proxy_port

Specify the port number of the proxy server.

Syntax

proxy_port=*proxy-port-number*

Protocols

- HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.

Default

None

Remarks

Use only if going through an HTTP proxy.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

set_cookie

Specify custom HTTP cookies to set in the HTTP requests used during synchronization.

Syntax

set_cookie=*cookie-name***=***cookie-value*,...

Protocols

- HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.

Default

None

Remarks

Custom HTTP cookies are useful when your synchronization client interacts with a third-party tool, such as an authentication tool, that uses cookies to identify sessions. For example, you have a system where a user agent connects to a web server, proxy, or gateway and authenticates itself. If successful, the agent receives one or more cookies from the server. The agent then starts a synchronization and hands over its session cookies through the set_cookie option.

If you have multiple name-value pairs, separate them with commas.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

Example

The following example sets a custom HTTP cookie in an embedded SQL or C++ UltraLite application.

```
info.stream = "http";
info.stream_parms = TEXT(
  "host=www.myhost.com;
  set_cookie=MySessionID=12345, enabled=yes;");
```


timeout

Specify the amount of time, in seconds, that the client waits for network operations to succeed before giving up.

Syntax

timeout=*seconds*

Protocols

- TCPIP, TLS, HTTP, HTTPS

Default

240 seconds

Support notes

- Cannot be used in the ML directive of the Redirector.

Remarks

If any connect, read, or write attempt to fails to complete within the specified time, the client fails the synchronization.

Throughout the synchronization, the client sends liveness updates within the specified interval to let the MobiLink server know that it is still alive, and MobiLink sends back liveness updates to let the client know that it is still alive.

You should be careful about setting the timeout to too low a value. Liveness checking increases network traffic because the MobiLink server and dbmlsync must communicate within each timeout period to ensure that the connection is still active. If the network or server load is very heavy and the timeout period is very short, it is possible that a live connection could be abandoned because the MobiLink server and dbmlsync were unable to confirm that the connection is still active. The liveness timeout should generally not be less than 30 seconds.

A value of 0 means that there is no timeout.

For information about how to set network protocol options with dbmlsync, see “CommunicationAddress (adr) extended option” on page 165.

For information about how to set network protocol options with UltraLite, see “Network protocol options for UltraLite synchronization streams” on page 394.

tls_type

Specify the encryption cipher to use for synchronization.

Separately licensed component required
ECC encryption and FIPS-certified encryption require a separate license. All strong encryption technologies are subject to export regulations.
See "Separately licensed components" [*SQL Anywhere 10 - Introduction*].

Syntax

tls_type=*cipher*

Protocols

- TLS, HTTPS

Default

RSA

Remarks

All communication for this synchronization is to be encrypted using the specified cipher. The cipher can be one of:

- **ecc** for elliptic-curve encryption.
- **rsa** for RSA encryption.

See also

- "Configuring MobiLink clients to use transport-layer security" [*SQL Anywhere Server - Database Administration*]
- "fips" on page 46
- "Encrypting MobiLink client/server communications" [*SQL Anywhere Server - Database Administration*]
- "-x option" [*MobiLink - Server Administration*]
- "certificate_company" on page 38
- "certificate_name" on page 40
- "certificate_unit" on page 42
- "trusted_certificates" on page 63

Example

The following example sets up RSA encryption for a TCP/IP protocol. This requires setup on the server and client. Each command must be written on one line.

On the server, the implementation is:

```
mlsrv10
  -c "dsn=SQL Anywhere 10 Demo;uid=DBA;pwd=sql"
  -x tls(
```



```
      port=9999;
      tls_type=rsa;
      certificate=c:\sa10\win32\rsaserver.crt;
      certificate_password=test )
```

On a SQL Anywhere client, the implementation is:

```
dbmlsync -e
   "CommunicationType=tls;
    CommunicationAddress=
      'tls_type=rsa;
       trusted_certificates=\rsaroot.crt;
       certificate_name=RSA Server'"
```

In an UltraLite application written in embedded SQL in C or C++, the implementation is:

```
       info.stream = "tls";
       info.stream_parms = TEXT(
        "tls_type=rsa;
         trusted_certificates=\rsaroot.crt;
         certificate_name=RSA Server");
```


trusted_certificates

Specify a file containing a list of trusted root certificates used for secure synchronization.

Separately licensed component required
ECC encryption and FIPS-certified encryption require a separate license. All strong encryption technologies are subject to export regulations.
See "Separately licensed components" [*SQL Anywhere 10 - Introduction*].

Syntax

trusted_certificates=*filename*

Syntax 2 (Palm OS)

trusted_certificates=vfs:[*volume-label***:**| *volume-ordinal***:**]*filename*

Protocols

- TLS, HTTPS

Default

None

Remarks

When synchronization occurs through a Certicom TLS synchronization stream, the MobiLink server sends its certificate to the client, as well as the certificate of the entity that signed it, and so on up to a self-signed root.

The client checks that the chain is valid and that it trusts the root certificate in the chain. This feature allows you to specify which root certificates to trust.

For UltraLite clients, trusted roots can be provided to ulinit, ulcreate, and ulload when creating the database. If the trusted_certificates parameter is provided, the trusted certificates found in the file replace those stored in the database.

For 32-bit Windows and Windows CE, if no trusted certificates are specified, the client loads the certificates from the operating system's trusted certificate store. This certificate store is used by web browsers when they connect to secure web servers via HTTPS.

Trusted certificates are supported for the Palm OS file system (not record-based data stores). On Palm OS, *volume-label* can be **INTERNAL** for the built-in drive, **CARD** for the expansion card, or the label name of the volume. Alternatively, you can use *volume-ordinal* to identify the volume (the default is 0, which is the first volume enumerated by the platform). The *filename* must be the full path to the file, following the filename and path naming conventions of the Palm platform.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

See also

- "Specifying file paths in an UltraLite connection parameter" [*UltraLite - Database Management and Reference*]
- "Encrypting MobiLink client/server communications" [*SQL Anywhere Server - Database Administration*]
- "-x option" [*MobiLink - Server Administration*]
- "tls_type" on page 61
- "certificate_company" on page 38
- "certificate_name" on page 40
- "certificate_unit" on page 42

Example

The following example sets up RSA encryption for an HTTPS protocol. This requires setup on the server and client. Each command must be written on one line.

The server implementation is:

```
mlsrv10
   -c "dsn=SQL Anywhere 10 Demo;uid=DBA;pwd=sql"
   -x https(
     port=9999;
     certificate=c:\sa10\win32\rsaserver.crt;
     certificate_password=test)
```

On a SQL Anywhere client, the implementation is:

```
dbmlsync
   -c "dsn=mydb;uid=DBA;pwd=sql"
   -e "ctp=https;
       adr='port=9999;
         trusted_certificates=c:\sa10\win32\rsaroot.crt;
         certificate_name=RSA Server'"
```

On an UltraLite client, the implementation is:

```
     info.stream = "https";
     info.stream_parms = TEXT(
       "port=9999;
        trusted_certificates=\rsaroot.crt;
        certificate_name=RSA Server");
     info.security_stream = NULL;
     info.security_parms = NULL;
```

On an UltraLite client running Palm OS, the stream and stream_parms can be set like this:

```
info.security_stream = "tls";
info.security_parms = "tls_type=rsa;trusted_certificates=vfs:/
rsaroot.crt;port=9376";
```


url_suffix

Specify the suffix to add to the URL on the first line of each HTTP request sent during synchronization.

Syntax

url_suffix=*suffix*

The syntax of *suffix* depends on the type of Redirector you are using:

Redirector	Syntax of *suffix*
ISAPI	*exe_dir*`/iaredirect.dll/ml/[`*server-groupI*`]` where *exe-dir* is the location of *iaredirect.dll*.
NSAPI	*mlredirect*`/ml/[`*server-groupI*`]` where *mlredirect* is a name mapped in your *obj.conf* file.
Apache	whatever you chose in the Redirector's <location> tag in the *httpd.conf* file.
Servlet	`iaredirect/ml/`
M-Business Anywhere	whatever you chose in the Redirector's <location> tag in the *sync.conf* file.

Protocols

- HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector, but is set on the client for the Redirector.

Default

The default is MobiLink.

Remarks

When synchronizing through a proxy or web server, the url_suffix may be necessary to find the MobiLink server.

Only some Redirectors support server groups. For details, see MobiLink Redirector Supported Web Servers.

For information about how to set this option when using the Redirector, see "Configuring MobiLink clients and servers for the Redirector" [*MobiLink - Server Administration*].

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

See also

- "Configuring MobiLink clients and servers for the Redirector" [*MobiLink - Server Administration*]
- "MobiLink server groups" [*MobiLink - Server Administration*]

Example

The following SQL statement creates a synchronization user called sales5322 that will synchronize over HTTPS. Assume that the MobiLink server runs behind the corporate firewall, and synchronization requests are redirected to it using the Redirector (a reverse proxy to an NSAPI web server). The MobiLink user will synchronize to the URL *https://www.mycompany.com:80/mlredirect/ml/*.

```
CREATE SYNCHRONIZATION USER sales5322
TYPE https
ADDRESS 'host=www.mycompany.com;port=80;url_suffix=mlredirect/ml/'
```

version

Specify the version of HTTP to use for synchronization.

Syntax

version=*HTTP-version-number*

Protocols

- HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.

Default

The default value is **1.1**.

Remarks

This option is useful if your HTTP infrastructure requires a specific version of HTTP. Values can be **1.0** or **1.1**.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

zlib_download_window_size

If you set the compression option to zlib, you can use this option to specify the compression window size for download.

Syntax

zlib_download_window_size=*window-bits*

Protocols

- TCPIP, TLS, HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.
- Not supported on Palm OS or Symbian.

Default

12 on Windows CE, otherwise 15

Remarks

To turn off compression for downloads, set *window-bits* to 0. Otherwise, the window size can be a value between 9 and 15 inclusive. In general, better compression rates can be achieved with a higher window size, but more memory is required.

window-bits is the base two logarithm of the window size (the size of the history buffer). The following formulas can be used to determine how much memory is used on the client for each *window-bits*:

upload (compress): memory = $2^{(\text{window-bits} + 3)}$

download (decompress): memory = $2^{(\text{window-bits})}$

To support zlib compression in UltraLite, an application must call `ULEnableZlibSyncCompression ( sqlca )` and *mlczlib10.dll* must be deployed.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

See also

- "compression" on page 44
- "zlib_upload_window_size" on page 69

Example

The following option sets compression for upload only:

```
"compression=zlib;zlib_download_window_size=0"
```


zlib_upload_window_size

If you set the compression option to zlib, you can use this option to specify the compression window size for upload.

Syntax

zlib_upload_window_size=*window-bits*

Protocols

- TCPIP, TLS, HTTP, HTTPS

Support notes

- Cannot be used in the ML directive of the Redirector.
- Not supported on Palm OS or Symbian.

Default

12 on Windows CE, otherwise 15

Remarks

To turn off compression for uploads, set the window size to 0. Otherwise, the window size can be a value between 9 and 15 inclusive. In general, better compression rates can be achieved with a higher window size, but more memory is required.

window-bits is the base two logarithm of the window size (the size of the history buffer). The following formulas can be used to determine how much memory is used on the client for each *window-bits*:

upload (compress): memory = $2^{(\text{window-size} + 3)}$

download (decompress): memory = $2^{(\text{window-size})}$

To support zlib compression in UltraLite, an application must call `ULEnableZlibSyncCompression ( sqlca )` and *mlczlib10.dll* must be deployed.

For information about how to set network protocol options with dbmlsync, see "CommunicationAddress (adr) extended option" on page 165.

For information about how to set network protocol options with UltraLite, see "Network protocol options for UltraLite synchronization streams" on page 394.

See also

- "compression" on page 44
- "zlib_download_window_size" on page 68

Example

The following option sets compression for download only:

```
"compression=zlib;zlib_upload_window_size=0"
```


CHAPTER 5

Schema Changes in Remote Clients

Contents

Introduction to MobiLink client schema changes

As your needs evolve, deployed remote databases may require schema changes. The most common schema changes are adding a new column to an existing table or adding a new table to the database.

Caution
Perform a successful synchronization just before changing schema. There should be no open transactions when you upgrade the schema.

Schema upgrades for SQL Anywhere remote databases

You can change the schema of remote SQL Anywhere databases after they are deployed.

If you can ensure that there are no other connections to the remote database, you can use the ALTER PUBLICATION statement manually to add new or altered tables to your publications. Otherwise, you must use the sp_hook_dbmlsync_schema_upgrade hook to upgrade your schema.
See "sp_hook_dbmlsync_schema_upgrade" on page 261.

♦ To add tables to SQL Anywhere remote databases

1. Add the associated table scripts in the consolidated database.

   The same script version may be used for the remote database without the new table and the remote database with the new table. However, if the presence of the new table changes how existing tables are synchronized, then you must create a new script version, and create new scripts for all tables being synchronized with the new script version.

2. Perform a normal synchronization. Ensure that the synchronization is successful before proceeding.

3. Use the ALTER PUBLICATION statement to add the table. For example,

   ```
   ALTER PUBLICATION your_pub
      ADD TABLE table_name
   ```

   You can use this statement inside a sp_hook_dbmlsync_schema_upgrade hook. See "sp_hook_dbmlsync_schema_upgrade" on page 261.

   For more information, see "ALTER PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*].

4. Synchronize. Use the new script version, if required.

Changing table definitions in remote databases

Changing the number or type of columns in an existing table must be done carefully. When a MobiLink client synchronizes with a new schema, it expects scripts, such as upload_update or download_cursor, which have parameters for all columns in the remote table. An older remote database expects scripts that have only the original columns.

♦ To alter a published table in a deployed SQL Anywhere remote database

1. At the consolidated database, create a new script version.

   For more information, see "Script versions" [*MobiLink - Server Administration*].

2. For your new script version, create scripts for all tables in the publication(s) that contain the table that you want to alter and that are synchronized with the old script version.

3. Perform a normal synchronization of the remote database using the old script version. Ensure that the synchronization is successful before proceeding.

4. At the remote database, use the ALTER PUBLICATION statement to temporarily drop the table from the publication. For example,

   ```
   ALTER PUBLICATION your_pub
     DROP TABLE table_name
   ```

   For more information, see "ALTER PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*].

   You can use this statement inside a sp_hook_dbmlsync_schema_upgrade hook. See "sp_hook_dbmlsync_schema_upgrade" on page 261.

5. At the remote database, use the ALTER TABLE statement to alter the table.

   For more information, see "ALTER TABLE statement" [*SQL Anywhere Server - SQL Reference*].

6. At the remote database, use the ALTER PUBLICATION statement to add the table back into the publication.

   For more information, see "ALTER PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*].

   You can use this statement inside a sp_hook_dbmlsync_schema_upgrade hook. See "sp_hook_dbmlsync_schema_upgrade" on page 261.

7. Synchronize with the new script version.

Schema upgrades for UltraLite remote databases

You can change the schema of a remote UltraLite database by having your existing application execute DDL.

- If you deploy a new application with a new database, you need to repopulate the UltraLite database by synchronizing with the MobiLink server.
- If you deploy a new application that contains DDL to upgrade the database, your data is preserved.
- If your existing application has a generic way to receive DDL statements, it can apply DDL to your database and your data is preserved.

It is usually impractical to have all users upgrade to the new version of the application at the same time. Therefore, you need to be able to have both versions co-existing in the field and synchronizing with a single consolidated database. You can create two or more versions of the synchronization scripts that are stored in the consolidated database and control the actions of the MobiLink server. Each version of your application can then select the appropriate set of synchronization scripts by specifying the correct version name when it initiates synchronization.

For information about UltraLite DDL, see "UltraLite SQL Statement Reference" [*UltraLite - Database Management and Reference*].

Part II. SQL Anywhere Clients

This part contains material that describes how to set up and run SQL Anywhere clients for MobiLink synchronization.

CHAPTER 6

SQL Anywhere Clients

Contents

Creating a remote database

Any SQL Anywhere database can be used as a remote database in a MobiLink system. All you need to do is create a publication, create a MobiLink user, register the user with the consolidated database, and subscribe the MobiLink user to the publication.

If you use the Create Synchronization Model wizard to create your MobiLink client application, these objects are created for you when you deploy the model. Even then, you should understand the concepts.

♦ **To use a SQL Anywhere database as a remote database**

1. Start with an existing SQL Anywhere database, or create a new one and add your tables.
2. Create one or more publications in the remote database.

   See "Publishing data" on page 84.
3. Create MobiLink users in the remote database.

   See "Creating MobiLink users in a SQL Anywhere remote database" on page 91.
4. Register users with the consolidated database.

   See "Adding MobiLink user names to the consolidated database" on page 10.
5. Subscribe MobiLink users to one or more of the publications.

   See "Creating synchronization subscriptions" on page 94.

Deploying remote databases

To deploy SQL Anywhere remote databases, you need to create the databases and add the appropriate publications and subscriptions. To do this, you can customize a prototype remote database.

When deploying a starter database to multiple locations, it is safest to deploy databases that have a NULL remote ID. If you have synchronized the databases to pre-populate them, you can set the remote ID back to NULL before deployment. This method ensures that the remote ID will be unique because the first time the remote database synchronizes, a unique remote ID is assigned. Alternatively, the remote ID can be set as a remote setup step, but it must be unique.

See "Setting remote IDs" on page 82.

♦ **To deploy MobiLink remote databases by customizing a prototype**

1. Create a prototype remote database.

   The prototype database should have all the tables and publications that are needed, but not the data that is specific to each database. This information typically includes the following:

   - The MobiLink user name.

- Synchronization subscriptions.
- The global_database_id option that provides the starting point for global autoincrement key values.

2. For each remote database, carry out the following operations:

   - Create a directory to hold the remote database.
   - Copy the prototype remote database into the directory.

     If the transaction log is held in the same directory as the remote database, the log file name does not need to be changed.
   - Run a SQL script that adds the individual information to the database.

     The SQL script can be a parameterized script. For information on parameterized scripts, see "PARAMETERS statement [Interactive SQL]" [*SQL Anywhere Server - SQL Reference*], and "Using SQL command files" [*SQL Anywhere Server - SQL Usage*].

When you use the Create Synchronization Model wizard to create your MobiLink client application, you can deploy your database using a wizard. See "Deploying models" [*MobiLink - Getting Started*].

See also

- "Deploying SQL Anywhere MobiLink clients" [*MobiLink - Server Administration*]
- "First synchronization always works" on page 83

Example

The following SQL script is taken from the Contact sample. It can be found in *samples-dir\MobiLink\Contact\customize.sql*. (For information about *samples-dir*, see "Samples directory" [*SQL Anywhere Server - Database Administration*].)

```
PARAMETERS ml_userid, db_id;
go
SET OPTION PUBLIC.global_database_id = {db_id}
go

CREATE SYNCHRONIZATION USER {ml_userid}
        TYPE 'TCPIP'
        ADDRESS 'host=localhost;port=2439'
        OPTION MEM=''
go
CREATE SYNCHRONIZATION SUBSCRIPTION TO "DBA"."Product"
        FOR {ml_userid}
go
CREATE SYNCHRONIZATION SUBSCRIPTION TO "DBA"."Contact"
        FOR {ml_userid}
go
commit work
go
```

The following command line executes the script for a remote database with data source dsn_remote_1:

```
dbisql -c "dsn=dsn_remote_1" read customize.sql [SSinger] [2]
```


Setting remote IDs

The remote ID uniquely identifies a remote database in a MobiLink synchronization system. When a SQL Anywhere database is created, the remote ID is NULL. When the database synchronizes with MobiLink, MobiLink checks for a NULL remote ID and if it finds one, it assigns a GUID as the remote ID. Once set, the database maintains the same remote ID unless it is manually changed.

If you are going to reference remote IDs in MobiLink event scripts or elsewhere, you may want to change the remote ID to a more meaningful name. To do this, you set the ml_remote_id database option for the remote database. The ml_remote_id option is a user-defined option that is stored in the SYSOPTION system table. You can change it using the SET OPTION statement or using the SQL Anywhere plug-in to Sybase Central.

The remote ID must be unique within your synchronization system.

For more information about changing database options, see:

- "SET OPTION statement" [*SQL Anywhere Server - SQL Reference*]
- "Setting database options" [*SQL Anywhere Server - SQL Usage*]
- "SYSOPTION system view" [*SQL Anywhere Server - SQL Reference*]

Caution
The safest time to change the remote ID is before the first synchronization. If you change it later, be sure you have performed a complete, successful synchronization just before changing the remote ID. Otherwise you may lose data and put your database into an inconsistent state.

See also

- "Remote IDs" on page 14

Example

The following SQL statement sets the remote ID to the value HR001:

```
SET OPTION PUBLIC.ml_remote_id = 'HR001'
```

Upgrading remote databases

If you install a new SQL Anywhere remote database over an older version, the synchronization progress information in the consolidated database is incorrect. You can correct this problem by setting the progress column of the ml_user table to 0 (zero) for this user.

For more information about the ml_user MobiLink system table, see "ml_user" [*MobiLink - Server Administration*].

For more information about upgrading, see "Upgrading SQL Anywhere MobiLink clients" [*SQL Anywhere 10 - Changes and Upgrading*].

Progress offsets

The progress offset is an integer value that indicates the point in time up to which all operations for the subscription have been uploaded and acknowledged. The dbmlsync utility uses the offset to decide what data to upload. On the remote database, the offset is stored in the progress column of the SYS.ISYSSYNC system table. On the consolidated database, the offset is stored in the progress column of the ml_subscription table.

For each remote, the remote and consolidated databases maintain an offset for every subscription. When a MobiLink user synchronizes, the offsets are confirmed for all subscriptions that are associated with the MobiLink user, even if they are not being synchronized at the time. This is required because more than one publication can contain the same data. The only exception is that dbmlsync does not check the progress offset of a subscription until it has attempted an upload.

If there is any disagreement between the remote and consolidated database offsets, the default behavior is to update the offsets on the remote with values from the consolidated and then send a new upload based on those offsets. In most cases, this default is appropriate. For example, it is generally appropriate when the consolidated database is restored from backup and the remote transaction log is intact, or when an upload is successful but communication failure prevented an upload acknowledgement from being sent.

Most progress offset mismatches are resolved automatically using the consolidated progress values. In the rare case that you must intervene to fix a problem with progress offsets, you can use the dbmlsync -r option.

For more information, see "-r option" on page 149.

First synchronization always works

The first time you attempt to synchronize a newly created subscription, the progress offsets for the subscription are not checked against those on the consolidated database. This feature allows a remote database to be recreated and synchronized without having to delete its state information, which is maintained in the consolidated database.

The dbmlsync utility detects a first synchronization when the columns in the remote database system table SYS.ISYSSYNC are as follows: the value for the **progress** column is the same as the value for the **created** column, and the value for the **log_sent** column is NULL.

However, when you synchronize two or more subscriptions in the same upload, and one of the subscriptions is not synchronizing for the first time, then progress offsets are checked for all subscriptions being synchronized, including the ones that are being synchronized for the first time. For example, if you specify the dbmlsync -n option with two publications (-n pub1,pub2), and pub1 has synchronized before but pub2 has not, then the progress offsets of both subscriptions are checked against the consolidated database values.

For more information, see:

- "ISYSSYNC system table" [*SQL Anywhere Server - SQL Reference*]
- "ml_subscription" [*MobiLink - Server Administration*]
- "Transaction log files" on page 98

Publishing data

A publication is a database object that identifies the data that is to be synchronized. A publication consists of one or more articles. Each article specifies a subset of a table that is to be synchronized. The subset may be the entire table or a subset of its rows and/or columns. Each article in a publication must refer to a different table.

You create publications using Sybase Central or with the CREATE PUBLICATION statement.

In Sybase Central, all publications and articles appear in the Publications folder.

Notes about publications

- DBA authority is required to create and drop publications.
- You cannot create two publications containing different column subsets of the same table.
- The publication determines which columns are selected, but it does not determine the order in which they are sent. Columns are always sent in the order in which they were defined in the CREATE TABLE statement.
- Each article must include all the columns in the primary key of the table that it references.
- An article can limit the columns of a table that are synchronized. Using a WHERE clause, it can also limit the rows.
- Views and stored procedures cannot be included in publications.
- Publications and subscriptions are also used by the Sybase message-based replication technology, SQL Remote. SQL Remote requires publications and subscriptions in both the consolidated and remote databases. In contrast, MobiLink publications appear only in SQL Anywhere remote databases. MobiLink consolidated databases are configured using synchronization scripts.

See also

- "CREATE PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*]

Publishing whole tables

The simplest publication you can make consists of a set of articles, each of which contains all the rows and columns in one table. These tables must already exist.

- **To publish one or more entire tables (Sybase Central Admin mode)**

1. Connect to the remote database as a user with DBA authority, using the SQL Anywhere plug-in.
2. Open the Publications folder.
3. From the File menu, choose New ► Publication.

   The Create Publication wizard appears.

4. Enter a name for the new publication. Click Next.
5. On the Tables tab, select a table from the list of Available Tables. Click Add. The table appears in the list of Selected Tables on the right.
6. Optionally, you may add additional tables. The order of the tables is not important.
7. Click Finish.

♦ **To publish one or more entire tables (SQL)**

1. Connect to the remote database as a user with DBA authority.
2. Execute a CREATE PUBLICATION statement that specifies the name of the new publication and the table you want to publish.

   See "CREATE PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*].

Example

The following statement creates a publication that publishes the whole customer table:

```
CREATE PUBLICATION pub_customer (
    TABLE customer
)
```

The following statement creates a publication including all columns and rows in each of a set of tables from the SQL Anywhere sample database:

```
CREATE PUBLICATION sales (
    TABLE customer,
    TABLE sales_order,
    TABLE sales_order_items,
    TABLE product
)
```

Publishing only some columns in a table

You can create a publication that contains all the rows but only some of the columns of a table from Sybase Central or by listing the columns in the CREATE PUBLICATION statement.

Note

- If you create two publications that include the same table with different column subsets, then any user who subscribes to both publications will be unable to synchronize.
- An article must include all the primary key columns in the table.

♦ **To publish only some columns in a table (Sybase Central Admin mode)**

1. Connect to the remote database as a user with DBA authority using the SQL Anywhere plug-in.
2. Open the Publications folder.

3. From the File menu, choose New ► Publication.

   The Create Publication wizard appears.

4. Enter a name for the new publication. Click Next.

5. On the Tables tab, select a table from the list of Available Tables. Click Add. The table is added to the list of Selected Tables on the right.

6. On the Columns tab, double-click the table's icon to expand the list of Available Columns. Select each column you want to publish and click Add. The selected columns appear on the right.

7. Click Finish.

♦ To publish only some columns in a table (SQL)

1. Connect to the remote database as a user with DBA authority.

2. Execute a CREATE PUBLICATION statement that specifies the publication name and the table name. List the published columns in parenthesis following the table name.

   See "CREATE PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*].

Example

The following statement creates a publication that publishes all rows of the id, company_name, and city columns of the customer table:

```
CREATE PUBLICATION pub_customer (
    TABLE customer (id, company_name,
        city )
)
```

Publishing only some rows in a table

When no WHERE clause is specified in a publication definition, all changed rows in the publication are uploaded. You can add WHERE clauses to articles in the publication to limit the rows to be uploaded to those that have changed and that satisfy the search condition in the WHERE clause.

The search condition in the WHERE clause can only reference columns that are included in the article. In addition, you cannot use any of the following in the WHERE clause:

- subqueries
- variables
- non-deterministic functions

These conditions are not enforced, but breaking them can lead to unexpected results. Any errors relating to the WHERE clause are generated when the DML is run against the table referred to by the WHERE clause, and not when the publication is defined.

♦ **To create a publication using a WHERE clause (Sybase Central Admin mode)**

1. Connect to the remote database as a user with DBA authority using the SQL Anywhere plug-in.
2. Open the Publications folder.
3. From the File menu, choose New ► Publication.

   The Create Publication wizard appears.
4. Enter a name for the new publication. Click Next.
5. On the Tables tab, select a table from the list of Available Tables. Click Add. The table is added to the list of Selected Tables on the right.
6. On the WHERE Clauses tab, select the table and enter the search condition in the lower box. Optionally, you can use the Insert dialog to assist you in formatting the search condition.
7. Click Finish.

♦ **To create a publication using a WHERE clause (SQL)**

1. Connect to the remote database as a user with DBA authority.
2. Execute a CREATE PUBLICATION statement that includes the tables you want to include in the publication and a WHERE condition.

   See "CREATE PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*].

Example

The following example creates a single-article publication that includes all sales order information for sales rep number 856.

```
CREATE PUBLICATION pub_orders_samuel_singer
 ( TABLE SalesOrders
     WHERE SalesRepresentative = 856 )
```

Download-only publications

You can create a publication that only downloads data to remote databases, and never uploads data. Download-only publications do not use a transaction log on the client.

Differences between download-only methods

There are two ways to specify that only a download (and not an upload) should occur:

♦ **Download-only synchronization** Use the dbmlsync options -e DownloadOnly or -ds.

♦ **Download-only publication** Create the publication with the FOR DOWNLOAD ONLY keyword.

The two approaches are quite different:

Download-only synchronizations	Download-only publications
If the download attempts to change rows that have been modified on the remote database and not yet uploaded, the download fails.	The download can overwrite rows that have been modified on the remote database and not yet uploaded.
Uses a normal publication that can be uploaded and/or downloaded. Download-only synchronization is specified using dbmlsync command line options or extended options.	Uses a download-only publication. All synchronizations on these publications are download-only. You cannot alter a normal publication to make it download-only.
Requires a log file.	Does not require a log file.
The log file is not truncated when these subscriptions are not uploaded for a long time, and can consume significant amounts of storage.	If there is a log file, the synchronization does not affect the synchronization truncation point. This means that the log file can still be truncated even if the publication is not synchronized for a long time. Download-only publications do not affect log file truncation.
You need to do an upload occasionally to reduce the amount of log that is scanned by the download-only synchronization. Otherwise, the download-only synchronization will take an increasingly long time to complete.	There is no need to ever do an upload.

See also

- "CREATE PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*]
- "Upload-only and download-only synchronizations" [*MobiLink - Server Administration*]

Altering existing publications

After you have created a publication, you can alter it by adding, modifying, or deleting articles, or by renaming the publication. If an article is modified, the entire specification of the modified article must be entered.

You can perform these tasks using Sybase Central or with the ALTER PUBLICATION statement.

Notes

- Publications can be altered only by the DBA or the publication's owner.
- Be careful. In a running MobiLink setup, altering publications may cause errors and can lead to loss of data. If the publication you are altering has any subscriptions, then you must treat this change as a schema upgrade. See "Schema Changes in Remote Clients" on page 71.

♦ To modify the properties of existing publications or articles (Sybase Central Admin mode)

1. Connect to the remote database as a user who owns the publication or as a user with DBA authority.
2. In the left pane, click the publication or article. The properties appears in the right pane.

3. Configure the desired properties.

♦ To add articles (Sybase Central Admin mode)

1. Connect to the remote database as a user who owns the publication or as a user with DBA authority using the SQL Anywhere plug-in.
2. Open the Publications folder.
3. Select a publication.
4. From the File menu, choose New ► Article. The Create a New Article wizard appears.
5. In the Create Article wizard, do the following:
   - ♦ On the first page, select a table.
   - ♦ On the next page, select the number of columns.
   - ♦ On the final page, enter a WHERE clause (if desired).
6. Click Finish to create the article.

♦ To remove articles (Sybase Central Admin mode)

1. Connect to the database as a user who owns the publication or as a user with DBA authority using the SQL Anywhere plug-in.
2. Open the Publications folder.
3. Click the publication.
4. In the right pane, right-click the article you want to delete and choose Delete from the popup menu.

♦ To modify an existing publication (SQL)

1. Connect to the remote database as a user who owns the publication or as a user with DBA authority.
2. Connect to the database as a DBA user.
3. Execute an ALTER PUBLICATION statement.

   See "ALTER PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*].

Example

♦ The following statement adds the customer table to the pub_contact publication.

```
ALTER PUBLICATION pub_contact (
    ADD TABLE customer
)
```

See also the "ALTER PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*].

Dropping publications

You can drop a publication using either Sybase Central or the DROP PUBLICATION statement. Before dropping the publication, you must drop all subscriptions connected to it.

You must have DBA authority to drop a publication.

♦ To delete a publication (Sybase Central Admin mode)

1. Connect to the remote database as a user with DBA authority using the SQL Anywhere plug-in.
2. Open the Publications folder.
3. Right-click the desired publications and choose Delete from the popup menu.

♦ To delete a publication (SQL)

1. Connect to the remote database as a user with DBA authority.
2. Execute a DROP PUBLICATION statement.

   See "DROP PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*].

Example

The following statement drops the publication named pub_orders.

```
DROP PUBLICATION pub_orders
```


Creating MobiLink users in a SQL Anywhere remote database

A MobiLink user name is used to authenticate when you connect to the MobiLink server. You must create MobiLink users in the remote database, and then register them on the consolidated database.

MobiLink users are not the same as database users. You can create a MobiLink user name that matches the name of a database user, but neither MobiLink nor SQL Anywhere is affected by this coincidence.

♦ To add a MobiLink user to a remote database (Sybase Central Admin mode)

1. Connect to the database from the SQL Anywhere plug-in as a user with DBA authority.
2. Click the MobiLink Users folder.
3. From the File menu, choose New ► MobiLink User.

   The Create User wizard appears.
4. Enter a name for the MobiLink user.
5. Click Finish.

♦ To add a MobiLink user to a remote database (SQL)

1. Connect to the database as a user with DBA authority.
2. Execute a CREATE SYNCHRONIZATION USER statement. The MobiLink user name uniquely identifies a remote database and so must be unique within your synchronization system.

   The following example adds a MobiLink user named SSinger:

   ```
   CREATE SYNCHRONIZATION USER SSinger
   ```

   You can specify properties for the MobiLink user as part of the CREATE SYNCHRONIZATION USER statement, or you can specify them separately with an ALTER SYNCHRONIZATION USER statement.

   For more information, see “CREATE SYNCHRONIZATION USER statement [MobiLink]” [*SQL Anywhere Server - SQL Reference*].

   For information about setting MobiLink user properties, including the password, see “Storing extended options for MobiLink users” on page 92.

For information about registering MobiLink users, see “Adding MobiLink user names to the consolidated database” on page 10.

Storing extended options for MobiLink users

You can specify options for each MobiLink user in the remote database by using extended options. Extended options can be specified on the command line, stored in the database, or specified with the sp_hook_dbmlsync_set_extended_options event hook.

For a list of extended options, see "MobiLink SQL Anywhere Client Extended Options" on page 161.

♦ To store MobiLink extended options in the database (Sybase Central Admin mode)

1. Connect to the database from the SQL Anywhere plug-in as a user with DBA authority.
2. Open the MobiLink Users folder.
3. Right-click the MobiLink user name and choose Properties from the popup menu.
4. Change the properties as needed.

♦ To store MobiLink extended options in the database (SQL)

1. Connect to the database as a user with DBA authority.
2. Execute an ALTER SYNCHRONIZATION USER statement.

   The following example changes the extended options for MobiLink user named SSinger to their default values:

   ```
   ALTER SYNCHRONIZATION USER SSinger
   DELETE ALL OPTION
   ```

   For more information, see "ALTER SYNCHRONIZATION USER statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*].

   You can also specify properties when you create the MobiLink user name.

   For more information, see "CREATE SYNCHRONIZATION USER statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*].

♦ To specify MobiLink user properties with a client event hook

- You can programmatically customize the behavior of an upcoming synchronization.

  For more information, see "sp_hook_dbmlsync_set_extended_options" on page 263.

See also

- "Using dbmlsync extended options" on page 97

Dropping MobiLink users

You must drop all subscriptions for a MobiLink user before you drop the user from a remote database.

♦ To drop a MobiLink user from a remote database (Sybase Central Admin mode)

1. Connect to the database from the SQL Anywhere plug-in as a user with DBA authority.
2. Locate the MobiLink user in the MobiLink Users folder.
3. Right click the MobiLink user and choose Delete from the popup menu.

♦ To drop a MobiLink user from a remote database (SQL)

1. Connect to the database as a user with DBA authority.
2. Execute a DROP SYNCHRONIZATION USER statement.

   The following example removes the MobiLink user named SSinger from the database:

   ```
   DROP SYNCHRONIZATION USER SSinger
   ```

   For more information, see "DROP SYNCHRONIZATION USER statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*].

Creating synchronization subscriptions

After creating MobiLink users and publications, you must subscribe at least one MobiLink user to one or more pre-existing publications. You do this by creating synchronization subscriptions.

For information about creating publications, see "Publishing data" on page 84. For information about creating MobiLink users, see "Creating MobiLink users in a SQL Anywhere remote database" on page 91.

Note
You must ensure that all subscriptions for a MobiLink user are synchronized to only one consolidated database. Otherwise, you may experience data loss and unpredictable behavior.

A synchronization subscription links a particular MobiLink user with a publication. It can also carry other information needed for synchronization. For example, you can specify the address of the MobiLink server and any desired options for a synchronization subscription. Values for a specific synchronization subscription override those set for MobiLink users.

Synchronization subscriptions are required only in MobiLink SQL Anywhere remote databases. Server logic is implemented through synchronization scripts, stored in the MobiLink system tables in the consolidated database.

A single SQL Anywhere database can synchronize with more than one MobiLink server. To allow synchronization with multiple servers, create different MobiLink users for each server.

See "CREATE SYNCHRONIZATION SUBSCRIPTION statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*].

Example

To synchronize the customer and sales_order tables in the SQL Anywhere sample database, you could use the following statements.

1. First, publish the customer and sales_order tables. Give the publication the name testpub.

```
CREATE PUBLICATION testpub
    (TABLE customer, TABLE sales_order)
```

2. Next, create a MobiLink user. In this case, the MobiLink user is demo_ml_user.

```
CREATE SYNCHRONIZATION USER demo_ml_user
```

3. To complete the process, create a subscription that links the user and the publication.

```
CREATE SYNCHRONIZATION SUBSCRIPTION TO testpub
    FOR demo_ml_user
    TYPE tcpip
    ADDRESS 'host=localhost;port=2439;'
    OPTION sv='version1'
```

Altering MobiLink subscriptions

Synchronization subscriptions can be altered using Sybase Central or the ALTER SYNCHRONIZATION SUBSCRIPTION statement. The syntax is similar to that of the CREATE SYNCHRONIZATION SUBSCRIPTION statement, but provides an extension to more conveniently add, modify, and delete options.

♦ To alter a synchronization subscription (Sybase Central Admin mode)

1. Connect to the database as a user with DBA authority.
2. Open the MobiLink Users folder.
3. Click the desired user. The properties appear in the right pane.
4. In the right pane, click the Synchronization Subscriptions tab. Right-click the subscription you want to change and select Properties from the popup menu.
5. Change the properties as needed

♦ To alter a synchronization subscription (SQL)

1. Connect to the database as a user with DBA authority.
2. Execute an ALTER SYNCHRONIZATION SUBSCRIPTION statement.

See "ALTER SYNCHRONIZATION USER statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*].

Dropping MobiLink subscriptions

You can delete a synchronization subscription using either Sybase Central or the DROP SYNCHRONIZATION SUBSCRIPTION statement.

You must have DBA authority to drop a synchronization subscription.

♦ To delete a synchronization subscription (Sybase Central Admin mode)

1. Connect to the database as a user with DBA authority.
2. Open the MobiLink Users folder.
3. Select a MobiLink user.
4. Right-click the desired subscription and choose Delete from the popup menu.

♦ To delete a synchronization subscription (SQL)

1. Connect to the database as a user with DBA authority.
2. Execute a DROP SYNCHRONIZATION SUBSCRIPTION statement.

Example

The following statement drops the synchronization subscription of MobiLink user jsmith to a publication named pub_orders.

```
DROP SYNCHRONIZATION SUBSCRIPTION
FOR jsmith TO pub_orders
```

See "DROP SYNCHRONIZATION SUBSCRIPTION statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*].

Initiating synchronization

The client always initiates MobiLink synchronization. In the case of a SQL Anywhere client, synchronization is initiated by running the dbmlsync utility. This utility connects to and synchronizes a SQL Anywhere remote database.

You can specify connection parameters on the dbmlsync command line using the -c option. These parameters are for the remote database. If you do not specify connection parameters, a connection dialog appears, asking you to supply the missing connection parameters and startup options.

See "-c option" on page 122.

Client network protocol options can be stored in the synchronization subscription, publication or user in the remote database; or can be specified on the dbmlsync command line. These are used to locate the appropriate MobiLink server.

See "CommunicationAddress (adr) extended option" on page 165.

Permissions for dbmlsync

When dbmlsync connects to a database, it must have permissions to apply all the changes being made. The dbmlsync command line contains the password for this connection. This could present a security issue.

To avoid security problems, grant a user (other than DBA) REMOTE DBA authority, and use this user ID in the dbmlsync connection string. A user ID with REMOTE DBA authority has DBA authority only when the connection is made from the dbmlsync utility. Any other connection using the same user ID is granted no special authority.

See "GRANT REMOTE DBA statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*].

Using dbmlsync extended options

MobiLink provides a number of extended options to customize the synchronization process. Extended options can be set for publications, users, and subscriptions. In addition, extended option values can be overridden using options on the dbmlsync command line.

For a complete list of extended options, see "MobiLink SQL Anywhere Client Extended Options" on page 161.

♦ **To override an extended option on the dbmlsync command line**

- Supply the extended option values in the -e or -eu dbmlsync options for dbmlsync, in the form *option-name*=*value*. For example:

```
dbmlsync -e "v=on;sc=low"
```


♦ **To set an extended option for a subscription, publication or user**

- Add the option to the CREATE SYNCHRONIZATION SUBSCRIPTION statement or CREATE SYNCHRONIZATION USER statement in the SQL Anywhere remote database.

  Adding an extended option for a publication is a little different. To add an extended option for a publication, use the ALTER/CREATE SYNCHRONIZATION SUBSCRIPTION statement and omit the FOR clause.

Example

The following statement creates a synchronization subscription that uses extended options to set the cache size for preparing the upload to 3 MB and the upload increment size to 3 KB.

```
CREATE SYNCHRONIZATION SUBSCRIPTION TO my_pub
FOR ml_user
ADDRESS 'host=test.internal;port=2439;'
OPTION memory='3m',increment='3k'
```

Note that the option values can be enclosed in single quotes, but the option names must remain unquoted.

Dbmlsync network protocol options

Dbmlsync connection information includes the protocol to use for communications with the server, the address for the MobiLink server, and other connection parameters.

For more information, see:

- "CommunicationType (ctp) extended option" on page 167
- "CommunicationAddress (adr) extended option" on page 165

Transaction log files

In most cases, dbmlsync determines what to upload by using the SQL Anywhere transaction log. The offset indicates the point to which all operations for a subscription have been uploaded and acknowledged.

SQL Anywhere databases maintain transaction logs by default. You can determine where the transaction log is located, or whether to have one, when you create the database.

The transaction log may not be required if you implement scripted upload or only use download-only publications.

To prepare the upload, the dbmlsync utility requires access to all transaction logs written since the last successful synchronization of all subscriptions for the MobiLink user who is synchronizing. However, SQL Anywhere log files are typically truncated and renamed as part of regular database maintenance. In such a case, old log files must be renamed and saved in a separate directory until all changes they describe have been synchronized successfully.

You can specify the directory that contains the renamed log files on the dbmlsync command line. You may omit this parameter if the working log file has not been truncated and renamed since you last synchronized, or if you run dbmlsync from the directory that contains the renamed log files.

See also

- "Backup and Data Recovery" [*SQL Anywhere Server - Database Administration*]
- "Progress offsets" on page 83
- "The transaction log" [*SQL Anywhere Server - Database Administration*]
- "Initialization utility (dbinit)" [*SQL Anywhere Server - Database Administration*]
- "Scripted Upload" on page 313

Example

Suppose that the old log files are stored in the directory *c:\oldlogs*. You could use the following command to synchronize the remote database.

```
dbmlsync –c "dbn=remote;uid=syncuser" c:\oldlogs
```

The path to the old logs directory must be the final argument on the command line.

Concurrency during synchronization

To ensure the integrity of synchronizations, dbmlsync must ensure that no rows in the download are modified between the time the upload is built and the time the download is applied.

On all platforms except Windows CE, by default, dbmlsync obtains a shared lock on all tables mentioned in any publication being synchronized. On Windows CE, by default, dbmlsync obtains an exclusive lock. Dbmlsync obtains the lock before it begins building the upload, and it maintains the lock until the download is applied.

For more information about locks, see "Row locks" [*SQL Anywhere Server - SQL Usage*].

The following options let you customize this locking behavior:

- -d option
- LockTables option

-d option

When using the locking mechanism, if other connections to the database exist and if these connections have any locks on the synchronization tables, then synchronization will fail. If you want to ensure that synchronization proceeds immediately even if other locks exist, use the dbmlsync -d option. When this option is specified, any connections with locks that would interfere with synchronization are dropped by the database so that synchronization can proceed. Uncommitted changes on the dropped connections are rolled back.

For more information, see "-d option" on page 123.

LockTables option

An alternative way to protect data integrity is to set the extended option LockTables to OFF, which prevents an article's tables from being locked. This causes dbmlsync to track all rows that are modified after the upload has been built. When the download is received, it is not applied if any rows in the download have been modified. Dbmlsync will then retry the synchronization. The retry will succeed unless a new download conflict is detected.

For more information, see "LockTables (lt) extended option" on page 181.

If a conflict is detected, the download phase is cancelled and the download operations rolled back to avoid overwriting the new change. The dbmlsync utility then retries the synchronization, including the upload step. This time, because the row is present at the beginning of the synchronization process, it is included in the upload and therefore not lost.

By default, dbmlsync will retry synchronization until success is achieved. You can limit the number of retries using the extended option ConflictRetries. Setting ConflictRetries to -1 causes dbmlsync to retry until success is achieved. Setting it to a non-negative integer causes dbmlsync to retry for not more than the specified number of times.

For more information, see "ConflictRetries (cr) extended option" on page 168.

Initiating synchronization from an application

You may want to include the features of dbmlsync in your application, rather than provide a separate executable to your remote users.

There are two ways to do this:

- Use the Dbmlsync Integration Component.

  For more information, see "Dbmlsync Integration Component" on page 277.

- If you are developing in any language that can call a DLL, then you can access dbmlsync through the DBTools interface. If you are programming in C or C++, you can include the *dbtools.h* header file, located in the *h* subdirectory of your SQL Anywhere installation directory. This file contains a description of the a_sync_db structure and the DBSynchronizeLog function, which you use to add this functionality to your application. This solution works on all supported platforms, including Windows and Unix.

  For more information, see:

  - "DBTools Interface for dbmlsync" on page 305
  - "DBSynchronizeLog function" [*SQL Anywhere Server - Programming*]
  - "a_sync_db structure" [*SQL Anywhere Server - Programming*]

Using ActiveSync synchronization

ActiveSync is synchronization software for Microsoft Windows CE handheld devices. ActiveSync governs synchronization between a Windows CE device and a desktop computer. A MobiLink provider for ActiveSync governs synchronization to the MobiLink server.

Setting up ActiveSync synchronization for SQL Anywhere clients involves the following steps:

- Configure the SQL Anywhere remote database for ActiveSync synchronization.

  See "Configuring SQL Anywhere remote databases for ActiveSync" on page 101.

- Install the MobiLink provider for ActiveSync.

  See "Installing the MobiLink provider for ActiveSync" on page 102.

- Register the SQL Anywhere client for use with ActiveSync.

  See "Registering SQL Anywhere clients for ActiveSync" on page 103.

If you use ActiveSync synchronization, synchronization must be initiated from the ActiveSync software. The MobiLink provider for ActiveSync can start dbmlsync or it can wake a dbmlsync that is sleeping as scheduled by a schedule string.

You can also put dbmlsync into a sleep mode using a delay hook in the remote database, but the MobiLink provider for ActiveSync cannot invoke synchronization from this state.

For information about scheduling synchronization, see "Scheduling synchronization" on page 105.

Configuring SQL Anywhere remote databases for ActiveSync

♦ To configure your SQL Anywhere remote database for ActiveSync

1. Select a synchronization type (TCP/IP, TLS, HTTP, or HTTPS).

   The synchronization type can be set for a synchronization publication, for a synchronization user, or for a synchronization subscription. It is set in a similar manner for each. Here is part of a typical CREATE SYNCHRONIZATION USER statement:

   ```
   CREATE SYNCHRONIZATION USER SSinger
   TYPE tcpip
   ...
   ```

2. Supply an address clause to specify communication between the MobiLink provider for ActiveSync and the MobiLink server.

   For HTTP or TCP/IP synchronization, the ADDRESS clause of the CREATE SYNCHRONIZATION USER or CREATE SYNCHRONIZATION SUBSCRIPTION statement specifies communication between the MobiLink client and server. For ActiveSync, the communication takes place in two stages: from the dbmlsync utility on the device to the MobiLink provider for ActiveSync on the desktop

machine, and from desktop machine to the MobiLink server. The ADDRESS clause specifies the communication between MobiLink provider for ActiveSync and the MobiLink server.

The following statement specifies TCP/IP communication to a MobiLink server on a machine named kangaroo:

```
CREATE SYNCHRONIZATION USER SSinger
TYPE tcpip
ADDRESS 'host=kangaroo;port=2439'
```

For more information, see "CREATE SYNCHRONIZATION USER statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*].

Installing the MobiLink provider for ActiveSync

Before you register your SQL Anywhere MobiLink client for use with ActiveSync, you must install the MobiLink provider for ActiveSync using the installation utility (*mlasinst.exe*).

The SQL Anywhere for Windows CE installer installs the MobiLink provider for ActiveSync. If you install SQL Anywhere for Windows CE you do not need to carry out the steps in this section.

When you have installed the MobiLink provider for ActiveSync you must register each application separately. For instructions, see "Registering SQL Anywhere clients for ActiveSync" on page 103.

♦ To install the MobiLink provider for ActiveSync

1. Ensure that you have the ActiveSync software on your machine, and that the Windows CE device is connected.
2. Enter the following command to install the MobiLink provider:

   ```
   dbasinst -k desk-path -v dev-path
   ```

   where *desk-path* is the location of the desktop component of the provider (*mlasdesk.dll*) and *dev-path* is the location of the device component (*mlasdev.dll*).

   If you have SQL Anywhere installed on your computer, *mlasdesk.dll* is in the *win32* or *win64* subdirectory of your SQL Anywhere installation directory and *mlasdev.dll* is in a platform-specific directory in the *CE* subdirectory. If you omit -v or -k, these directories are searched by default.

   If you receive a message telling you that the remote provider failed to open, perform a soft reset of the device and repeat the command:

   For more information, see "ActiveSync provider installation utility [mlasinst]" on page 27.
3. Restart your machine.

   ActiveSync does not recognize new providers until the machine is restarted.
4. Enable the MobiLink provider.

   ♦ From the ActiveSync window, click Options.

- Check the MobiLink item in the list and click OK to activate the provider.
- To see a list of registered applications, click Options again, choose the MobiLink provider, and click Settings.

  For more information about registering applications, see "Registering SQL Anywhere clients for ActiveSync" on page 103.

Registering SQL Anywhere clients for ActiveSync

You can register your application for use with ActiveSync either by using the ActiveSync provider install utility or using the ActiveSync software itself. This section describes how to use the ActiveSync software.

For information on the alternative approach, see "ActiveSync provider installation utility [mlasinst]" on page 27.

♦ To register the SQL Anywhere client for use with ActiveSync

1. Ensure that the MobiLink provider for ActiveSync is installed.

   For information, see "Installing the MobiLink provider for ActiveSync" on page 102.
2. Start the ActiveSync software on your desktop machine.
3. From the ActiveSync window, choose Options.
4. From the list of information types, choose MobiLink and click Settings.
5. In the MobiLink Synchronization dialog, click New. The Properties dialog appears.
6. Enter the following information for your application:

   - **Application name** A name identifying the application to be displayed in the ActiveSync user interface.
   - **Class name** The class name for the dbmlsync client, as set using the -wc option.

     For more information, see "-wc option" on page 159.
   - **Path** The location of the dbmlsync application on the device.
   - **Arguments** Any command line arguments to be used when ActiveSync starts dbmlsync.

     You start dbmlsync in one of two modes:

     - If you specify scheduling options, dbmlsync enters hover mode. In this case, use the dbmlsync -wc option with a matching value in the class name setting.

       For more information, see "-wc option" on page 159 and "Scheduling synchronization" on page 105.
     - Otherwise, dbmlsync is not in hovering mode. In this case, use -k to shut down dbmlsync.

For more information, see "-k option (deprecated)" on page 134.

7. Click OK to register the application.

Scheduling synchronization

You can set up dbmlsync to synchronize periodically based on rules you define. There are two ways you can set this up:

- Use the dbmlsync extended option SCHEDULE to initiate synchronization at specific times of the day or week or at regular intervals. In this case, dbmlsync remains running until stopped by the user.

  See "Setting up scheduling with dbmlsync options" on page 105.

- Use dbmlsync event hooks to initiate synchronization based on logic that you define. This is the best way to implement synchronization at irregular intervals or in response to an event. In this case, you can stop dbmlsync programmatically from your hook code.

  See "Initiating synchronization with event hooks" on page 106.

Hovering

When scheduling options or hooks are specified, dbmlsync goes into hovering mode. Hovering is a feature that reduces the amount of time spent scanning the log. You can improve the performance benefits of hovering by setting the dbmlsync extended option HoverRescanThreshold or by using the dbmlsync stored procedure sp_hook_dbmlsync_log_rescan.

For more information, see:

- "HoverRescanThreshold (hrt) extended option" on page 177
- "sp_hook_dbmlsync_log_rescan" on page 248

Setting up scheduling with dbmlsync options

Instead of running dbmlsync in a batch fashion, where it synchronizes and then shuts down, you can set up a SQL Anywhere client so that dbmlsync runs continuously, synchronizing at predetermined times.

You specify the synchronization schedule as an extended option. It can be specified either on the dbmlsync command line or it can be stored in the database for the synchronization user, subscription, or publication.

For more information about scheduling syntax, see "Schedule (sch) extended option" on page 189.

For more information about extended options, see:

- "MobiLink SQL Anywhere Client Extended Options" on page 161
- "-eu option" on page 132

♦ To add scheduling to the synchronization subscription

- Set the Schedule extended option in the synchronization subscription. For example,

```
CREATE SYNCHRONIZATION SUBSCRIPTION TO mypub
FOR mluser
```



```
ADDRESS 'host=localhost'
OPTION schedule='weekday@11:30am-12:30pm'
```

You can override scheduling and synchronize immediately using the dbmlsync -is option. The -is option instructs dbmlsync to ignore scheduling that is specified with the scheduling extended option. For more information, see "-is option" on page 133.

♦ **To add scheduling from the dbmlsync command line**

- Set the schedule extended option. Extended options are set with -e or -eu. For example,

```
dbmlsync -e "sch=weekday@11:30am-12:30pm" ...
```

If scheduled synchronization is specified in either place, dbmlsync does not shut down after synchronizing, but runs continuously.

Initiating synchronization with event hooks

There are dbmlsync event hooks that you can implement to control when synchronization occurs.

With the sp_hook_dbmlsync_end hook, you can use the Restart row in the #hook_dict table to decide at the end of each synchronization if dbmlsync should repeat the synchronization.

For more information, see "sp_hook_dbmlsync_end" on page 246.

With the sp_hook_dbmlsync_delay hook you can create a delay at the beginning of each synchronization that allows you to choose the time when synchronization will proceed. With this hook it is possible to delay for a fixed amount of time or to poll periodically, waiting for some condition to be satisfied.

For more information, see "sp_hook_dbmlsync_delay" on page 226.

Customizing dbmlsync synchronization

dbmlsync client event hooks

Event hooks allow you to use SQL stored procedures to manage the client-side synchronization process for dbmlsync. You can use client event hooks with the dbmlsync command line utility or the dbmlsync programming interfaces.

You can use event hooks to log and handle synchronization events. For example, you can schedule synchronizations based on logical events, retry connection failures, or handle specific errors and referential integrity violations.

For more information about client event hooks, see "Event Hooks for SQL Anywhere Clients" on page 209.

dbmlsync programming interfaces

You can use the following programming interfaces to integrate MobiLink clients into your applications and start synchronizations. These interfaces provide an alternative to the dbmlsync command line utility.

- **Dbmlsync Integration Component** The Dbmlsync Integration Component provides a visual and non-visual programming interface to initiate synchronization, receive information about the progress of a synchronization, and implement special processing for synchronization events. For example, you can use the Dbmlsync Integration Component to integrate synchronization into a .NET application.

  For more information, see "Dbmlsync Integration Component" on page 277.

- **DBTools interface for dbmlsync** You can use the DBTools interface for dbmlsync to integrate synchronization functionality into your SQL Anywhere synchronization client applications. All the SQL Anywhere database management utilities are built on DBTools.

  For more information, see "DBTools Interface for dbmlsync" on page 305.

SQL Anywhere client logging

When you create MobiLink applications with SQL Anywhere remote databases, there are two types of client log file that you should be aware of:

- dbmlsync console log
- SQL Anywhere transaction log

dbmlsync console log

By default, dbmlsync messages are sent to the dbmlsync console. In addition, you can send the output to a console log file using the -o or -ot options. The following partial command line sends output to a log file named *dbmlsync.log*.

```
dbmlsync -o dbmlsync.log ...
```

Logging dbmlsync activity is particularly useful during the development process and when troubleshooting. Verbose output is not recommended for normal operation in a production environment because it can slow performance.

You can control the size of log files, and specify what you want done when a file reaches its maximum size:

- Use the -o option to specify a log file and append output to it.
- Use the -ot option to specify a log file, but delete the contents the file before appending output to it.
- In addition to -o or -ot, use the -os option to specify the size at which the log file is renamed and a new file is started with the original name.

For more information, see:

- "-o option" on page 139
- "-ot option" on page 141
- "-os option" on page 140

You can control what information is logged to the console log file and displayed in the dbmlsync window using the –v option.

For more information, see "-v option" on page 158.

You can manage log files using the delete_old_logs option.

For more information, see "delete_old_logs option [MobiLink client] [SQL Remote] [Replication Agent]" [*SQL Anywhere Server - Database Administration*].

When no console log is specified, all output is displayed in the console. When a console log is specified, less output is sent to the console.

SQL Anywhere transaction log

See "Transaction log files" on page 98.

CHAPTER 7

MobiLink SQL Anywhere Client Utility [dbmlsync]

Contents

dbmlsync syntax

Use the dbmlsync utility to synchronize SQL Anywhere remote databases with a consolidated database.

Syntax

dbmlsync [*options*] [*transaction-logs-directory*]

Option	Description
@data	Read in options from the specified environment variable or configuration file. See "@data option" on page 115.
-a	Do not prompt for input again on error. See "-a option" on page 116
-ap	Specify authentication parameters. See "-ap option" on page 117.
-ba *file-name*	Apply a download file. See "-ba option" on page 118.
-bc *file-name*	Create a download file. See "-bc option" on page 119.
-be *string*	When creating a download file, add a string. See "-be option" on page 120.
-bg	When creating a download file, make it suitable for new remotes. See "-bg option" on page 121.
-c *connection-string*	Supply database connection parameters in the form *parm1=value1*; *parm2=value2*,… If you do not supply this option, a dialog will appear and you must supply connection information. See "-c option" on page 122.
-d	Drop any other connections to the database whose locks conflict with the articles to be synchronized. See "-d option" on page 123.
-dc	Continue a previously failed download. See "-dc option" on page 124.
-dl	Display log messages on the console. See "-dl option" on page 125.
-drs *bytes*	For restartable downloads, specify the maximum amount of data that may need to be resent after a communications failure. See "-drs option" on page 126.
-ds	Perform a download-only synchronization. See "-ds option" on page 127.
-e "*option=value*"…	Specify extended options. See "MobiLink SQL Anywhere Client Extended Options" on page 161.
-eh	Ignore errors that occur in hook functions.
-ek *key*	Specify encryption key. See "-ek option" on page 130.
-ep	Prompt for encryption key. See "-ep option" on page 131.

Option	Description
-eu	Specify extended options for upload defined by most recent -n option. See "-eu option" on page 132.
-is	Ignore schedule. See "-is option" on page 133.
-k	Close window on completion. See "-k option (deprecated)" on page 134.
-l	List available extended options. See "-l option" on page 135.
-mn *password*	Specify new MobiLink password. See "-mn option" on page 136.
-mp *password*	Specify MobiLink password. See "-mp option" on page 137.
-n *name*	Specify synchronization publication name(s). See "-n option" on page 138.
-o *logfile*	Log output messages to this file. See "-o option" on page 139.
-os *size*	Specify a maximum size for the output log, at which point the log is renamed. See "-os option" on page 140.
-ot *logfile*	Delete the contents of the log file and then log output messages to it. See "-ot option" on page 141.
-p	Disable logscan polling. See "-p option" on page 142.
-pc+	Maintain an open connection to the MobiLink server between synchronizations. See "-pc option" on page 143
-pd *dllname*;...	Preload specified dlls for Windows CE. See "-pd option" on page 144.
-pi	Test that you can connect to MobiLink. See "-pi option" on page 145.
-pp *number*	Set logscan polling period. See "-pp option" on page 146.
-q	Run in minimized window. See "-q option" on page 147.
-qc	Shut down dbmlsync when synchronization is finished. See "-qc option" on page 148.
-r[**a** | **b**]	Use client progress values for upload retry. See "-r option" on page 149.
-sc	Reload schema information before each synchronization. See "-sc option" on page 150.
-tu	Perform transactional upload. See "-tu option" on page 151.
-u *ml_username*	Specify the MobiLink user to synchronize. See "-u option" on page 153.

Option	Description
-ui	For Linux with X window, starts dbmlsync in console mode if a usable display isn't available. See "-ui option" on page 154.
-uo	Perform upload-only synchronization. See "-uo option" on page 155.
-urc *row-estimate*	Specify an estimate of the number of rows that will be uploaded. See "-urc option" on page 156.
-ux	For Solaris and Linux, open the console. See "-ux option" on page 157.
-v[*levels*]	Verbose operation. See "-v option" on page 158.
-wc *classname*	Specify a window class name. See "-wc option" on page 159.
-x	Rename and restart the transaction log. See "-x option" on page 160.
transaction-logs-directory	Specify the location of the transaction log. See Transaction Log File, below.

Remarks

Run dbmlsync on the command line to synchronize a SQL Anywhere remote database with a consolidated database.

To locate and connect to the MobiLink server, dbmlsync uses the information on the publication, synchronization user, synchronization subscription, or command line.

Transaction log file The *transaction-logs-directory* is the directory that contains the transaction log for the SQL Anywhere remote database. There is an active transaction log and transaction log archive files, both of which may be required by dbmlsync to determine what to upload. You must specify this parameter if all of the following are true:

- the contents of the working log file have been deleted and the file has been renamed since you last synchronized
- you run the dbmlsync utility from a directory other than the one where the renamed log files are stored

For more information, see "Transaction log files" on page 98.

dbmlsync event hooks There are also dbmlsync client stored procedures that can help you customize the synchronization process. For more information, see "Introduction to dbmlsync hooks" on page 211 and "Event Hooks for SQL Anywhere Clients" on page 209.

Using dbmlsync For more information about using dbmlsync, see "Initiating synchronization" on page 97.

See also

- "Initiating synchronization" on page 97
- "Event Hooks for SQL Anywhere Clients" on page 209
- "Dbmlsync Integration Component" on page 306

- "DBTools Interface for dbmlsync" on page 305

@data option

Reads in options from the specified environment variable or configuration file.

Syntax

dbmlsync @*data* …

Remarks

With this option, you can put command line options in an environment variable or configuration file. If both exist with the name you specify, the environment variable is used.

For more information about configuration files, see "Using configuration files" [*SQL Anywhere Server - Database Administration*].

If you want to protect passwords or other information in the configuration file, you can use the File Hiding utility to obfuscate the contents of the configuration file.

See "File Hiding utility (dbfhide)" [*SQL Anywhere Server - Database Administration*].

-a option

Specifies that dbmlsync should not display a dialog prompt for input again on error.

Syntax

dbmlsync -a …

-ap option

Supplies parameters to the authenticate_parameters script and to authentication parameters.

Syntax

dbmlsync -ap "*parameters,...***"** …

Remarks

Use when you use the authenticate_parameters connection script or authentication parameters. For example,

```
dbmlsync -ap "parm1,parm2,parm3"
```

The parameters are sent to the MobiLink server and passed to the authenticate_parameters script or other events on the consolidated database.

See also

- "Authentication parameters" [*MobiLink - Server Administration*]
- "authenticate_parameters connection event" [*MobiLink - Server Administration*]

-ba option

Applies a download file.

Syntax

dbmlsync -ba "*file-name***"** …

Remarks

Specify the name of an existing download file to be applied to the remote database. You can optionally specify a path. If you do not specify a path, the default location is the directory where dbmlsync was started.

See also

- "MobiLink File-Based Download" [*MobiLink - Server Administration*]
- "-bc option" on page 119
- "-be option" on page 120
- "-bg option" on page 121

-bc option

Creates a download file.

Syntax

dbmlsync -bc "*file-name***"** …

Remarks

Create a download file with the specified name. You should use the file extension .df for download files.

You can optionally specify a path. If you do not specify a path, the default location is the dbmlsync current working directory, which is the directory where dbmlsync was started.

Optionally, in the same dbmlsync command line as you create the download file, you can use the -be option to specify a string that can be validated at the remote database, and the -bg option to create a download file for new remote databases.

See also

- "MobiLink File-Based Download" [*MobiLink - Server Administration*]
- "-ba option" on page 118
- "-be option" on page 120
- "-bg option" on page 121

-be option

When creating a download file, this option specifies an extra string to be included in the file.

Syntax

dbmlsync -bc "*file-name***" -be "***string***"** …

Remarks

The string can be used for authentication or other purposes. It is passed to the sp_hook_dbmlsync_validate_download_file stored procedure on the remote database when the download file is applied.

See also

- “sp_hook_dbmlsync_validate_download_file” on page 275
- “MobiLink File-Based Download” [*MobiLink - Server Administration*]
- “-bc option” on page 119
- “-ba option” on page 118

-bg option

When creating a download file, this option creates a file that can be used with remote databases that have not yet synchronized.

Syntax

dbmlsync -bc "*file-name***" -bg** …

Remarks

The -bg option causes the download file to update the generation numbers on the remote database.

This option allows you to build a download file that can be applied to remote databases that have never synchronized. Otherwise, you must perform a synchronization before you apply a download file.

Download files built with the -bg option should be snapshot downloads. Timestamp-based downloads will not work with remote databases that have not synchronized because the last download timestamp on a new remote is by default January 1, 1900, which will be earlier than the last download timestamp in the download file. For timestamp-based file-based downloads to work, the last download timestamp in the download file must be the same or earlier than on the remote.

Do not apply -bg download files to remote databases that have already synchronized if your system depends on functionality provided by generation numbers as this option circumvents that functionality.

See also

- "MobiLink File-Based Download" [*MobiLink - Server Administration*]
- "-ba option" on page 118
- "-bc option" on page 119
- "MobiLink generation numbers" [*MobiLink - Server Administration*]
- "Synchronizing new remotes" [*MobiLink - Server Administration*]

-c option

Specifies connection parameters for the remote database.

Syntax

dbmlsync -c "*connection-string***"** …

Remarks

The connection string must give dbmlsync permission to connect to the SQL Anywhere remote database with DBA or REMOTE DBA authority. It is recommended that you use a user ID with REMOTE DBA authority.

Specify the connection string in the form *keyword*=*value*, with multiple parameters separated by semicolons. If any of the parameter names contain spaces, you need to enclose the connection string in double quotes.

If you do not specify -c, a dbmlsync Setup dialog appears. You can specify the remaining command line options in the fields of the connection dialog.

For a complete list of connection parameters for connecting to SQL Anywhere databases, see "Connection parameters" [*SQL Anywhere Server - Database Administration*].

-d option

Drops conflicting locks to the remote database.

Syntax

dbmlsync -d …

Remarks

During synchronization, unless the LockTables extended option is set to OFF, all tables involved in the publications being synchronized are locked to prevent any other processes from making changes. If another connection has a lock on one of these tables, the synchronization may fail or be delayed. Specifying this option forces SQL Anywhere to drop any other connections to the remote database that hold conflicting locks so that synchronization can proceed immediately.

See also

- "Concurrency during synchronization" on page 99

-dc option

Restart a previously failed download.

Syntax

dbmlsync -dc …

Remarks

By default, if MobiLink fails during a download it doesn't apply any of the download data to the remote database. However, it stores the part of the download it did receive in a temporary file on the remote device, so that if you specify -dc the next time you start dbmlsync, it can more quickly complete the download. When you specify -dc, dbmlsync restarts the download and attempts to download the part of the previous download that it did not receive. If it is able to download the remaining data, it applies the complete download to your remote database.

If there is any new data to be uploaded when you use -dc, the restartable download will fail.

You can also restart a failed download using the ContinueDownload extended option or the sp_hook_dbmlsync_end hook.

See also

- "Resuming failed downloads" [*MobiLink - Server Administration*]
- "ContinueDownload (cd) extended option" on page 169
- "sp_hook_dbmlsync_end" on page 246
- "DownloadReadSize (drs) extended option" on page 173

-dl option

Displays messages in the log file.

Syntax

dbmlsync -dl …

Remarks

Normally when output is logged to a file, more messages are written to the log file than to the dbmlsync window. This option forces dbmlsync to write information normally only written to the file to the window as well. Using this option may have an effect on the speed of synchronization.

-drs option

For restartable downloads, specifies the maximum amount of data that may need to be resent after a communications failure.

Syntax

dbmlsync -drs *bytes ...*

Remarks

The -drs option specifies a download read size that is only useful when doing restartable downloads.

Dbmlsync reads the download in chunks. The download read size defines the size of these chunks. When a communication error occurs, dbmlsync loses the entire chunk that was being processed. Depending on when the error occurs, the number of bytes lost will be between 0 and the download read size -1. So for example, if the DownloadReadSize is 100 bytes and an error occurs after reading 497 bytes, the last 97 bytes read will be lost. Bytes that are lost in this way will be resent when the download is restarted.

In general, larger download read size values result in better performance on successful synchronizations but result in more data being resent when an error occurs.

The typical use of this option is to reduce the default size when communication is unreliable.

The default is **32767**. If you set this option to a value larger than 32767, the value 32767 is used.

You can also specify the download read size using the DownloadReadSize extended option.

See also

- "DownloadReadSize (drs) extended option" on page 173
- "Resuming failed downloads" [*MobiLink - Server Administration*]
- "ContinueDownload (cd) extended option" on page 169
- "sp_hook_dbmlsync_end" on page 246
- "-dc option" on page 124

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -drs 100
```


-ds option

Performs a download-only synchronization.

Syntax

dbmlsync -ds …

Remarks

When download-only synchronization occurs, dbmlsync does not upload any row operations or data. However, it does upload information about the schema and progress offset.

In addition, dbmlsync ensures that changes on the remote are not overwritten during download-only synchronization. It does this by scanning the log to detect rows with operations waiting to be uploaded. If any of these rows is modified by the download, the download is rolled back and the synchronization fails. If the synchronization fails for this reason, you must do a full synchronization to correct the problem.

When you have remotes that are synchronized by download-only synchronization, you should regularly do a full bi-directional synchronization to reduce the amount of log that is scanned by the download-only synchronization. Otherwise, the download-only synchronizations will take an increasingly long time to complete.

When -ds is used, the ConflictRetries extended option is ignored. dbmlsync never retries a download-only synchronization. If a download-only synchronization fails, it will continue to fail until a normal synchronization is performed.

For a list of the scripts that must be defined for download-only synchronization, see "Required scripts" [*MobiLink - Server Administration*].

See also

- "Upload-only and download-only synchronizations" [*MobiLink - Server Administration*]
- "DownloadOnly (ds) extended option" on page 172
- "Download-only publications" on page 87

-e option

Specifies extended options.

Syntax

dbmlsync -e *extended-option*=*value*; ...

extended-option:
adr cd cr ctp dbs dir drs ds eh el ft hrt inc isc lt mem mn mp p pp sa sc sch scn st sv toc tor uo v vn vm vo vr vs vu

Parameters

Extended options can be specified by their long form or short form.

See "MobiLink SQL Anywhere Client Extended Options" on page 161.

Remarks

Options specified on the command line with the -e option apply to all synchronizations requested on the command line. For example, in the following command line the extended option sv=test applies to the synchronization of both pub1 and pub2.

```
dbmlsync -e "sv=test" -n pub1 -n pub2
```

You can review extended options in the dbmlsync console log and the SYSSYNC system view.

To specify extended options for a single upload, use the -eu option.

See also

- "-eu option" on page 132
- "SYSSYNC system view" [*SQL Anywhere Server - SQL Reference*]
- "sp_hook_dbmlsync_set_extended_options" on page 263

Example

The following dbmlsync command line illustrates how you can set extended options when you start dbmlsync:

```
dbmlsync -e "adr=host=localhost;dir=c:\db\logs"...
```


-eh option

Ignores errors that occur in hook functions.

Syntax

dbmlsync -eh …

-ek option

Allows you to specify the encryption key for strongly encrypted databases directly on the command line.

Syntax

dbmlsync -ek *key* …

Remarks

If you have a strongly encrypted database, you must provide the encryption key to use the database or transaction log in any way, including offline transactions. For strongly encrypted databases, you must specify either -ek or -ep, but not both. The command will fail if you do not specify a key for a strongly encrypted database.

-ep option

Prompt for the encryption key.

Syntax

dbmlsync -ep …

Remarks

This option causes a dialog box to appear, in which you enter the encryption key. It provides an extra measure of security by never allowing the encryption key to be seen in clear text. For strongly encrypted databases, you must specify either -ek or -ep, but not both. The command will fail if you do not specify a key for a strongly encrypted database.

-eu option

Specifies extended upload options.

Syntax

dbmlsync -n *publication-name* **-eu** *keyword=value*;…

Remarks

Extended options that are specified on the command line with the -eu option apply only to the synchronization specified by the -n option they follow. For example, on the following command line, the extended option sv=test applies only to the synchronization of pub2.

```
dbmlsync -n pub1 -n pub2 -eu "sv=test"
```

For an explanation of how extended options are processed when they are set in more than one place, see "MobiLink SQL Anywhere Client Extended Options" on page 161.

For a complete list of extended options, see "MobiLink SQL Anywhere Client Extended Options" on page 161.

-is option

Ignores scheduling instructions so that synchronization is immediate.

Syntax

dbmlsync -is …

Remarks

Ignore extended options that schedule synchronization.

For information about scheduling, see “Scheduling synchronization” on page 105.

-k option (deprecated)

Shuts down dbmlsync when synchronization is finished. This option is deprecated. Use -qc instead.

Syntax

dbmlsync -k …

See also

- "-qc option" on page 148

-l option

Lists available extended options.

Syntax

dbmlsync -l …

Remarks

When used with the dbmlsync command line it shows you available extended options.

-mn option

Supplies a new password for the MobiLink user being synchronized.

Syntax

dbmlsync -mn *password* …

Remarks

Changes the MobiLink user's password.

For more information, see "MobiLink Users" on page 9.

See also

- "MobiLinkPwd (mp) extended option" on page 184
- "NewMobiLinkPwd (mn) extended option" on page 185
- "-mp option" on page 137

-mp option

Supplies the password of the MobiLink user being synchronized.

Syntax

dbmlsync -mp *password* …

Remarks

Supplies the password for MobiLink user authentication.

For more information, see "MobiLink Users" on page 9.

See also

- "MobiLinkPwd (mp) extended option" on page 184
- "NewMobiLinkPwd (mn) extended option" on page 185
- "-mn option" on page 136

-n option

Specifies the publication(s) to synchronize.

Syntax

dbmlsync -n *pubname …*

Remarks

Name of synchronization publication. You can supply more than one -n option to synchronize more than one synchronization publication.

There are two ways to use -n to synchronize multiple publications:

- Specify `-n pub1,pub2,pub3` to upload pub1, pub2, and pub3 in one upload followed by one download.

  In this case, if you have set extended options on the publications, only the options set on the first publication in the list are used. Extended options set on subsequent publications are ignored.

- Specify `-n pub1 -n pub2 -n pub3` to synchronize pub1, pub2, and pub3 in three separate sequential synchronizations.

  When successive synchronizations occur very quickly, such as when you specify `-n pub1 -n pub2`, it is possible that dbmlsync may start processing a synchronization when the server is still processing the previous synchronization. In this case, the second synchronization will fail with an error indicating that concurrent synchronizations are not allowed. If you run into this situation, you can define an sp_hook_dbmlsync_delay stored procedure to create a delay before each synchronization. Usually a few seconds to a minute is a sufficient delay.

  For more information, see "sp_hook_dbmlsync_delay" on page 226.

-o option

Sends output to the dbmlsync console log.

Syntax

dbmlsync -o *file-name* …

Remarks

Append output to a log file. Default is to send output to the screen.

See also

- "-os option" on page 140
- "-ot option" on page 141

-os option

Specifies a maximum size for the dbmlsync console log, at which point the log is renamed.

Syntax

dbmlsync -os *size* [**K** | **M** | **G**]…

Remarks

The *size* is the maximum file size for logging output messages, specified in units of bytes. Use the suffix k, m or g to specify units of kilobytes, megabytes or gigabytes, respectively. By default, there is no size limit. The minimum size limit is 10K.

Before the dbmlsync utility logs output messages to a file, it checks the current file size. If the log message will make the file size exceed the specified size, the dbmlsync utility renames the output file to *yymmddxx*.dbr, where *yymmdd* represents the year, month, and day, and *xx* are sequential characters ranging from AA to ZZ.

This option allows you to manually delete old log files and free up disk space.

See also

- "-o option" on page 139
- "-ot option" on page 141

-ot option

Deletes the contents of the log file and then logs output messages to it.

Syntax

dbmlsync -ot *logfile* …

Remarks

The functionality is the same as the -o option except the contents of the log file are deleted when dbmlsync starts up, before any messages are written to it.

See also

- "-o option" on page 139
- "-os option" on page 140

-p option

Disables logscan polling.

Syntax

dbmlsync -p …

Remarks

To build an upload, dbmlsync must scan the transaction log. Usually it does this just before synchronization. However, when synchronizations are scheduled or when the sp_hook_dbmlsync_delay hook is used, dbmlsync by default scans the log in the pause that occurs before synchronization. This behavior is more efficient because when synchronization begins the log is already at least partially scanned. This default behavior is called logscan polling.

Logscan polling is on by default but only has an effect when synchronizations are scheduled using scheduling options or when sp_hook_dbmlsync_delay hook is used. When in effect, polling occurs at set intervals; by default this is 1 minute, but it can be changed with the dbmlsync -pp option.

This option is identical to the extended option DisablePolling=on.

See also

- "DisablePolling (p) extended option" on page 170
- "PollingPeriod (pp) extended option" on page 188
- "-pp option" on page 146

-pc option

Maintain a persistent connection to the MobiLink server between synchronizations.

Syntax

dbmlsync -pc+ ...

Remarks

When this option is specified, dbmlsync connects to the MobiLink server as usual, but it then keeps that connection open for use with subsequent synchronizations. A persistent connection is closed when any of the following occur:

- An error occurs that causes a synchronization to fail.
- Liveness checking has timed out.

  See "timeout" on page 60.

- A synchronization is initiated in which the communication type or address are different. This could mean that the settings are different (for example, a different host is specified), or that they are specified in a different way (for example, the same host and port are specified, but in a different order).

When a persistent connection is closed, a new connection is opened that is also persistent.

This option is most useful when the client synchronizes frequently and the cost of establishing a connection to the server is high.

By default, persistent connections are not maintained.

-pd option

Preload specified DLLs for Windows CE.

Syntax

dbmlsync -pd *dllname*;...

Remarks

When running dbmlsync on Windows CE, if you are using encrypted communication streams you must use the –pd option to ensure that the appropriate DLLs are loaded at startup. Otherwise, dbmlsync will not attempt to load the DLLs until they are needed. Loading these DLLs late is prone to failure due to resource limitations on Windows CE.

Following are the DLLs that need to be loaded for each communication protocol:

Protocol	DLL
ECC	mlcecc10.dll
RSA	mlcrsa10.dll
FIPS	mlcrsafips10.dll

You should specify multiple DLLs as a semicolon-separated list. For example:

```
-pd mlcrsafips10.dll;mlcrsa10.dll
```

-pi option

Pings a MobiLink server.

Syntax

dbmlsync -pi -c *connection_string* ...

Remarks

When you use -pi, dbmlsync connects to the remote database, retrieves information required to connect to the MobiLink server, connects to the server, and authenticates the specified MobiLink user. When the MobiLink server receives a ping, it connects to the consolidated database, authenticates the user, and then sends the authenticating user status and value back to the client. If the MobiLink user name cannot be found in the ml_user system table and the MobiLink server is running with the command line option -zu+, the MobiLink server adds the user to the ml_user MobiLink system table.

To adequately test your connection, you should use the-pi option with all of the synchronization options you want to use to synchronize with dbmlsync. When -pi is included, dbmlsync does not perform a synchronization.

If the ping succeeds, the MobiLink server issues an information message. If the ping does not succeed, it issues an error message.

When you start dbmlsync with -pi, the MobiLink server can execute only the following scripts, if they exist:

- begin_connection
- authenticate_user
- authenticate_user_hashed
- end_connection

-pp option

Specifies the frequency of log scans.

Syntax

dbmlsync -pp *number* [**h** | **m** | **s**]…

Remarks

To build an upload, dbmlsync must scan the transaction log. Usually it does this just before synchronization. However, when synchronizations are scheduled or when the sp_hook_dbmlsync_delay hook is used, dbmlsync by default scans the log in the pause that occurs before synchronization. This behavior is more efficient because when synchronization begins the log is already at least partially scanned. This default behavior is called logscan polling.

This option specifies the interval between log scans. Use the suffix s, m, h, or d to specify seconds, minutes, hours or days, respectively. The default is **1** minute. If you do not specify a suffix, the default unit of time is minutes.

See also

- "PollingPeriod (pp) extended option" on page 188
- "DisablePolling (p) extended option" on page 170
- "-p option" on page 142

-q option

Starts the MobiLink synchronization client in a minimized window.

Syntax

dbmlsync -q …

-qc option

Shuts down dbmlsync when synchronization is finished.

Syntax

dbmlsync -qc …

Remarks

When used, dbmlsync exits after synchronization is completed if the synchronization was successful or if an output log file was specified using the -o or -ot options.

See also

- "-o option" on page 139
- "-ot option" on page 141

-r option

Specifies that the remote offset should be used when there is disagreement between the offsets in the remote and consolidated databases.

The -rb option indicates that the remote offset should be used if it is less than the consolidated offset (such as when the remote database has been restored from backup). The -r option is provided for backward compatibility and is identical to -rb. The -ra option indicates that the remote offset should be used if it is greater than the consolidated offset. This option is provided only for very rare circumstances and may cause data loss.

Syntax

dbmlsync { **-r | -ra | -rb** } …

Remarks

For information about progress offsets, see "Progress offsets" on page 83.

-rb If the remote database is restored from backup, the default behavior may cause data to be lost. In this case, the first time you run dbmlsync after the remote database is restored, you should specify -rb. When you use -rb, the upload continues from the offset recorded in the remote database if the offset recorded in the remote is less than that obtained from the consolidated database. If you use -rb and the offset in the remote is not less than the offset from the consolidated database, an error is reported and the synchronization is aborted.

The -rb option may result in some data being uploaded that has already been uploaded. This can result in conflicts in the consolidated database and should be handled with appropriate conflict resolution scripts.

-ra The -ra option should be used only in very rare cases. If you use -ra, the upload is retried starting from the offset obtained from the remote database if the remote offset is greater than the offset obtained from the consolidated database. If you use -ra and the offset in the remote is not greater than the offset from the consolidated database, an error is reported and the synchronization is aborted.

The -ra option should be used with care. If the offset mismatch is the result of a restore of the consolidated database, changes that happened in the remote database in the gap between the two offsets are lost. The -ra option may be useful when the consolidated database has been restored from backup and the remote database transaction log has been truncated at the same point as the remote offset. In this case, all data that was uploaded from the remote database is lost from the point of the consolidated offset to the point of the remote offset.

-sc option

Specifies that dbmlsync should reload schema information before each synchronization.

Syntax

dbmlsync -sc…

Remarks

Prior to version 9.0, dbmlsync reloaded schema information from the database before each synchronization. The information that was reloaded includes foreign key relationships, publication definitions, extended options stored in the database, and information about database settings. Loading this information is time-consuming and in most cases the information does not change between synchronizations.

Starting with version 9.0, by default dbmlsync loads schema information only at startup. Specify -sc if you want the information to be loaded before every synchronization.

-tu option

Specifies that each transaction on the remote database should be uploaded as a separate transaction within one synchronization.

Syntax

dbmlsync -tu …

Remarks

When you use -tu, you create a **transactional upload**: dbmlsync uploads each transaction on the remote database as a distinct transaction. The MobiLink server applies and commits each transaction separately when it is received.

When you use -tu, the order of transactions on the remote database is always preserved on the consolidated database. However, the order of operations in a transaction may not be preserved, for two reasons:

- MobiLink always applies updates based on foreign key relationships. For example, when data is changed in child and parent tables, MobiLink inserts data into the parent table before the child table, but deletes data from the child before the parent. If your remote operations do not follow this order, the order of operations will be different on the consolidated database.
- Operations within a transaction are coalesced. This means that if you change the same row three times in one transaction, only the final form of the row is uploaded.

If a transactional upload is interrupted, the data that was not sent is sent in the next synchronization. In most cases, only the transactions that were not successfully completed are sent at that time. In some cases, such as when the upload failure occurs during the first synchronization of a subscription, dbmlsync resends all transactions.

When you do not use -tu, MobiLink coalesces all changes on the remote database into one transaction in the upload. This means that if you change the same row three times between synchronizations, regardless of the number of remote transactions, only the final form of the row is uploaded. This default behavior is efficient and is optimal in many situations.

However, in certain situations you may want to preserve remote transactions on the consolidated database. For example, you may want to define triggers on the consolidated database that act on transactions as they occur in the remote database.

In addition, there are advantages to breaking up the upload into smaller transactions. Many consolidated databases are optimized for small transactions, so sending a very large transaction is not efficient or may cause too much contention. Also, when you use -tu each transaction is applied as it is successfully uploaded, so you may not lose the entire upload if there are communications errors during the upload. When you use -tu and there is an upload error, all successfully uploaded transactions are applied.

The -tu option makes MobiLink behave in a manner that is very close to SQL Remote. The main difference is that SQL Remote replicates all changes to the remote database in the order they occur, without coalescing. To mimic this behavior, you must commit after each database operation on the remote database.

You cannot use -tu with the Increment extended option or with scripted uploads.

See also

- "-tx option" [*MobiLink - Server Administration*]
- "Uploading data from self-referencing tables" [*MobiLink - Server Administration*]

-u option

Specifies the MobiLink user name.

Syntax

dbmlsync -u *ml_username …*

Remarks

You can specify one user in the dbmlsync command line, where *ml_username* is the name used in the FOR clause of the CREATE SYNCHRONIZATION SUBSCRIPTION statement corresponding to the subscription to be processed.

This option should be used in conjunction with -n *publication* to identify the subscription on which dbmlsync should operate. Each subscription is uniquely identified by an *ml_username*, *publication* pair.

You can only specify one user name on the command line. All subscriptions to be synchronized in a single run must involve the same user. The -u option can be omitted if each publication that is specified on the command line with the -n option has only one subscription.

-ui option

For Linux with X window server support, starts dbmlsync in console mode if a usable display isn't available.

Syntax

mlsrv10 –c "*connection-string***" –ui** …

Remarks

When this option is used, dbmlsync will start whether or not the X window server starts. First, dbmlsync will try to start with X Windows. If this fails, it will start with a console UI.

When -ui is specified, dbmlsync attempts to find a usable display. If it cannot find one, for example because the X window server isn't running, then dbmlsync starts in console mode.

-uo option

Specifies that synchronization will only include an upload, and no download will occur.

Syntax

dbmlsync -uo…

Remarks

During upload-only synchronization, dbmlsync prepares and sends an upload to MobiLink exactly as it would in a normal full synchronization. However, instead of sending a download back down, MobiLink sends only an acknowledgement indicating if the upload was successfully committed.

For a list of the scripts that must be defined for upload-only synchronization, see "Required scripts" [*MobiLink - Server Administration*].

See also

- "Upload-only and download-only synchronizations" [*MobiLink - Server Administration*]
- "DownloadOnly (ds) extended option" on page 172
- "UploadOnly (uo) extended option" on page 198

-urc option

Specifies an estimate of the number of rows to be uploaded in a synchronization.

Syntax

dbmlsync -urc *row-estimate* …

Remarks

To improve performance, you can specify an estimate of the number of rows that will be uploaded in a synchronization. This setting is especially useful when you are uploading a large number of rows. A higher estimate results in faster uploads but more memory usage.

Synchronization will proceed correctly regardless of the estimate that is specified.

See also

- "Memory (mem) extended option" on page 182
- "For large uploads, estimate the number of rows" [*MobiLink - Server Administration*]

-ux option

On Linux, opens a console where messages are displayed.

Syntax

dbmlsync -ux…

Remarks

When -ux is specified, dbmlsync must be able to find a usable display. If it cannot find one, for example because the DISPLAY environment variable is not set or because the X window server is not running, dbmlsync fails to start.

To run the console in quiet mode, use -q.

On Windows, the console appears automatically.

See also

- "-q option" on page 147

-v option

Allows you to specify what information is logged to the message log file and displayed in the synchronization window. A high level of verbosity may affect performance and should normally be used in the development phase only.

Syntax

dbmlsync -v [*levels*] …

Remarks

The -v options affect the message log file and synchronization window. You only have a message log if you specify -o or -ot on the dbmlsync command line.

If you specify –v alone, a small amount of information is logged.

The values of *levels* are as follows. You can use one or more of these options at once; for example, -vnrsu or -v+cp.

- **+** Turn on all logging options except for c and p.
- **c** Expose the connect string in the log.
- **p** Expose the password in the log.
- **n** Log the number of rows that were uploaded and downloaded.
- **o** Log information about the command line options and extended options that you have specified.
- **r** Log the values of rows that were uploaded and downloaded.
- **s** Log messages related to hook scripts.
- **u** Log information about the upload.

There are extended options that have similar functionality to the -v options. If you specify both -v and the extended options and there are conflicts, the -v option overrides the extended option. If there is no conflict, the verbosity logging options are additive—all options that you specify are used. When logging verbosity is set by extended option, the logging does not take effect immediately, so startup information is not logged. By the time of the first synchronization, the logging behavior is identical between the -v options and the extended options.

See also

- "Verbose (v) extended option" on page 199
- "VerboseHooks (vs) extended option" on page 200
- "VerboseMin (vm) extended option" on page 201
- "VerboseOptions (vo) extended option" on page 202
- "VerboseRowCounts (vn) extended option" on page 203
- "VerboseRowValues (vr) extended option" on page 204
- "-o option" on page 139
- "-ot option" on page 141

-wc option

Specifies a window class name.

Syntax

dbmlsync -wc *class-name* …

Remarks

This option specifies a window class name that can be used to poke dbmlsync and wake it up whenever it is in hover mode, such as when scheduling is enabled or when you are using server-initiated synchronization.

In addition, the window class name identifies the application for ActiveSync synchronization. The class name must be given when registering the application for use with ActiveSync synchronization.

This option applies only to Windows.

See also

- "Registering SQL Anywhere clients for ActiveSync" on page 103
- "Using ActiveSync synchronization" on page 101
- INFINITE keyword in "Schedule (sch) extended option" on page 189
- "Scheduling synchronization" on page 105

Example

```
dbmlsync -wc dbmlsync_$message_end...
```


-x option

Renames and restarts the transaction log after it has been scanned for outgoing messages.

Syntax

dbmlsync -x [*size* [**K** | **M** | **G**]…

Remarks

The optional *size* means that the transaction log is renamed only if it is larger than the specified size. Use the suffix k, m or g to specify units of kilobytes, megabytes or gigabytes, respectively. The default size is 0.

In some circumstances, synchronizing data to a consolidated database can take the place of backing up remote databases, or renaming the transaction log when the database server is shut down.

If backups are not routinely performed at the remote database, the transaction log continues to grow. As an alternative to using the -x option to control transaction log size, you can use a SQL Anywhere event handler to control the size of the transaction log.

See also

- "Automating Tasks Using Schedules and Events" [*SQL Anywhere Server - Database Administration*]
- "delete_old_logs option [MobiLink client] [SQL Remote] [Replication Agent]" [*SQL Anywhere Server - Database Administration*]
- "CREATE EVENT statement" [*SQL Anywhere Server - SQL Reference*]

CHAPTER 8

MobiLink SQL Anywhere Client Extended Options

Contents

Introduction to dbmlsync extended options

Extended options can be specified on the dbmlsync command line using the -e or -eu options, or they can be stored in the database. You store extended options in the database by using Sybase Central, by using the sp_hook_dbmlsync_set_extended_options event hook, or by using the OPTION clause in any of the following statements:

- CREATE SYNCHRONIZATION SUBSCRIPTION
- ALTER SYNCHRONIZATION SUBSCRIPTION
- CREATE SYNCHRONIZATION USER
- ALTER SYNCHRONIZATION USER
- CREATE SYNCHRONIZATION SUBSCRIPTION without specifying a synchronization user (which associates extended options with a publication)

Priority order

Dbmlsync combines options stored in the database with those specified on the command line. If conflicting options are specified, dbmlsync resolves them as follows. In the following list, options specified by methods occurring earlier in the list take precedence over those occurring later in the list.

1. Options specified in the sp_hook_dbmlsync_set_extended_options event hook.
2. Options specified in the command line that aren't extended options. (For example, `-ds` overrides `-e "ds=off"`.
3. Options specified on the command line with the -eu option.
4. Options specified on the command line with the -e option.
5. Options specified for the subscription, whether by a SQL statement or in Sybase Central. When you use the Deploy Synchronization Model wizard to deploy a MobiLink model, extended options are set for you and are specified in the subscription.
6. Options specified for the MobiLink user, whether by a SQL statement or in Sybase Central.
7. Options specified for the publication, whether by a SQL statement or in Sybase Central.

Note
This priority order also affects connection parameters, such as those specified with the TYPE and ADDRESS options in the SQL statements mentioned above.

You can review extended options in the log and the SYSSYNC system view.

For information on how extended options can be used to tune synchronization, see "Using dbmlsync extended options" on page 97.

See also

- "-e option" on page 128
- "-eu option" on page 132
- "CREATE SYNCHRONIZATION SUBSCRIPTION statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*]
- "ALTER SYNCHRONIZATION SUBSCRIPTION statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*]
- "CREATE SYNCHRONIZATION USER statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*]
- "ALTER SYNCHRONIZATION USER statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*]
- "CREATE PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*]
- "ALTER PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*]
- "SYSSYNC system view" [*SQL Anywhere Server - SQL Reference*]
- "sp_hook_dbmlsync_set_extended_options" on page 263

Example

The following dbmlsync command line illustrates how you can set extended options when you start dbmlsync:

```
dbmlsync -e "adr=host=localhost;dir=c:\db\logs"...
```

The following SQL statement illustrates how you can store extended options in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION TO mypub
   FOR mluser
   ADDRESS 'host=localhost'
   OPTION schedule='weekday@11:30am-12:30pm', dir='c:\db\logs'
```

The following dbmlsync command line opens the usage screen that lists options and their syntax:

```
dbmlsync -l
```


CommunicationAddress (adr) extended option

Specifies network protocol options for connecting to the MobiLink server.

Syntax

adr=*protocol-option*; ...

Parameters

See "MobiLink client network protocol options" on page 32.

Remarks

You must ensure that all subscriptions for a MobiLink user are synchronized to only one consolidated database. Otherwise, you may experience data loss and unpredictable behavior.

If you are using the Redirector, see "Configuring MobiLink clients and servers for the Redirector" [*MobiLink - Server Administration*].

This option has a short form and long form: you can use **adr** or **CommunicationAddress**.

This option can also be stored in the database using the SQL statement that creates or alters a publication, subscription, or user. For more information, see:

- "CREATE SYNCHRONIZATION SUBSCRIPTION statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*]
- "CREATE SYNCHRONIZATION USER statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*]

Use the CommunicationType extended option to specify the type of network protocol.

See "CommunicationType (ctp) extended option" on page 167.

See also

- "MobiLink Client Network Protocol Options" on page 31
- "Configuring MobiLink clients and servers for the Redirector" [*MobiLink - Server Administration*]

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "adr=host=localhost"
```

To specify multiple network protocol options on the command line, enclose them in single quotes. For example,

```
dbmlsync -e "adr='host=somehost;port=5001'"
```

To store the Address or CommunicationType in the database, you can use an extended option or you can use the ADDRESS clause. For example,

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
```



```
        FOR ml_user1
        ADDRESS 'host=localhost;port=2439'
```


CommunicationType (ctp) extended option

Specifies the type of network protocol to use for connecting to the MobiLink server.

Syntax

ctp=*network-protocol*; ...

Remarks

network-protocol can be one of **tcpip**, **tls**, **http**, or **https**. The default is **tcpip**.

You must ensure that all subscriptions for a MobiLink user are synchronized to only one consolidated database. Otherwise, you may experience data loss and unpredictable behavior.

This option has a short form and long form: you can use **ctp** or **CommunicationType**.

See also

- "Encrypting MobiLink client/server communications" [*SQL Anywhere Server - Database Administration*]
- "CommunicationAddress (adr) extended option" on page 165

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "ctp=https"
```

To store the CommunicationType in the database, you can use an extended option or you can use the TYPE clause. For example,

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   TYPE 'tcpip'
```


ConflictRetries (cr) extended option

Specifies the number of retries if the download fails because of conflicts.

Syntax

cr=*number*; ...

Remarks

When the extended option LockTables is set to OFF (preventing dbmlsync from obtaining locks on the tables being synchronized), it is possible for operations to be applied to the database between the time the upload is built and the time that the download is applied. If these changes affect rows that will also be changed by the download, dbmlsync will consider this to be a conflict and will not apply the download stream. When this occurs dbmlsync retries the entire synchronization. This option controls the number of retries that are performed.

This option is useful only if the LockTables option is OFF, which is not the default.

The default is **-1** (retries should continue indefinitely).

This option has a short form and long form: you can use **cr** or **ConflictRetries**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "Handling conflicts" [*MobiLink - Server Administration*]

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "cr=5"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION cr='5';
```


ContinueDownload (cd) extended option

Restarts a previously failed download.

Syntax

cd={ **ON** | **OFF** }; ...

Remarks

If MobiLink fails during a download it does not apply any of the download data to the remote database. However, it stores the part of the download it did receive in a temporary file on the remote device, so that it can be restarted later. When you set the extended option cd=on, dbmlsync restarts the download and attempts to download the part of the previous download that it did not receive. If it is able to download the remaining data, it applies the complete download to your remote database.

If there is any new data to be uploaded when you set -cd=on, the restartable download will fail.

You can also specify restartable downloads for SQL Anywhere remote databases with the -dc option or with the sp_hook_dbmlsync_end hook.

This option has a short form and long form: you can use **cd** or **ContinueDownload**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "Resuming failed downloads" [*MobiLink - Server Administration*]
- "sp_hook_dbmlsync_set_extended_options" on page 263
- "-dc option" on page 124
- "sp_hook_dbmlsync_end" on page 246

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "cd=on"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION cd='on';
```


DisablePolling (p) extended option

Disables automatic logscan polling.

Syntax

p={ **ON** | **OFF** }; ...

Remarks

To build an upload, dbmlsync must scan the transaction log. Usually it does this just before synchronization. However, when synchronizations are scheduled, dbmlsync by default scans the log in the time between scheduled synchronizations; and when the sp_hook_dbmlsync_delay hook is used, dbmlsync by default scans the log in the pause that occurs just before synchronization. This behavior is more efficient because the log is already at least partially scanned when synchronization begins. This default behavior is called logscan polling.

Logscan polling is on by default but only has an effect when synchronizations are scheduled or when sp_hook_dbmlsync_delay hook is used. When in effect, polling occurs at set intervals: dbmlsync scans to the end of the log, waits for the polling period, and then scans any new transactions in the log. By default, the polling period is 1 minute, but it can be changed with the dbmlsync -pp option or the PollingPeriod extended option.

The default is to not disable logscan polling (**OFF**).

This option is identical to **dbmlsync -p**.

This option has a short form and long form: you can use **p** or**DisablePolling**.

You can also store extended options in the database. For more information about dbmlsync extended options, see “Introduction to dbmlsync extended options” on page 163.

See also

- “PollingPeriod (pp) extended option” on page 188
- “-p option” on page 142
- “-pp option” on page 146

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "p=on"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION p='on';
```


DownloadBufferSize (dbs) extended option

Specifies the size of the download buffer.

Syntax

dbs=*number*[**K** | **M**]; ...

Remarks

The buffer size is specified in units of bytes. Use the suffix k or m to specify units of kilobytes or megabytes, respectively.

If you set this option to 0, dbmlsync does not buffer the download. If this option is greater than 0, the entire download stream is read from the communication stream with the MobiLink server before it is applied to the remote database. If the download stream fits in the space specified by the option then it is held entirely in memory; otherwise some of it is written to a temporary file.

If the setting is greater than 0 but less than 4 KB, dbmlsync uses a 4 KB buffer size and issues a warning. The default is **32k** on Windows CE, and **1m** on all other operating systems.

Download buffering increases the benefit of eliminating the download acknowledgement because it allows the MobiLink server to send the download faster.

This option has a short form and long form: you can use **dbs** or **DownloadBufferSize**.

You can also store extended options in the database. For more information about dbmlsync extended options, see “Introduction to dbmlsync extended options” on page 163.

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "dbs=32k"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION dbs='32k';
```


DownloadOnly (ds) extended option

Specifies that synchronization should be download-only.

Syntax

ds={ **ON** | **OFF** }; ...

Remarks

When download-only synchronization occurs, dbmlsync does not upload any row operations or data. However, it does upload information about the schema and progress offset.

In addition, dbmlsync ensures that changes on the remote are not overwritten during download-only synchronization. It does this by scanning the log to detect rows with operations waiting to be uploaded. If any of these rows is modified by the download, the download is rolled back and the synchronization fails. If the synchronization fails for this reason, you must do a full synchronization to correct the problem.

When you have remotes that are synchronized by download-only synchronization, you should regularly do a full synchronization to reduce the amount of log that is scanned by the download-only synchronization. Otherwise, the download-only synchronizations will take an increasingly long time to complete. If this is a problem, you can alternatively use a download-only publication to avoid log issues during synchronization.

For a list of the scripts that must be defined for download-only synchronization, see "Required scripts" [*MobiLink - Server Administration*].

The default is **OFF** (full synchronization of both upload and download).

This option has a short form and long form: you can use **ds** or **DownloadOnly**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "-ds option" on page 127
- "Download-only publications" on page 87
- "Upload-only and download-only synchronizations" [*MobiLink - Server Administration*]

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "ds=on"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION ds='ON';
```


DownloadReadSize (drs) extended option

For restartable downloads, specifies the maximum amount of data that may need to be resent after a communications failure.

Syntax

drs=*number*[**K**]; ...

Remarks

The DownloadReadSize option is only useful when doing restartable downloads.

The download read size is specified in units of bytes. Use the suffix k to optionally specify units of kilobytes.

Dbmlsync reads the download in chunks. The DownloadReadSize defines the size of these chunks. When a communication error occurs, dbmlsync loses the entire chunk that was being processed. Depending on when the error occurs, the number of bytes lost will be between 0 and the DownloadReadSize -1. So for example, if the DownloadReadSize is 100 bytes and an error occurs after reading 497 bytes, the last 97 bytes read will be lost. Bytes that are lost in this way will be resent when the download is restarted.

In general, larger DownloadReadSize values result in better performance on successful synchronizations but result in more data being resent when an error occurs.

The typical use of this option is to reduce the default size when communication is unreliable.

The default is **32767**. If you set this option to a value larger than 32767, the value 32767 is used.

This option has a short form and long form: you can use **drs** or **DownloadReadSize**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "-drs option" on page 126
- "Resuming failed downloads" [*MobiLink - Server Administration*]
- "ContinueDownload (cd) extended option" on page 169
- "sp_hook_dbmlsync_end" on page 246
- "-dc option" on page 124

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "drs=100"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION drs='100';
```


ErrorLogSendLimit (el) extended option

Specifies how much of the remote log file dbmlsync should send to the server when synchronization error occurs.

Syntax

el=*number*[**K** | **M**]; ...

Remarks

This option is specified in units of bytes. Use the suffix k or m to specify units of kilobytes or megabytes, respectively.

This option specifies the number of bytes of the output log that dbmlsync sends to the MobiLink server when errors occur during synchronization. Set this option to **0** if you don't want any dbmlsync output log to be sent.

When this option is non-zero, the error log is uploaded when a client-side error occurs. Not all client-side errors cause the log to be sent: the log is not sent for communication errors or errors that occur when dbmlsync is not connected to the MobiLink server. If the error occurs after the upload is sent, the error log is uploaded only if the SendDownloadAck extended option is set to ON.

If ErrorLogSendLimit is set to be large enough, dbmlsync sends the entire output log messages from the current session to the MobiLink server. For example, if the output log messages were appended to an old output log file, dbmlsync only sends the new messages generated in the current session. If the total length of new messages is greater than ErrorLogSendLimit, dbmlsync only logs the last part of the newly generated error and log messages up to the specified size.

Note: The size of the output log is influenced by your verbosity settings. You can adjust these using the dbmlsync -v option, or by using dbmlsync extended options starting with "verbose". For more information, see "-v option" on page 158 and the -e verbose options:

- "Verbose (v) extended option" on page 199
- "VerboseHooks (vs) extended option" on page 200
- "VerboseMin (vm) extended option" on page 201
- "VerboseOptions (vo) extended option" on page 202
- "VerboseRowCounts (vn) extended option" on page 203
- "VerboseRowValues (vr) extended option" on page 204
- "VerboseUpload (vu) extended option" on page 205

The default is **32K**.

This option has a short form and long form: you can use **el** or **ErrorLogSendLimit**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "el=32k"
```


The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION el='32k';
```


FireTriggers (ft) extended option

Specifies that triggers should be fired on the remote database when the download is applied.

Syntax

ft={ **ON** | **OFF** }; ...

Remarks

The default is **ON**.

This option has a short form and long form: you can use **ft** or **FireTriggers**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "ft=off"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION ft='off';
```


HoverRescanThreshold (hrt) extended option

When you are using scheduling, this limits the amount of discarded memory that is allowed to accumulate before a rescan is performed.

Syntax

hrt=*number*[**K** | **M**]; ...

Remarks

Specifies memory in units of bytes. Use the suffix k or m to specify units of kilobytes or megabytes, respectively. The default is **1m**.

When more than one -n option is specified at the command line, dbmlsync may experience fragmentation which results in discarded memory. The discarded memory can only be recovered by rescanning the database transaction log. This option lets you specify a limit on the amount of discarded memory that will be allowed to accumulate before the log is rescanned and the memory recovered. Another way to control the recovery of discarded memory is to implement the sp_hook_dbmlsync_log_rescan stored procedure.

This option has a short form and long form: you can use **hrt** or **HoverRescanThreshold**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "sp_hook_dbmlsync_log_rescan" on page 248

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "hrt=2m"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION hrt='2m';
```


IgnoreHookErrors (eh) extended option

Specifies that errors that occur in hook functions should be ignored.

Syntax

eh={ **ON** | **OFF** }; ...

Remarks

The default is **OFF**.

This option has a short form and long form: you can use **eh** or **IgnoreHookErrors**.

This option is equivalent to the dbmlsync -eh option.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "eh=off"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION eh='off';
```


IgnoreScheduling (isc) extended option

Specifies that scheduling settings should be ignored.

Syntax

isc={ **ON** | **OFF** }; ...

Remarks

If set to ON, dbmlsync ignores any scheduling information that is specified in extended options and synchronizes immediately. The default is **OFF**.

This option is equivalent to the dbmlsync -is option.

This option has a short form and long form: you can use **isc** or **IgnoreScheduling**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "Scheduling synchronization" on page 105
- "Schedule (sch) extended option" on page 189

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "isc=off"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION isc='off';
```


Increment (inc) extended option

Enables incremental uploads and controls the size of upload increments.

Syntax

inc=*number*[**K** | **M**]; ...

Remarks

This option specifies a minimum incremental scan volume in units of bytes. Use the suffix k or m to specify units of kilobytes or megabytes, respectively.

When this option is specified, uploads are sent to MobiLink in one or more parts. This could be useful if a site has difficulty maintaining a connection for long enough to complete the full upload. When the option is not set, uploads are sent as a single unit.

The value of this option specifies, very approximately, the size of each upload part. The value of the option controls the size of each upload part as follows. Dbmlsync builds the upload by scanning the database transaction log. When this option is set, dbmlsync scans the number of bytes that are set in the option, and then continues scanning to the first point at which there are no outstanding partial transactions—the next point at which all transactions have either been committed or rolled back. It then sends what it has scanned as an upload part and resumes scanning the log from where it left off.

You cannot use the Increment extended option with scripted upload or transactional upload.

This option has a short form and long form: you can use **inc** or **Increment**.

You can also store extended options in the database. For more information about dbmlsync extended options, see “Introduction to dbmlsync extended options” on page 163.

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "inc=32000"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION inc='32k';
```


LockTables (lt) extended option

Specifies that tables in the publications being synchronized should be locked before synchronizing.

Syntax

lt={ **ON** | **OFF** | **SHARE** | **EXCLUSIVE** }; ...

Remarks

SHARE means that dbmlsync locks all synchronization tables in shared mode. EXCLUSIVE means that dbmlsync locks all synchronization tables in exclusive mode. For all platforms except Windows CE, ON is the same as SHARE. For Windows CE devices, ON is the same as EXCLUSIVE. The default is **ON**.

Set to OFF to allow modifications during synchronization. When OFF is used, dbmlsync uses a different mechanism to ensure that the download does not overwrite rows with changes waiting to be uploaded.

For more information about shared and exclusive locks, see "How locking works" [*SQL Anywhere Server - SQL Usage*] and "LOCK TABLE statement" [*SQL Anywhere Server - SQL Reference*].

For more information about locking tables in MobiLink applications, see "Concurrency during synchronization" on page 99.

When synchronization tables are locked in exclusive mode (the default for Windows CE devices), no other connections can access the tables, and so dbmlsync stored procedures that execute on a separate connection will not be able to execute if they require access to any of the synchronization tables.

For information about hooks that execute on separate connections, see "Event Hooks for SQL Anywhere Clients" on page 209.

This option has a short form and long form: you can use **lt** or **LockTables**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "lt=on"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION lt='on';
```


Memory (mem) extended option

Specifies a cache size that is used by dbmlsync when building the upload.

Syntax

mem=*number*[**K** | **M**]; ...

Remarks

Specifies the size of the cache used for building the upload, in units of bytes. A larger cache means that dbmlsync can keep more pages of data in memory, thus reducing the number of disk reads/writes and improving performance.

Use the suffix k or m to specify units of kilobytes or megabytes, respectively. The default is **1M**.

This option has a short form and long form: you can use **mem** or **Memory**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "-urc option" on page 156
- "Performance tips" [*MobiLink - Server Administration*]

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "mem=2M"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION mem='2m';
```


MirrorLogDirectory (mld) extended option

Specifies the location of old mirror log files so that they can be deleted.

Syntax

mld=*filename*; ...

Remarks

This option makes it possible for dbmlsync to delete old mirror log files when either of the following two circumstances occur:

- the offline mirror log is located in a different directory from the mirror transaction log

  or

- dbmlsync is run on a different machine from the remote database engine

In a normal setup, the active mirror log and renamed mirror transaction logs are located in the same directory, and dbmlsync is run on the same machine as the remote database, so this option is not required and old mirror log files are automatically deleted.

Transaction logs in this directory will only be affected if the delete_old_logs database option is set to On, Delay, or *n* days.

This option has a short form and long form: you can use **mld** or **MirrorLogDirectory**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "delete_old_logs option [MobiLink client] [SQL Remote] [Replication Agent]" [*SQL Anywhere Server - Database Administration*]

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "mld=c:\tmp\file"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION mld='c:\tmp\file';
```


MobiLinkPwd (mp) extended option

Specifies the MobiLink password.

Syntax

mp=*password*; ...

Remarks

Specifies the password used to connect. This password should be the correct password for the MobiLink user whose subscriptions are being synchronized. This user may be specified with the dbmlsync -u option. The default is **NULL**.

If the MobiLink user already has a password, use the extended option **-e mn** to change it.

This option has a short form and long form: you can use **mp** or **MobiLinkPwd**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "NewMobiLinkPwd (mn) extended option" on page 185
- "-mn option" on page 136
- "-mp option" on page 137

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "mp=password"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION mp='SQL';
```


NewMobiLinkPwd (mn) extended option

Specifies a new password.

Syntax

mn=*new-password*; ...

Remarks

Specifies a new password for the MobiLink user whose subscriptions are being synchronized. Use this option when you want to change an existing password. The default is not to change the password.

This option has a short form and long form: you can use **mn** or **NewMobiLinkPwd**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "MobiLinkPwd (mp) extended option" on page 184
- "-mn option" on page 136
- "-mp option" on page 137

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "mp=oldpassword; mn=newpassword"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION mn='SQL';
```


NoSyncOnStartup (nss) extended option

Prevents dbmlsync from synchronizing on startup when a scheduling option would otherwise cause that to happen.

Syntax

nss={ **on** | **off** }; ...

Remarks

This option has an effect only when a schedule is used with the EVERY or INFINITE clause. These scheduling options cause dbmlsync to automatically synchronize on startup.

The default is off.

When you set NoSyncOnStartup to on and use a schedule with the INFINITE clause, a synchronization does not occur until a window message is received.

When you set NoSyncOnStartup to on and use a schedule with the EVERY clause, the first synchronization after startup occurs after the amount of time specified in the EVERY clause.

This setting does not affect the behavior of the schedule in any way other than at dbmlsync startup.

This option has a short form and long form: you can use **nss** or **NoSyncOnStartup**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "Schedule (sch) extended option" on page 189
- "Scheduling synchronization" on page 105

Example

The following partial dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "schedule=EVERY:01:00;nss=off"...
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION nss='off', schedule='EVERY:01:00';
```


OfflineDirectory (dir) extended option

Specifies the path containing offline transaction logs.

Syntax

dir=*path*; ...

Remarks

This option has a short form and long form: you can use **dir** or **OfflineDirectory**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "dir=c:\db\logs"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION dir='c:\db\logs';
```


PollingPeriod (pp) extended option

Specifies the logscan polling period.

Syntax

pp=*number*[**S** | **M** | **H** | **D**]; ...

Remarks

This option specifies the interval between log scans. Use the suffix s, m, h, or d to specify seconds, minutes, hours or days, respectively. The default is **1** minute. If you do not specify a suffix, the default unit of time is minutes.

Logscan polling occurs only when you are scheduling synchronizations or using the sp_hook_dbmlsync_delay hook.

For an explanation of logscan polling, see "DisablePolling (p) extended option" on page 170.

This option is identical to **dbmlsync -pp**.

This option has a short form and long form: you can use **pp** or **PollingPeriod**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "DisablePolling (p) extended option" on page 170
- "-pp option" on page 146
- "-p option" on page 142
- "sp_hook_dbmlsync_delay" on page 226

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "pp=5"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION pp='5';
```


Schedule (sch) extended option

Specifies a schedule for synchronization.

Syntax

sch=*schedule*; ...

schedule : { **EVERY**:*hhhh*:*mm* | **INFINITE** | *singleSchedule* }

hhhh : **00**… **9999**

mm : **00**… **59**

singleSchedule : *day* @*hh*:*mm*[**AM** | **PM**] [**–***hh*:*mm*[**AM** | **PM**]] ,...

hh : **00**… **24**

mm : **00**… **59**

day :
EVERYDAY | **WEEKDAY** | **MON** | **TUE** | **WED** | **THU** | **FRI** | **SAT** | **SUN** | *dayOfMonth*

dayOfMonth : **0**… **31**

Parameters

EVERY The EVERY keyword causes synchronization to occur on startup, and then repeat indefinitely after the specified time period. If the synchronization process takes longer than the specified period, synchronization starts again immediately.

To avoid having a synchronization occur as soon as dbmlsync starts, use the extended option NoSyncOnStartup. See "NoSyncOnStartup (nss) extended option" on page 186.

singleSchedule Given one or more single schedules, synchronization occurs only at the specified days and times.

An interval is specified as *@hh*:*mm*–*hh*:*mm* (with optional specification of AM or PM). If AM or PM is not specified, a 24-hour clock is assumed. 24:00 is interpreted as 00:00 on the next day. When an interval is specified, synchronization occurs, starting at a random time within the interval. The interval provides a window of time for synchronization so that multiple remote databases with the same schedule do not cause congestion at the synchronization server by synchronizing at exactly the same time.

The interval end time is always interpreted as following the start time. When the time interval includes midnight, it ends on the next day. If dbmlsync is started midway through the interval, synchronization occurs at a random time before the end time.

EVERYDAY EVERYDAY is all seven days of the week.

WEEKDAY WEEKDAY is Monday through Friday.

Days of the week are Mon, Tue, and so on. You may also use the full forms of the day, such as Monday. You must use the full forms of the day names if the language you are using is not English, is not the language requested by the client in the connection string, and is not the language which appears in the server window.

dayOfMonth To specify the last day of the month regardless of the length of the month, set the *dayOfMonth* to 0.

INFINITE The INFINITE keyword causes dbmlsync to synchronize on startup, and then not to synchronize again until synchronization is initiated by another program sending a window message to dbmlsync. While it waits, dbmlsync runs and scans the log periodically. You can use the dbmlsync extended option NoSyncOnStartup to avoid the initial synchronization.

For more information, see "NoSyncOnStartup (nss) extended option" on page 186.

You can use this option in conjunction with the dbmlsync -wc option to wake up dbmlsync and perform a synchronization.

For more information, see "-wc option" on page 159.

Remarks

If a previous synchronization is still incomplete at a scheduled time, the scheduled synchronization commences when the previous synchronization completes.

The default is no schedule.

This option has a short form and long form: you can use **sch** or **Schedule**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

The schedule option syntax is the same when used in the synchronization SQL statements and in the dbmlsync command line.

The IgnoreScheduling extended option and the -is option instruct dbmlsync to ignore scheduling, so that synchronization is immediate. For more information, see "IgnoreScheduling (isc) extended option" on page 179.

For more information about scheduling, see "Scheduling synchronization" on page 105.

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "sch=WEEKDAY@8:00am,SUN@9:00pm"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION sch='WEEKDAY@8:00am,SUN@9:00pm';
```


ScriptVersion (sv) extended option

Specifies a script version.

Syntax

sv=*version-name*; ...

Remarks

The script version determines which scripts are run by MobiLink on the consolidated database during synchronization. The default script version name is **default**.

This option has a short form and long form: you can use **sv** or **ScriptVersion**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "sv=SyaAd001"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION sv='SysAd001';
```


SendColumnNames (scn) extended option

Specifies that column names should be sent in the upload for use by direct row handling.

Syntax

scn={ **ON** | **OFF** }; ...

Remarks

The column names are used by the MobiLink server for direct row handling. When using the row handling API to refer to columns by name rather than by index, you should set this option. This is the only use of the column names that are sent by this option.

See "Direct Row Handling" [*MobiLink - Server Administration*].

The default is **OFF**.

This option has a short form and long form: you can use **scn** or **SendColumnNames**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "scn=on"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION scn='on';
```


SendDownloadACK (sa) extended option

Specifies that a download acknowledgement should be sent from the client to the server.

Syntax

sa={ **ON** | **OFF** }; ...

Remarks

Turning the acknowledgement off (the default) can lead to less contention in the consolidated database and also increased throughput due to shorter download transactions. Download transactions are shorter because they are committed or rolled back as soon as possible, since MobiLink doesn't need to keep these transactions open for as long as it takes the remote client to apply the download. Enable client side download buffering to get the most performance out of eliminating the download acknowledgement. It is recommended that SendDownloadAck be set to OFF. If the download fails, the remote will upload the same timestamp over again, and no data will be lost.

For more information about improving performance by turning off the download acknowledgement, see "Do not enable download acknowledgement" [*MobiLink - Server Administration*].

Note: When SendDownloadAck is set to ON and you are in verbose mode, an acknowledgement line is written to the client log.

The default is **OFF**.

This option has a short form and long form: you can use **sa** or **SendDownloadACK**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "sa=off"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION sa='off';
```


SendTriggers (st) extended option

Specifies that trigger actions should be sent on upload.

Syntax

st={ **ON** | **OFF** }; ...

Remarks

Cascaded deletes are also considered trigger actions.

The default is **OFF**.

This option has a short form and long form: you can use **st** or **SendTriggers**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "st=on"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION st='on';
```


TableOrder (tor) extended option

Specifies the order of tables in the upload.

Syntax

tor=*tables*; ...

tables = *table-name* [**,***table-name*], ...

Remarks

This option allows you to specify the order of tables on the remote database that are to be uploaded. Specify *tables* as a comma-separated list. You must specify all tables that are to be uploaded. If you include tables that are not included in the synchronization, they are ignored.

The table order that you specify must ensure referential integrity. This means that if Table1 has a foreign key reference to Table2, then Table2 must be uploaded before Table1. If you do not specify tables in the appropriate order, you will get an error, except in the two following cases:

- You set TableOrderChecking=OFF.
- Your tables have a cyclical foreign key relationship. (In this case, there is no order that satisfies the rule and so the tables involved in the cycle can be uploaded in any order.)

If you do not specify TableOrder, then dbmlsync chooses an order that satisfies referential integrity.

The order of tables on the download is the same as the upload. Control of the upload table order may make writing server side scripts simpler, especially if the remote and consolidated databases have different foreign key constraints.

There are no cases where this option must be used. It is provided for users who want to ensure that tables are uploaded in a specific order.

This option has a short form and long form: you can use **tor** or **TableOrder**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "TableOrderChecking (toc) extended option" on page 197
- "How the upload is processed" [*MobiLink - Getting Started*]
- "Referential integrity and synchronization" [*MobiLink - Getting Started*]

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "tor=admin,parent,child"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
```



```
FOR ml_user1
OPTION tor='admin,parent,child';
```


TableOrderChecking (toc) extended option

When you specify TableOrder, determines whether dbmlsync should check that no table is uploaded before another table on which it has a foreign key.

Syntax

tor={ OFF | ON }; ...

Remarks

In most applications, tables on the remote and consolidated databases have the same foreign key relationships. In these cases, you should leave TableOrderChecking at its default value of ON, and dbmlsync will ensure that no table is uploaded before another table on which it has a foreign key. This ensures referential integrity.

This option is useful when the consolidated and remote databases have different foreign key relationships. Use it with the TableOrder extended option to specify an order of tables that does not follow the rule that no table is uploaded before one on which it has a foreign key.

This option is only useful when the TableOrder extended option is specified.

The default is ON.

This option has a short form and long form: you can use **toc** or **TableOrderChecking**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "TableOrder (tor) extended option" on page 195
- "How the upload is processed" [*MobiLink - Getting Started*]
- "Referential integrity and synchronization" [*MobiLink - Getting Started*]

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "toc=OFF"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION toc='Off';
```


UploadOnly (uo) extended option

Specifies that synchronization should only include an upload.

Syntax

uo={ **ON** | **OFF** }; ...

Remarks

During upload-only synchronization, dbmlsync prepares and sends an upload to the MobiLink server exactly as in a normal full synchronization. However, instead of sending a download back down, MobiLink sends only an acknowledgement indicating if the upload was successfully committed.

For a list of the scripts that must be defined for upload-only synchronization, see "Required scripts" [*MobiLink - Server Administration*].

The default is **OFF**.

This option has a short form and long form: you can use **uo** or **UploadOnly**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "Upload-only and download-only synchronizations" [*MobiLink - Server Administration*]
- "DownloadOnly (ds) extended option" on page 172

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "uo=on"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION uo='on';
```


Verbose (v) extended option

Specifies full verbosity.

Syntax

v={ **ON** | **OFF** }; ...

Remarks

This option specifies a high level of verbosity, which may affect performance and should normally be used in the development phase only.

This option is identical to **dbmlsync -v+**. If you specify both -v and the extended options and there are conflicts, the -v option overrides the extended option. If there is no conflict, the verbosity logging options are additive—all options that you specify are used. When logging verbosity is set by extended option, the logging does not take effect immediately, so startup information is not logged. By the time of the first synchronization, the logging behavior is identical between the -v options and the extended options.

For more information, see "-v option" on page 158.

The default is **OFF**.

This option has a short form and long form: you can use **v** or **Verbose**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "VerboseHooks (vs) extended option" on page 200
- "VerboseMin (vm) extended option" on page 201
- "VerboseOptions (vo) extended option" on page 202
- "VerboseRowCounts (vn) extended option" on page 203
- "VerboseRowValues (vr) extended option" on page 204
- "VerboseUpload (vu) extended option" on page 205

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "v=on"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION v='on';
```


VerboseHooks (vs) extended option

Specifies that messages related to hook scripts should be logged.

Syntax

vs={ **ON** | **OFF** }; ...

Remarks

This option is identical to **dbmlsync -vs**. If you specify both -v and the extended options and there are conflicts, the -v option overrides the extended option. If there is no conflict, the verbosity logging options are additive—all options that you specify are used. When logging verbosity is set by extended option, the logging does not take effect immediately, so startup information is not logged. By the time of the first synchronization, the logging behavior is identical between the -v options and the extended options.

For more information, see "-v option" on page 158.

The default is **OFF**.

This option has a short form and long form: you can use **vs** or **VerboseHooks**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "Event Hooks for SQL Anywhere Clients" on page 209
- "Verbose (v) extended option" on page 199
- "VerboseMin (vm) extended option" on page 201
- "VerboseOptions (vo) extended option" on page 202
- "VerboseRowCounts (vn) extended option" on page 203
- "VerboseRowValues (vr) extended option" on page 204
- "VerboseUpload (vu) extended option" on page 205

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "vs=on"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION vs='on';
```


VerboseMin (vm) extended option

Specifies that a small amount of information should be logged.

Syntax

vm={ **ON** | **OFF** }; ...

Remarks

This option is identical to **dbmlsync -v**. If you specify both -v and the extended options and there are conflicts, the -v option overrides the extended option. If there is no conflict, the verbosity logging options are additive—all options that you specify are used. When logging verbosity is set by extended option, the logging does not take effect immediately, so startup information is not logged. By the time of the first synchronization, the logging behavior is identical between the -v options and the extended options.

For more information, see "-v option" on page 158.

The default is **OFF**.

This option has a short form and long form: you can use **vm** or **VerboseMin**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "Verbose (v) extended option" on page 199
- "Verbose (v) extended option" on page 199
- "VerboseOptions (vo) extended option" on page 202
- "VerboseRowCounts (vn) extended option" on page 203
- "VerboseRowValues (vr) extended option" on page 204
- "VerboseUpload (vu) extended option" on page 205

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "vm=on"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION vm='on';
```


VerboseOptions (vo) extended option

Specifies that information should be logged about the command line options (including extended options) that you have specified.

Syntax

vo={ **ON** | **OFF** }; ...

Remarks

This option is identical to **dbmlsync -vo**. If you specify both -v and the extended options and there are conflicts, the -v option overrides the extended option. If there is no conflict, the verbosity logging options are additive—all options that you specify are used. When logging verbosity is set by extended option, the logging does not take effect immediately, so startup information is not logged. By the time of the first synchronization, the logging behavior is identical between the -v options and the extended options.

For more information, see "-v option" on page 158.

The default is **OFF**.

This option has a short form and long form: you can use **vo** or **VerboseOptions**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "Verbose (v) extended option" on page 199
- "Verbose (v) extended option" on page 199
- "VerboseMin (vm) extended option" on page 201
- "VerboseRowCounts (vn) extended option" on page 203
- "VerboseRowValues (vr) extended option" on page 204
- "VerboseUpload (vu) extended option" on page 205

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "vo=on"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION vo='on';
```


VerboseRowCounts (vn) extended option

Specifies that the number of rows that are uploaded and downloaded should be logged.

Syntax

vn={ **ON** | **OFF** }; ...

Remarks

This option is identical to **dbmlsync -vn**. If you specify both -v and the extended options and there are conflicts, the -v option overrides the extended option. If there is no conflict, the verbosity logging options are additive—all options that you specify are used. When logging verbosity is set by extended option, the logging does not take effect immediately, so startup information is not logged. By the time of the first synchronization, the logging behavior is identical between the -v options and the extended options.

For more information, see "-v option" on page 158.

The default is **OFF**.

This option has a short form and long form: you can use **vn** or **VerboseRowCounts**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "Verbose (v) extended option" on page 199
- "Verbose (v) extended option" on page 199
- "VerboseMin (vm) extended option" on page 201
- "VerboseOptions (vo) extended option" on page 202
- "VerboseRowValues (vr) extended option" on page 204
- "VerboseUpload (vu) extended option" on page 205

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "vn=on"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION vn='on';
```


VerboseRowValues (vr) extended option

Specifies that the values of rows that are uploaded and downloaded should be logged.

Syntax

vr={ **ON** | **OFF** }; ...

Remarks

This option is identical to **dbmlsync -vr**. If you specify both -v and the extended options and there are conflicts, the -v option overrides the extended option. If there is no conflict, the verbosity logging options are additive—all options that you specify are used. When logging verbosity is set by extended option, the logging does not take effect immediately, so startup information is not logged. By the time of the first synchronization, the logging behavior is identical between the -v options and the extended options.

For more information, see "-v option" on page 158.

The default is **OFF**.

This option has a short form and long form: you can use **vr** or **VerboseRowValues**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "Verbose (v) extended option" on page 199
- "Verbose (v) extended option" on page 199
- "VerboseMin (vm) extended option" on page 201
- "VerboseOptions (vo) extended option" on page 202
- "VerboseRowCounts (vn) extended option" on page 203
- "VerboseUpload (vu) extended option" on page 205

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "vr=on"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION vr='on';
```


VerboseUpload (vu) extended option

Specifies that information about the upload steam should be logged.

Syntax

vu={ **ON** | **OFF** }; ...

Remarks

This option is identical to **dbmlsync -vu**. If you specify both -v and the extended options and there are conflicts, the -v option overrides the extended option. If there is no conflict, the verbosity logging options are additive—all options that you specify are used. When logging verbosity is set by extended option, the logging does not take effect immediately, so startup information is not logged. By the time of the first synchronization, the logging behavior is identical between the -v options and the extended options.

For more information, see "-v option" on page 158.

The default is **OFF**.

This option has a short form and long form: you can use **vu** or **VerboseUpload**.

You can also store extended options in the database. For more information about dbmlsync extended options, see "Introduction to dbmlsync extended options" on page 163.

See also

- "Verbose (v) extended option" on page 199
- "Verbose (v) extended option" on page 199
- "VerboseMin (vm) extended option" on page 201
- "VerboseOptions (vo) extended option" on page 202
- "VerboseRowCounts (vn) extended option" on page 203
- "VerboseRowValues (vr) extended option" on page 204

Example

The following dbmlsync command line illustrates how you can set this option when you start dbmlsync:

```
dbmlsync -e "vu=on"
```

The following SQL statement illustrates how you can store this option in the database:

```
CREATE SYNCHRONIZATION SUBSCRIPTION
   TO sales_publication
   FOR ml_user1
   OPTION vu='on';
```


CHAPTER 9

MobiLink SQL Statements

Contents

MobiLink Statements

Following are the SQL statements used for configuring and running MobiLink SQL Anywhere clients:

- "ALTER PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*]
- "ALTER SYNCHRONIZATION SUBSCRIPTION statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*]
- "ALTER SYNCHRONIZATION USER statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*]
- "CREATE PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*]
- "CREATE SYNCHRONIZATION SUBSCRIPTION statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*]
- "CREATE SYNCHRONIZATION USER statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*]
- "DROP PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*]
- "DROP SYNCHRONIZATION SUBSCRIPTION statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*]
- "DROP SYNCHRONIZATION USER statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*]
- "START SYNCHRONIZATION DELETE statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*]
- "STOP SYNCHRONIZATION DELETE statement [MobiLink]" [*SQL Anywhere Server - SQL Reference*]

UltraLite clients

See "UltraLite SQL Statement Reference" [*UltraLite - Database Management and Reference*].

CHAPTER 10

Event Hooks for SQL Anywhere Clients

Contents

Introduction to dbmlsync hooks

The SQL Anywhere synchronization client, dbmlsync, provides an optional set of event hooks that you can use to customize the synchronization process. When a hook is implemented, it is called at a specific point in the synchronization process.

You implement an event hook by creating a SQL stored procedure with a specific name. Most event-hook stored procedures are executed on the same connection as the synchronization itself.

You can use event hooks to log and handle synchronization events. For example, you can schedule synchronizations based on logical events, retry connection failures, or handle errors and referential integrity violations.

In addition, you can use event hooks to synchronize subsets of data that cannot be easily defined in a publication. For example, you can synchronize data in a temporary table by writing one event hook procedure to copy data from the temporary table to a permanent table prior to the synchronization and another to copy the data back afterwards.

Caution
The integrity of the synchronization process relies on a sequence of built-in transactions. Thus, you must not perform an implicit or explicit commit or rollback within your event-hook procedures.
Also, changing connection settings in a hook may produce unexpected results. If you need to change connection settings in a hook, the hook should restore the old value before the hook completes.

dbmlsync interfaces

You can use client event hooks with the dbmlsync command line utility or any programming interface used to synchronize SQL Anywhere clients, including the Dbmlsync Integration Component and the DBTools interface for dbmlsync.

See “Customizing dbmlsync synchronization” on page 107.

Synchronization event hook sequence

The following pseudo-code shows the available events and the point at which each is called during the synchronization process. For example, sp_hook_dbmlsync_abort is the first event hook to be invoked.

Each hook is provided with parameter values that you can use when you implement the procedure. In some cases, you can modify the value to return a new value; others are read-only. These parameters are not stored procedure arguments. No arguments are passed to any of the event-hook stored procedures. Instead, arguments are exchanged by reading and modifying rows in the #hook_dict table.

For example, the sp_hook_dbmlsync_begin procedure has a MobiLink user parameter, which is the MobiLink user being synchronized. You can retrieve this value from the #hook_dict table.

Although the sequence has similarities to the event sequence at the MobiLink server, there is little overlap in the kind of logic you would want to add to the consolidated and remote databases. The two interfaces are therefore separate and distinct.

If a *_begin hook executes successfully, the corresponding *_end hook is called regardless of any error that occurred after the *_begin hook. If the *_begin hook is not defined, but you have defined an *_end hook, then the *_end hook is called unless an error occurs prior to the point in time where the *_begin hook would normally be called.

If the hooks change data in your database, all changes up to and including sp_hook_dbmlsync_logscan_begin are synchronized in the current synchronization session; after that point, changes are synchronized in the next session.

```
sp_hook_dbmlsync_abort
sp_hook_dbmlsync_set_extended_options
loop until return codes direct otherwise (
   sp_hook_dbmlsync_abort
   sp_hook_dbmlsync_delay
)
sp_hook_dbmlsync_abort
// start synchronization
sp_hook_dbmlsync_begin
// upload events
for each upload segment
// a normal synchronization has one upload segment
// a transactional upload has one segment per transaction
// an incremental upload has one segment per upload piece
 sp_hook_dbmlsync_logscan_begin  //not called for scripted upload
 sp_hook_dbmlsync_logscan_end  //not called for scripted upload
 sp_hook_dbmlsync_set_ml_connect_info //only called during first upload
 sp_hook_dbmlsync_upload_begin
 sp_hook_dbmlsync_set_upload_end_ progress  //only called for scripted upload
 sp_hook_dbmlsync_upload_end
next upload segment

// download events
sp_hook_dbmlsync_validate_download_file (only called
   when -ba option is used)
for each download segment
sp_hook_dbmlsync_download_begin
for each table
   sp_hook_dbmlsync_download_table_begin
   sp_hook_dbmlsync_download_table_end
next table
sp_hook_dbmlsync_download_end


sp_hook_dbmlsync_schema_upgrade
// end synchronization
sp_hook_dbmlsync_end
sp_hook_dbmlsync_process_exit_code
sp_hook_dbmlsync_log_rescan
```

For more information about upload options, see "-tu option" on page 151 and "Increment (inc) extended option" on page 180.

Using event-hook procedures

This section describes some considerations for designing and using event-hook procedures.

Notes

- Do not perform any COMMIT or ROLLBACK operations in event-hook procedures. The procedures are executed on the same connection as the synchronization, and a COMMIT or ROLLBACK may interfere with synchronization.
- Don't change connection settings. Changing connection settings in a hook may produce unexpected results. If you need to change connection settings in a hook, the hook should restore the old value before the hook completes.
- The event-hook connection calls the stored procedures without qualifying them by owner. The stored procedures must therefore be owned by either the user name employed on the dbmlsync connection (typically a user with REMOTE DBA authority), or a group ID of which the dbmlsync user is a member.
- A remote database can only have one instance of each hook. Do not create multiple instances of a hook that have different owners.
- Hook procedures must be created by a user with DBA authority.
- If a *_begin hook executes successfully, the corresponding *_end hook is called regardless of any error that occurred after the *_begin hook. If the *_begin hook is not defined, but you have defined an *_end hook, then the *_end hook is called unless an error occurs prior to the point in time where the *_begin hook would normally be called.

#hook_dict table

Immediately before a hook is called, dbmlsync creates the #hook_dict table in the remote database, using the following CREATE statement. The # before the table name means that the table is temporary.

```
CREATE TABLE #hook_dict(
name VARCHAR(128) NOT NULL UNIQUE,
value VARCHAR(10240) NOT NULL)
```

The dbmlsync utility uses the #hook_dict table to pass values to hook functions, and hook functions use the #hook_dict table to pass values back to dbmlsync.

Each hook receives parameter values. In some cases, you can modify the value to return a new value; others are read-only. Each row in the table contains the value for one parameter.

For example, for the following dbmlsync command line, when the sp_hook_dbmlsync_abort hook is called, the #hook_dict table will contain the following rows:

```
dbmlsync -c 'dsn=MyDsn' -n pub1,pub2 -u MyUser
```

#hook_dict row	Value
publication_0	pub1
publication_1	pub2
MobiLink user	MyUser

#hook_dict row	Value
Abort synchronization	false

Your abort hook can retrieve values from the #hook_dict table and use them to customize behavior. For example, to retrieve the MobiLink user you would use a SELECT statement like this:

```
SELECT value
FROM #hook_dict
WHERE name = 'MobiLink user'
```

In/out parameters can be updated by your hook to modify the behavior of dbmlsync. For example, your hook could instruct dbmlsync to abort synchronization by updating the abort synchronization row of the table using a statement like this:

```
UPDATE #hook_dict
SET value='true'
WHERE name='abort synchronization'
```

The description of each hook lists the rows in the #hook_dict table.

Examples

The following sample sp_hook_dbmlsync_delay procedure illustrates the use of the #hook_dict table to pass arguments. The procedure allows synchronization only outside a scheduled down time of the MobiLink system between 18:00 and 19:00.

```
CREATE PROCEDURE sp_hook_dbmlsync_delay()
BEGIN
   DECLARE delay_val integer;
 SET delay_val=DATEDIFF(
   second, CURRENT TIME, '19:00');
 IF (delay_val>0 AND
     delay_val<3600)
 THEN
 UPDATE #hook_dict SET value=delay_val
   WHERE name='delay duration';
 END IF;
END
```

The following procedure is executed in the remote database at the beginning of synchronization. It retrieves the current MobiLink user name (one of the parameters available for the sp_hook_dbmlsync_begin event), and displays it on the console.

```
CREATE PROCEDURE sp_hook_dbmlsync_begin()
BEGIN
   DECLARE syncdef VARCHAR(150);
   SELECT '>>>syncdef = ' || value INTO syncdef
      FROM #hook_dict
      WHERE name ='MobiLink user name';
   MESSAGE syncdef TYPE INFO TO CONSOLE;
END
```

Connections for event-hook procedures

Each event-hook procedure is executed on the same connection as the synchronization itself. The following are exceptions:

- sp_hook_dbmlsync_all_error
- sp_hook_dbmlsync_communication_error
- sp_hook_dbmlsync_download_com_error
- sp_hook_dbmlsync_download_fatal_sql_error
- sp_hook_dbmlsync_download_log_ri_violation
- sp_hook_dbmlsync_misc_error
- sp_hook_dbmlsync_sql_error

These procedures are called before a synchronization fails. On failure, synchronization actions are rolled back. By executing on a separate connection, you can use these procedures to log information about the failure, without the logging actions being rolled back along with the synchronization actions.

Handling errors and warnings in event hook procedures

You can create event hook stored procedures to handle synchronization errors, MobiLink connection failures, and referential integrity violations. This section describes event hook procedures that are used to handle errors and warnings. Once implemented, each procedure is automatically executed whenever an error of the named type occurs.

Handling RI violations

Referential integrity violations occur when rows in the download violate foreign key relationships on the remote database. Use the following event hooks to log and handle referential integrity violations:

- "sp_hook_dbmlsync_download_log_ri_violation" on page 236
- "sp_hook_dbmlsync_download_ri_violation" on page 238

Handling MobiLink connection failures

The sp_hook_dbmlsync_ml_connect_failed event hook allows you to retry failed attempts to connect to the MobiLink server using a different communication type or address. If connection ultimately fails, dbmlsync calls the sp_hook_dbmlsync_communication_error and sp_hook_dbmlsync_all_error hooks.

See "sp_hook_dbmlsync_ml_connect_failed" on page 256.

Handling dbmlsync errors

Each time a dbmlsync error message is generated, the following hooks are called:

- First, depending on the type of error, one of the following hooks is called: sp_hook_dbmlsync_communication_error, sp_hook_dbmlsync_misc_error, or sp_hook_dbmlsync_sql_error. These hooks contain information specific to the type of error; for example, sqlcode and sqlstate are provided for SQL errors.
- Next, sp_hook_dbmlsync_all_error is called. This hook is useful for logging all errors that occur.

See:

- "sp_hook_dbmlsync_communication_error" on page 224
- "sp_hook_dbmlsync_sql_error" on page 268
- "sp_hook_dbmlsync_misc_error" on page 253
- "sp_hook_dbmlsync_all_error" on page 219

If you want to restart a synchronization in response to an error, you can use the user state parameter in sp_hook_dbmlsync_end.

See "sp_hook_dbmlsync_end" on page 246.

Ignoring errors

By default, synchronization stops when an error is encountered in an event hook procedure. You can instruct the dbmlsync utility to ignore errors that occur in event hook procedures by supplying the -eh option.

See "IgnoreHookErrors (eh) extended option" on page 178.

sp_hook_dbmlsync_abort

Use this stored procedure to cancel the synchronization process.

Rows in #hook_dict table

Name	Value	Description
abort synchronization (in|out)	**true** | **false**	If you set the abort synchronization row of the #hook_dict table to **true**, then dbmlsync terminates immediately after the event.
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
exit code (in|out)	number	When abort synchronization is set to TRUE, you can use this value to set the exit code for the aborted synchronization. 0 indicates a successful synchronization. Any other number indicates that the synchronization failed.
script version (in|out)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

If a procedure of this name exists, it is called at dbmlsync startup, and then again after each synchronization delay that is caused by the sp_hook_dbmlsync_delay hook.

If the hook requests an abort by setting the abort synchronization value to true, the exit code is passed to the sp_hook_dbmlsync_process_exit_code hook. If no sp_hook_dbmlsync_process_exit_code hook is defined, the exit code is used as the exit code for the program.

Actions of this procedure are committed immediately after execution.

See also

- "Synchronization event hook sequence" on page 211
- "sp_hook_dbmlsync_process_exit_code" on page 259

Examples

The following procedure prevents synchronization during a scheduled maintenance hour between 19:00 and 20:00 each day.

```
CREATE PROCEDURE sp_hook_dbmlsync_abort()
BEGIN
  DECLARE down_time_start TIME;
  DECLARE is_down_time VARCHAR(128);
  SET down_time_start='19:00';
```



```
  IF datediff( hour,down_time_start,now(*) ) < 1
  THEN

    set is_down_time='true';
  ELSE
    SET is_down_time='false';
  END IF;
  UPDATE #hook_dict
  SET value = is_down_time
  WHERE name = 'abort synchronization'
END;
```

Suppose you have an abort hook that may abort synchronization for one of two reasons. One of the reasons indicates normal completion of synchronization, so you want dbmlsync to have an exit code of 0. The other reason indicates an error condition, so you want dbmlsync to have a non-zero exit code. You could achieve this with an sp_hook_dbmlsync_abort hook defined as follows.

```
BEGIN
   IF [condition that defines the normal abort case] THEN
      UPDATE #hook_dict SET value =  '0'
   WHERE name = 'exit code';
      UPDATE #hook_dict SET value =  'TRUE'
   WHERE name = 'abort synchronization';
   ELSEIF [condition that defines the error abort case] THEN
      UPDATE #hook_dict SET value =  '1'
   WHERE name = 'exit code';
      UPDATE #hook_dict SET value =  'TRUE'
   WHERE name = 'abort synchronization';
   END IF;
END;
```


sp_hook_dbmlsync_all_error

Use this stored procedure to process dbmlsync error messages of all types. For example, you can implement the sp_hook_dbmlsync_all_error hook to log errors or perform a specific action when a specific error occurs.

Rows in #hook_dict table

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version that is used for the synchronization.
error message (in)	error message text	This is the same text that is displayed in the dbmlsync log.
error id (in)	integer	An ID that uniquely identifies the message. Use this row to identify the error message, as the error message text may change.
error hook user state (in|out)	integer	This value can be set by the hook to pass state information to future calls to the sp_hook_dbmlsync_all_error, sp_hook_dbmlsync_communication_error, sp_hook_dbmlsync_misc_error, sp_hook_dbmlsync_sql_error, or sp_hook_dbmlsync_end hooks. The first time one of these hooks is called, the value of the row is 0. If the hook changes the value of the row, the new value is used in the next hook call. When you use this hook to pass state information to the sp_hook_dbmlsync_end hook, you can cause the sp_hook_dbmlsync_end hook to perform actions such as retrying the synchronization.

Remarks

Each time a dbmlsync error message is generated, the following hooks are called:

- First, depending on the type of error, one of the following hooks is called: sp_hook_dbmlsync_communication_error, sp_hook_dbmlsync_misc_error, or sp_hook_dbmlsync_sql_error. These hooks contain information specific to the type of error; for example, sqlcode and sqlstate are provided for SQL errors.
- Next, the sp_hook_dbmlsync_all_error is called. This hook is useful for logging all errors that occurred.

If an error occurs during startup before a synchronization has been initiated, the #hook_dict entries for MobiLink user and Script version are set to an empty string, and no publication_*n* rows are set in the #hook_dict table.

This procedure executes on a separate connection to ensure that operations it performs are not lost if a rollback is performed on the synchronization connection. If dbmlsync cannot establish a separate connection, the procedure is not called.

By default on Windows CE devices, synchronization tables are locked in exclusive mode, which means that this hook cannot successfully execute if it requires access to any of the synchronization tables. It also cannot execute if it needs to access synchronization tables and you set the dbmlsync extended option LockTables to EXCLUSIVE. See "LockTables (lt) extended option" on page 181.

Actions of this procedure are committed immediately after the hook completes.

See also

- "Handling errors and warnings in event hook procedures" on page 215
- "sp_hook_dbmlsync_communication_error" on page 224
- "sp_hook_dbmlsync_misc_error" on page 253
- "sp_hook_dbmlsync_sql_error" on page 268

Example

Assume you use the following table to log errors in the remote database.

```
CREATE TABLE error_log
(
 pk INTEGER DEFAULT AUTOINCREMENT PRIMARY KEY,
 err_id INTEGER,
 err_msg VARCHAR(10240),
);
```

The following example sets up sp_hook_dbmlsync_all_error to log errors.

```
CREATE PROCEDURE sp_hook_dbmlsync_all_error()
BEGIN
 DECLARE msg VARCHAR(10240);
 DECLARE id INTEGER;

 // get the error message text
 SELECT value INTO msg
  FROM #hook_dict
  WHERE name ='error message';

 // get the error id
 SELECT value INTO id
  FROM #hook_dict
  WHERE name = 'error id';

 // log the error information
 INSERT INTO error_log(err_msg, err_id)
  VALUES (msg, id);
END;
```

To see possible error id values, test run dbmlsync. For example, if dbmlsync returns the error "Unable to connect to MobiLink server", sp_hook_dbmlsync_all_error inserts the following row in error_log.


```
1,14173,
 'Unable to connect to MobiLink server'
```

Now, you can associate the error "Unable to connect to MobiLink server" with the error id 14173.

The following example sets up hooks to retry the synchronization whenever error 14173 occurs.

```
CREATE PROCEDURE sp_hook_dbmlsync_all_error()
BEGIN
 IF EXISTS( SELECT value FROM #hook_dict
    WHERE name = 'error id' AND value = '14173' )
 THEN
    UPDATE #hook_dict SET value = '1'
       WHERE name = 'error hook user state';
   END IF;
END;

CREATE PROCEDURE sp_hook_dbmlsync_end()
BEGIN
 IF EXISTS( SELECT value FROM #hook_dict
    WHERE name='error hook user state' AND value='1')
 THEN
    UPDATE #hook_dict SET value = 'sync'
       WHERE name='restart';
   END IF;
END;
```

See “sp_hook_dbmlsync_end” on page 246.

sp_hook_dbmlsync_begin

Use this stored procedure to add custom actions at the beginning of the synchronization process.

Rows in #hook_dict table

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

If a procedure of this name exists, it is called at the beginning of the synchronization process.

Actions of this procedure are committed immediately after execution.

See also

- "Synchronization event hook sequence" on page 211

Examples

Assume you use the following table to log synchronization events on the remote database.

```
CREATE TABLE SyncLog
(
 "event_id"          integer NOT NULL DEFAULT autoincrement ,
   "event_name"       varchar(128) NOT NULL ,
   "ml_user"            varchar(128) NULL ,
   "event_time"         timestamp NULL,
   "table_name"         varchar(128) NULL ,
   "upsert_count"       varchar(128) NULL ,
   "delete_count"       varchar(128) NULL ,
   "exit_code"          integer NULL ,
   "status_retval"      varchar(128) NULL ,
   "pubs"                varchar(128) NULL ,
   "sync_descr "         varchar(128) NULL ,
    PRIMARY KEY ("event_id"),
)
```

The following example compiles a list of publications. It logs the list of publications and other synchronization information at the beginning of the synchronization process.

```
CREATE PROCEDURE sp_hook_dbmlsync_begin ()
BEGIN

    DECLARE pubs_list VARCHAR(1024);
    DECLARE temp_str VARCHAR(128);
    DECLARE qry VARCHAR(128);
```



```
-- insert publication list into pubs_list
    SELECT LIST(value) INTO pubs_list
     FROM #hook_dict
     WHERE name LIKE 'publication_%';


-- log publication and synchronization information
    INSERT INTO SyncLog(event_name,ml_user,pubs,event_time)
     SELECT 'dbmlsync_begin',#hook_dict.value,pubs_list,CURRENT TIMESTAMP
     FROM #hook_dict
     WHERE name='MobiLink user';
END
```


sp_hook_dbmlsync_communication_error

Use this stored procedure to process communications errors.

Rows in #hook_dict table

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version that is used for the synchronization.
error message (in)	error message text	This is the same text that is displayed in the dbmlsync log.
error id (in)	numeric	An ID that uniquely identifies the message. Use this row to identify the error message, as the error message text may change.
error hook user state (in|out)	integer	This value can be set by the hook to pass state information to future calls to the sp_hook_dbmlsync_all_error, sp_hook_dbmlsync_communication_error, sp_hook_dbmlsync_misc_error, sp_hook_dbmlsync_sql_error, or sp_hook_dbmlsync_end hooks. The first time one of these hooks is called, the value of the row is 0. If the hook changes the value of the row, the new value is used in the next hook call. When you use this hook to pass state information to the sp_hook_dbmlsync_end hook, you can cause the _end hook to perform actions such as retrying the synchronization.
stream error code (in)	integer	The error reported by the stream.
system error code (in)	integer	A system-specific error code.

Remarks

If an error occurs during startup before a synchronization has been initiated, the #hook_dict entries for MobiLink user and Script version are set to an empty string, and no publication_*n* rows are set in the #hook_dict table.

When communication errors occur between dbmlsync and the MobiLink server, this hook allows you to access stream-specific error information.

The **stream error code** parameter is an integer indicating the type of communication error.

For a listing of possible error code values, see "MobiLink Communication Error Messages" [*SQL Anywhere 10 - Error Messages*].

This procedure executes on a separate connection to ensure that operations it performs are not lost if a rollback is performed on the synchronization connection. If dbmlsync cannot establish a separate connection, the procedure is not called.

By default on Windows CE devices, synchronization tables are locked in exclusive mode, which means that this hook cannot successfully execute if it requires access to any of the synchronization tables. It also cannot execute if it needs to access synchronization tables and you set the dbmlsync extended option LockTables to EXCLUSIVE. See "LockTables (lt) extended option" on page 181.

Actions of this procedure are committed immediately after execution.

See also

- "Handling errors and warnings in event hook procedures" on page 215
- "sp_hook_dbmlsync_all_error" on page 219
- "sp_hook_dbmlsync_misc_error" on page 253
- "sp_hook_dbmlsync_sql_error" on page 268

Example

Assume you use the following table to log communication errors in the remote database.

```
CREATE TABLE communication_error_log
(
  error_msg VARCHAR(10240),
  error_code VARCHAR(128)
);
```

The following example sets up sp_hook_dbmlsync_communication_error to log communication errors.

```
CREATE PROCEDURE sp_hook_dbmlsync_communication_error()
BEGIN
 DECLARE msg VARCHAR(255);
 DECLARE code INTEGER;

 // get the error message text
 SELECT value INTO msg
  FROM #hook_dict
  WHERE name ='error message';

 // get the error code
 SELECT value INTO code
  FROM #hook_dict
  WHERE name = 'stream error code';

 // log the error information
 INSERT INTO communication_error_log(error_code,error_msg)
  VALUES (code,msg);
END
```


sp_hook_dbmlsync_delay

Use this stored procedure to control when synchronization takes place.

Rows in #hook_dict table

Name	Value	Description
delay duration (in|out)	number of seconds	If the procedure sets the delay duration value to zero, then dbmlsync synchronization proceeds. A non-zero delay duration value specifies the number of seconds before the delay hook is called again.
maximum accumulated delay (in|out)	number of seconds	The maximum accumulated delay specifies the maximum number of seconds delay before each synchronization. Dbmlsync keeps track of the total delay created by all calls to the delay hook since the last synchronization. If no synchronization has occurred since dbmlsync started running, the total delay is calculated from the time dbmlsync started up. When the total delay exceeds the value of maximum accumulated delay, synchronization begins without any further calls to the delay hook.
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

If a procedure of this name exists, it is called before **sp_hook_dbmlsync_begin** at the beginning of the synchronization process.

Actions of this procedure are committed immediately after execution.

See also

- “Synchronization event hook sequence” on page 211
- “Initiating synchronization with event hooks” on page 106
- “sp_hook_dbmlsync_download_end” on page 232

Example

Assume you have the following table to log orders on the remote database.

```
CREATE TABLE OrdersTable(
  "id" INTEGER PRIMARY KEY DEFAULT AUTOINCREMENT,
```



```
  "priority" VARCHAR(128)
);
```

The following example delays synchronization for a maximum accumulated delay of one hour. Every ten seconds the hook is called again and checks for a high priority row in the OrdersTable. If a high priority row exists, the delay duration is set to zero to start the synchronization process.

```
CREATE PROCEDURE sp_hook_dbmlsync_delay()
BEGIN
      -- Set the maximum delay between synchronizations
    -- or before the first synchronization starts to 1 hour
    UPDATE #hook_dict SET value = '3600'  // 3600 seconds
     WHERE name = 'maximum accumulated delay';

    -- check if a high priority order exists in OrdersTable
    IF EXISTS (SELECT * FROM OrdersTable where priority='high') THEN
     -- start the synchronization to process the high priority row
     UPDATE #hook_dict
      SET value = '0'
      WHERE name='delay duration';
    ELSE
     -- set the delay duration to call this procedure again
     -- following a 10 second delay
     UPDATE #hook_dict
      SET value = '10'
      WHERE name='delay duration';
    END IF;
END;
```

In the sp_hook_dbmlsync_end hook you can mark the high priority row as processed:

```
    CREATE PROCEDURE sp_hook_dbmlsync_upload_end()
        BEGIN
            IF EXISTS( SELECT value FROM #hook_dict
               WHERE name = 'Upload status'
               AND value = 'committed' ) THEN
            UPDATE OrderTable SET priority = ‘high-processed’
     WHERE priority = ‘high’;
            END IF;
        END;
```

See “sp_hook_dbmlsync_end” on page 246.

sp_hook_dbmlsync_download_begin

Use this stored procedure to add custom actions at the beginning of the download stage of the synchronization process.

Rows in #hook_dict table

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

If a procedure of this name exists, it is called at the beginning of the download stage of the synchronization process.

Actions of this procedure are committed or rolled back when the download is committed or rolled back.

See also

- "Synchronization event hook sequence" on page 211

Example

Assume you use the following table to log synchronization events on the remote database.

```
CREATE TABLE SyncLog
(
 "event_id"          INTEGER NOT NULL DEFAULT AUTOINCREMENT ,
   "event_name"       VARCHAR(128) NOT NULL ,
   "ml_user"            VARCHAR(128) NULL ,
   "event_time"         TIMESTAMP NULL,
   "table_name"         VARCHAR(128) NULL ,
   "upsert_count"       VARCHAR(128) NULL ,
   "delete_count"       VARCHAR(128) NULL ,
   "exit_code"          INTEGER NULL ,
   "status_retval"      VARCHAR(128) NULL ,
   "pubs"                VARCHAR(128) NULL ,
   "sync_descr "         VARCHAR(128) NULL ,
    PRIMARY KEY ("event_id"),
);
```

The following example compiles a list of publications. It logs the list of publications and other synchronization information at the beginning of the download stage of the synchronization.

```
CREATE PROCEDURE sp_hook_dbmlsync_download_begin ()
BEGIN

    DECLARE pubs_list VARCHAR(1024);
```



```
    DECLARE temp_str VARCHAR(128);
    DECLARE qry VARCHAR(128);


-- insert publication list into pubs_list
    SELECT LIST(value) INTO pubs_list
     FROM #hook_dict
     WHERE name LIKE 'publication_%';


-- log publication and synchronization information
    INSERT INTO SyncLog(event_name,ml_user,pubs,event_time)
     SELECT 'dbmlsync_download_begin',#hook_dict.value,
      pubs_list,CURRENT TIMESTAMP
     FROM #hook_dict
     WHERE name='MobiLink user';
END;
```


sp_hook_dbmlsync_download_com_error (deprecated)

Use this stored procedure to add custom actions when communications errors occur while reading the download sent by the MobiLink server.

This hook is deprecated. See "Handling errors and warnings in event hook procedures" on page 215.

Rows in #hook_dict table

Name	Value	Description
table name (in)	table name	The table to which operations were being applied when the error occurred. The value is an empty string if dbmlsync is unable to identify the table.
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

If a procedure of this name exists, it is invoked when a communication error is detected during the download phase of synchronization. The download is then terminated.

This procedure executes on a separate connection, so that failures can be logged. Otherwise, the action of logging would be rolled back along with the synchronization actions. If dbmlsync cannot establish a separate connection, the procedure is not called.

By default on Windows CE devices, synchronization tables are locked in exclusive mode, which means that this hook cannot successfully execute if it requires access to any of the synchronization tables. It also cannot execute if it needs to access synchronization tables and you set the dbmlsync extended option LockTables to EXCLUSIVE. See "LockTables (lt) extended option" on page 181.

Actions of this procedure are committed immediately after execution.

See also

- "Synchronization event hook sequence" on page 211

Examples

Assume you use the following table to log communication errors.

```
CREATE TABLE SyncLogComErrorTable
(
   " user_name "  VARCHAR(255) NOT NULL ,
```



```
   " event_time "   TIMESTAMP NOT NULL ,
);
```

The following example logs the MobiLink user and current time stamp when communications errors occur while reading the download sent by the MobiLink server. The information is stored on the SyncLogComErrorTable table on the remote database.

```
CREATE PROCEDURE sp_hook_dbmlsync_download_com_error ()
BEGIN
 INSERT INTO SyncLogComErrorTable (user_name, event_time)
  SELECT #hook_dict.value, CURRENT TIMESTAMP
  FROM #hook_dict
  WHERE name = 'MobiLink user';
END;
```


sp_hook_dbmlsync_download_end

Use this stored procedure to add custom actions at the end of the download stage of the synchronization process.

Rows in #hook_dict table

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

If a procedure of this name exists, it is called at the end of the download stage of the synchronization process.

Actions of this procedure are committed or rolled back when the download is committed or rolled back.

See also

- "Synchronization event hook sequence" on page 211
- "Initiating synchronization with event hooks" on page 106
- "sp_hook_dbmlsync_delay" on page 226

Examples

Assume you use the following table to log synchronization events on the remote database.

```
CREATE TABLE SyncLog
(
 "event_id"          INTEGER NOT NULL DEFAULT AUTOINCREMENT ,
   "event_name"       VARCHAR(128) NOT NULL ,
   "ml_user"            VARCHAR(128) NULL ,
   "event_time"         TIMESTAMP NULL,
   "table_name"         VARCHAR(128) NULL ,
   "upsert_count"       VARCHAR(128) NULL ,
   "delete_count"       VARCHAR(128) NULL ,
   "exit_code"          INTEGER NULL ,
   "status_retval"      VARCHAR(128) NULL ,
   "pubs"                VARCHAR(128) NULL ,
   "sync_descr "         VARCHAR(128) NULL ,
    PRIMARY KEY ("event_id"),
)
```

The following example compiles a list of publications. It logs the list of publications and other synchronization information at the end of the download stage of a synchronization.

```
CREATE PROCEDURE sp_hook_dbmlsync_download_end ()
BEGIN
```



```
    DECLARE pubs_list VARCHAR(1024);
    DECLARE temp_str VARCHAR(128);
    DECLARE qry VARCHAR(128);


-- insert publication list into pubs_list
    SELECT LIST(value) INTO pubs_list
     FROM #hook_dict
     WHERE name LIKE 'publication_%';


-- log publication and synchronization information
    INSERT INTO SyncLog(event_name,ml_user,pubs,event_time)
     SELECT 'dbmlsync_download_end',#hook_dict.value,
      pubs_list,CURRENT TIMESTAMP
     FROM #hook_dict
     WHERE name='MobiLink user';
END
```


sp_hook_dbmlsync_download_fatal_sql_error (deprecated)

Take action when a synchronization download is about to be rolled back because of a database error.

This hook is deprecated. See "Handling errors and warnings in event hook procedures" on page 215.

Rows in #hook_dict table

Name	Value	Description
table name (in)	table name	The table to which operations were being applied when the error occurred. The value is an empty string if dbmlsync is unable to identify the table.
SQL error code (in)	SQL error code	Identifies the SQL error code returned by the database when the operation failed.
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

If a procedure of this name exists, it is called immediately before a synchronization download is rolled back because of a database error. This occurs whenever a SQL error is encountered that cannot be ignored, or when the sp_hook_dbmlsync_download_SQL_error hook has already been called and has chosen not to ignore the error.

This procedure executes on a separate connection, so that failures can be logged. Otherwise, the action of logging would be rolled back along with the synchronization actions. If dbmlsync cannot establish a separate connection, the procedure is not called.

By default on Windows CE devices, synchronization tables are locked in exclusive mode, which means that this hook cannot successfully execute if it requires access to any of the synchronization tables. It also cannot execute if it needs to access synchronization tables and you set the dbmlsync extended option LockTables to EXCLUSIVE. See "LockTables (lt) extended option" on page 181.

Actions of this procedure are committed immediately after execution.

See also

- "Synchronization event hook sequence" on page 211
- "sp_hook_dbmlsync_download_sql_error (deprecated)" on page 240

Examples

Assume you use the following table to log SQL errors.

```
CREATE TABLE "DBA"."SyncLogComErrorTable"
(
   " error_code "       VARCHAR(255) NOT NULL ,
   " event_time "       TIMESTAMP NOT NULL ,
);
```

The following example logs the SQL error code and current time stamp when SQL errors occur while reading the download. The information is stored in SyncLogSQLErrorTable on the remote database.

```
CREATE PROCEDURE sp_hook_dbmlsync_download_fatal_sql_error ()
BEGIN
 INSERT INTO SyncLogSQLErrorTable (error_code, event_time)
  SELECT #hook_dict.value, CURRENT TIMESTAMP
  FROM #hook_dict
  WHERE name = 'SQL error code';
END;
```


sp_hook_dbmlsync_download_log_ri_violation

Logs referential integrity violations in the download process.

Rows in #hook_dict table

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
foreign key table (in)	table name	The table containing the foreign key column for which the hook is being called.
primary key table (in)	table name	The table referenced by the foreign key for which the hook is being called.
role name (in)	role name	The role name of the foreign key for which the hook is being called.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

A download RI violation occurs when rows in the download violate foreign key relationships on the remote database. This hook allows you to log RI violations as they occur so that you can investigate their cause later.

After the download is complete, but before it is committed, dbmlsync checks for RI violations. If it finds any, it identifies a foreign key that has an RI violation and calls sp_hook_dbmlsync_download_log_ri_violation (if it is implemented). It then calls sp_hook_dbmlsync_download_ri_conflict (if it is implemented). If there is still a conflict, dbmlsync deletes the rows that violate the foreign key constraint. This process is repeated for remaining foreign keys that have RI violations.

This hook is called only when there are RI violations involving tables that are currently being synchronized. If there are RI violations involving tables that are not being synchronized, this hook is not called and the synchronization fails.

This hook is called on a separate connection from the one that dbmlsync uses for the download. The connection used by the hook has an isolation level of 0 so that the hook can see the rows that have been applied from the download that are not yet committed. The actions of the hook are committed immediately after it completes so that changes made by this hook will be preserved regardless of whether the download is committed or rolled back.

By default on Windows CE devices, synchronization tables are locked in exclusive mode, which means that this hook cannot successfully execute if it requires access to any of the synchronization tables. It also cannot

execute if it needs to access synchronization tables and you set the dbmlsync extended option LockTables to EXCLUSIVE. See "LockTables (lt) extended option" on page 181.

Do not attempt to use this hook to correct RI violation problems. It should be used for logging only. Use sp_hook_dbmlsync_download_ri_violation to resolve RI violations.

See also

- "sp_hook_dbmlsync_download_ri_violation" on page 238
- "Synchronization event hook sequence" on page 211

Examples

Assume you use the following table to log referential integrity violations.

```
CREATE TABLE DBA.LogRIViolationTable
(
    entry_time        TIMESTAMP,
    pk_table        VARCHAR( 255 ),
    fk_table        VARCHAR( 255 ),
    role_name        VARCHAR( 255 )
);
```

The following example logs the foreign key table name, primary key table name, and role name when a referential integrity violation is detected on the remote database. The information is stored in LogRIErrorTable on the remote database.

```
CREATE PROCEDURE sp_hook_dbmlsync_download_log_ri_violation()
BEGIN
 INSERT INTO DBA.LogRIViolationTable VALUES(
    CURRENT_TIMESTAMP,
    (SELECT value FROM #hook_dict WHERE name = 'Primary key table'),
    (SELECT value FROM #hook_dict WHERE name = 'Foreign key table'),
    (SELECT value FROM #hook_dict WHERE name = 'Role name' ) );
END;
```


sp_hook_dbmlsync_download_ri_violation

Allows you to resolve referential integrity violations in the download process.

Rows in #hook_dict table

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
foreign key table (in)	table name	The table containing the foreign key column for which the hook is being called.
primary key table (in)	table name	The table referenced by the foreign key for which the hook is being called.
role name (in)	role name	The role name of the foreign key for which the hook is being called.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

A download RI violation occurs when rows in the download violate foreign key relationships on the remote database. This hook allows you to attempt to resolve RI violations before dbmlsync deletes the rows that are causing the conflict.

After the download is complete, but before it is committed, dbmlsync checks for RI violations. If it finds any, it identifies a foreign key that has an RI violation and calls sp_hook_dbmlsync_download_log_ri_violation (if it is implemented). It then calls sp_hook_dbmlsync_download_ri_conflict (if it is implemented). If there is still a conflict, dbmlsync deletes the rows. This process is repeated for remaining foreign keys that have RI violations.

This hook is called only when there are RI violations involving tables that are currently being synchronized. If there are RI violations involving tables that are not being synchronized, this hook is not called and the synchronization fails.

This hook is called on the same connection that dbmlsync uses for the download. This hook should not contain any explicit or implicit commits, because they may lead to inconsistent data in the database. The actions of this hook are committed or rolled back when the download is committed or rolled back.

Unlike other hook actions, the operations performed during this hook are not uploaded during the next synchronization.

See also

- "sp_hook_dbmlsync_download_log_ri_violation" on page 236

Example

This example uses the Department and Employee tables shown below:

```
CREATE TABLE Department(
 "department_id"  INTEGER primary key
);

CREATE TABLE Employee(
  "employee_id"      INTEGER PRIMARY KEY,
  "department_id" INTEGER,
  FOREIGN KEY EMPLOYEE_FK1 (department_id) REFERENCES Department
);
```

The following sp_hook_dbmlsync_download_ri_violation definition cleans up referential integrity violations between the Department and Employee tables. It verifies the role name for the foreign key and inserts missing department_id values into the Department table.

```
CREATE PROCEDURE sp_hook_dbmlsync_download_ri_violation()
BEGIN

IF EXISTS (SELECT * FROM #hook_dict WHERE name = 'role name'
 AND value = 'EMPLOYEE_FK1') THEN

 -- update the Department table with missing department_id values
 INSERT INTO Department
  SELECT distinct department_id FROM Employee
  WHERE department_id NOT IN (SELECT department_id FROM Department)

END IF;
```


sp_hook_dbmlsync_download_sql_error (deprecated)

Handle database errors that occur while applying the download sent by the MobiLink server.

This hook is deprecated. See "Handling errors and warnings in event hook procedures" on page 215.

Rows in #hook_dict table

Name	Value	Description
table name (in)	table name	The table to which operations were being applied when the error occurred. The value is an empty string if dbmlsync is unable to identify the table.
continue (in|out)	**true** | **false**	Indicates whether the error should be ignored and synchronization should continue. This parameter should be set to **false** to call the sp_hook_dbmlsync_download_fatal_sql_error hook and stop synchronization. If you set this parameter to **true**, dbmlsync ignores the error and continues with synchronization, which may result in data loss.
SQL error code (in)	SQL error code	Identifies the SQL error code returned by the database when the operation failed.
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

If a procedure of this name exists, it is invoked when a database error is detected during the download phase of synchronization. The procedure is only invoked for errors where it is possible to ignore the error and continue with synchronization. For fatal errors, the sp_hook_dbmlsync_download_fatal_SQL_error procedure is called.

Caution

When continue is set to TRUE, dbmlsync simply ignores the database error and continues with synchronization. There is no attempt to retry the operation that failed. As a result part or all of the download may be lost. The amount of data lost depends on the type of error encountered, when it occurred, and what steps the hook took to recover. It is very difficult to predict which data will be lost and so this feature must be used with extreme caution. Most users would be best advised to not attempt to continue after a SQL error.

Actions of this procedure are committed or rolled back when the download is committed or rolled back.

See also

- "Synchronization event hook sequence" on page 211
- "sp_hook_dbmlsync_download_fatal_sql_error (deprecated)" on page 234

sp_hook_dbmlsync_download_table_begin

Use this stored procedure to add custom actions immediately before each table is downloaded.

Rows in #hook_dict table

Name	Value	Description
table name (in)	table name	The table to which operations are about to be applied.
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

If a procedure of this name exists, it is called for each table immediately before downloaded operations are applied to that table. Actions of this procedure are committed or rolled back when the download is committed or rolled back.

See also

- "Synchronization event hook sequence" on page 211

Examples

Assume you use the following table to log synchronization events on the remote database.

```
CREATE TABLE SyncLog
(
 "event_id"          INTEGER NOT NULL DEFAULT AUTOINCREMENT ,
   "event_name"       VARCHAR(128) NOT NULL ,
   "ml_user"            VARCHAR(128) NULL ,
   "event_time"         TIMESTAMP NULL,
   "table_name"         VARCHAR(128) NULL ,
   "upsert_count"       VARCHAR(128) NULL ,
   "delete_count"       VARCHAR(128) NULL ,
   "exit_code"          INTEGER NULL ,
   "status_retval"      VARCHAR(128) NULL ,
   "pubs"                VARCHAR(128) NULL ,
   "sync_descr "         VARCHAR(128) NULL ,
    PRIMARY KEY ("event_id"),
);
```

The following example logs the MobiLink user, table name, and current timestamp immediately before a table is downloaded.

```
CREATE PROCEDURE sp_hook_dbmlsync_download_table_begin()
BEGIN
    DECLARE tbl VARCHAR(255);

    -- load the table name from #hook_dict
```



```
  SELECT #hook_dict.value
   INTO tbl
   FROM #hook_dict
   WHERE #hook_dict.name = 'table name';

  INSERT INTO SyncLog (event_name, ml_user, table_name
    ,event_time)
   SELECT 'download_table_begin', #hook_dict.value, tbl
    ,CURRENT TIMESTAMP
   FROM #hook_dict
   WHERE name = 'MobiLink user' ;
END;
```

sp_hook_dbmlsync_download_table_end

Use this stored procedure to add custom actions immediately after each table is downloaded.

Rows in #hook_dict table

Name	Value	Description
table name (in)	table name	The table to which operations have just been applied.
delete count (in)	number of rows	The number of rows in this table deleted by the download.
upsert count (in)	number of rows	The number of rows in this table updated or inserted by the download.
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

If a procedure of this name exists, it is called immediately after all operations in the download for a table have been applied.

Actions of this procedure are committed or rolled back when the download is committed or rolled back.

See also

- "Synchronization event hook sequence" on page 211

Examples

Assume you use the following table to log synchronization events on the remote database.

```
CREATE TABLE SyncLog
(
 "event_id"          INTEGER NOT NULL DEFAULT AUTOINCREMENT ,
   "event_name"       VARCHAR(128) NOT NULL ,
   "ml_user"            VARCHAR(128) NULL ,
   "event_time"         TIMESTAMP NULL,
   "table_name"         VARCHAR(128) NULL ,
   "upsert_count"       VARCHAR(128) NULL ,
   "delete_count"       VARCHAR(128) NULL ,
   "exit_code"          INTEGER NULL ,
   "status_retval"      VARCHAR(128) NULL ,
   "pubs"                VARCHAR(128) NULL ,
   "sync_descr "         VARCHAR(128) NULL ,
```



```
    PRIMARY KEY ("event_id"),
);
```

The following example logs the MobiLink user, the table name and the number of inserted or updated rows immediately after a table is downloaded.

```
CREATE PROCEDURE sp_hook_dbmlsync_download_table_end()
BEGIN
    -- declare variables
    DECLARE tbl VARCHAR(255);
    DECLARE upsertCnt VARCHAR(255);
    DECLARE deleteCnt VARCHAR(255);

    -- load the table name from #hook_dict
    SELECT #hook_dict.value
     INTO tbl
     FROM #hook_dict
     WHERE #hook_dict.name = 'table name';

    -- load the upsert count from #hook_dict
    SELECT #hook_dict.value
     INTO upsertCnt
     FROM #hook_dict
     WHERE #hook_dict.name = 'upsert count';

    -- load the delete count from #hook_dict
    SELECT #hook_dict.value
     INTO deleteCnt
     FROM #hook_dict
     WHERE #hook_dict.name = 'delete count';

    INSERT INTO SyncLog (event_name, ml_user, table_name,
      upsert_count, delete_count, event_time)
     SELECT 'download_table_end', #hook_dict.value, tbl,
      upsertCnt, deleteCnt, CURRENT TIMESTAMP
     FROM #hook_dict
     WHERE name = 'MobiLink user' ;
END;
```


sp_hook_dbmlsync_end

Use this stored procedure to add custom actions immediately before synchronization is complete.

Rows in #hook_dict table

Name	Value	Description
restart (out)	**sync** | **download** | **none**	If set to **sync**, then dbmlsync retries the synchronization it just completed. The value **sync** replaces **true**, which is identical but is deprecated. If set to **none** (the default), then dbmlsync shuts down or restarts according to its command line arguments. The value **none** replaces **false**, which is identical but is deprecated. If set to **download** and the restartable download parameter is **true**, then dbmlsync attempts to restart the download that just failed.
exit code (in)	number	If set to anything other than zero (the default), this represents a synchronization error.
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
upload status (in)	**not sent** | **committed** | **failed**	Specifies the status returned by the MobiLink server when dbmlsync attempted to verify receipt of the upload. The status can be: ♦ **not sent** - No upload was sent to the MobiLink server, either because an error prevented it or because the requested synchronization did not require it, which would happen in cases such as download-only synchronization, a restarted download, or file-based download. ♦ **committed** - The upload was received by the MobiLink server, and committed. ♦ **failed** - The MobiLink server did not commit the upload. For a transactional upload, the upload status is 'failed' when some but not all of the transactions were successfully uploaded and acknowledged by the server.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Name	Value	Description
restartable download (in)	**true**|**false**	If **true**, the download for the current synchronization failed and can be restarted. If **false**, the download was successful or it cannot be restarted.
restartable download size (in)	integer	When the restartable download parameter is **true**, this parameter indicates the number of bytes that were received before the download failed. When restartable download is **false**, this value is meaningless.
error hook user state (in)	integer	This value contains information about errors and can be sent from the hooks sp_hook_dbmlsync_all_error, sp_hook_dbmlsync_communication_error, sp_hook_dbmlsync_misc_error, or sp_hook_dbmlsync_sql_error.

Remarks

If a procedure of this name exists, it is called at the end of each synchronization.

Actions of this procedure are committed immediately after execution.

If an sp_hook_dbmlsync_end hook is defined so that the hook always sets the restart parameter to **sync**, and you specify multiple publications on the dbmlsync command line in the form -n pub1, -n pub2, and so on, then dbmlsync repeatedly synchronizes the first publication and never synchronizes the second.

See also

- "Introduction to dbmlsync hooks" on page 211
- "Synchronization event hook sequence" on page 211
- "Resuming failed downloads" [*MobiLink - Server Administration*]
- "Handling errors and warnings in event hook procedures" on page 215

Examples

In the following example the download is manually restarted if the download for the current synchronization failed and can be restarted.

```
CREATE PROCEDURE sp_hook_dbmlsync_end()
BEGIN
  -- Restart the download if the download for the current sync
  --  failed and can be restarted
  IF EXISTS (SELECT * FROM #hook_dict
    WHERE name = 'restartable download' AND value='true')
      THEN
   UPDATE #hook_dict SET value ='download' WHERE name='restart';
  END IF;
END;
```


sp_hook_dbmlsync_log_rescan

Use this stored procedure to programmatically decide when a rescan is required.

Rows in #hook_dict table

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
discarded storage (in)	number	The number of bytes of discarded memory after the last synchronization.
rescan (in|out)	**true** | **false**	If set to True by the hook, dbmlsync performs a complete rescan before the next synchronization. On entry, this value is set to False.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

When more than one -n option is specified at the command line, dbmlsync may experience fragmentation which results in discarded memory. The discarded memory can be recovered by rescanning the database transaction log. This hook allows you to decide if dbmlsync should rescan the database transaction log to recover memory.

When no other condition has been met that would force a rescan, this hook is called immediately after the sp_hook_dbmlsync_process_exit_code hook.

See also

- "HoverRescanThreshold (hrt) extended option" on page 177

Examples

The following example sets the rescan field in the #hook_dict table to TRUE if the discarded storage is greater than 1000 bytes.

```
CREATE PROCEDURE sp_hook_dbmlsync_log_rescan ()
BEGIN
 IF EXISTS(SELECT * FROM #hook_dict
  WHERE name = 'Discarded storage' AND value>1000)
 THEN
  UPDATE #hook_dict SET value ='true' WHERE name='Rescan';
 END IF;
END;
```


sp_hook_dbmlsync_logscan_begin

Use this stored procedure to add custom actions immediately before the transaction log is scanned for upload.

Rows in #hook_dict table

Name	Value	Description
starting log offset_*n* (in)	number	The log offset value where scanning is to begin. There is one value for each publication being uploaded. The numbering of *n* starts at zero. This value matches the Publication-*n*. For example, log offset_0 is the offset for publication_0.
log scan retry (in)	**true** | **false**	If this is the first time the transaction log has been scanned for this synchronization, the value is false; otherwise it is true. The log is scanned twice when the MobiLink server and dbmlsync have different information about where the scanning should begin.
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

If a procedure of this name exists, it is called immediately before dbmlsync scans the transaction log to assemble the upload.

Actions of this procedure are committed immediately after execution.

See also

- "Synchronization event hook sequence" on page 211

Examples

Assume you use the following table to log synchronization events on the remote database.

```
CREATE TABLE SyncLog
(
 "event_id"          INTEGER NOT NULL DEFAULT AUTOINCREMENT ,
   "event_name"       VARCHAR(128) NOT NULL ,
   "ml_user"            VARCHAR(128) NULL ,
   "event_time"         TIMESTAMP NULL,
   "table_name"         VARCHAR(128) NULL ,
   "upsert_count"       VARCHAR(128) NULL ,
   "delete_count"       VARCHAR(128) NULL ,
```



```
    "exit_code"          INTEGER NULL ,
    "status_retval"      VARCHAR(128) NULL ,
    "pubs"                VARCHAR(128) NULL ,
    "sync_descr "         VARCHAR(128) NULL ,
     PRIMARY KEY ("event_id"),
);
```

The following example logs the MobiLink user and current timestamp immediately before the transaction log is scanned for upload.

```
CREATE PROCEDURE sp_hook_dbmlsync_logscan_begin ()
BEGIN
 -- log the synchronization event
 INSERT INTO SyncLog (event_name, ml_user,event_time)
  SELECT 'logscan_begin', #hook_dict.value, CURRENT TIMESTAMP
  FROM #hook_dict
  WHERE name = 'MobiLink user' ;
END;
```


sp_hook_dbmlsync_logscan_end

Use this stored procedure to add custom actions immediately after the transaction log is scanned for upload.

Rows in #hook_dict table

Name	Value	Description
ending log offset (in)	number	The log offset value where scanning ended.
starting log offset_*n* (in)	number	The initial progress value for each subscription you synchronize. The *n* values correspond to those in Publication_*n*. For example, Starting log offset_1 is the offset for Publication_1.
log scan retry (in)	**true** | **false**	If this is the first time the transaction log has been scanned for this synchronization, the value is false; otherwise it is true. The log is scanned twice when the MobiLink server and dbmlsync have different information about where the scanning should begin.
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

If a procedure of this name exists, it is called immediately after dbmlsync has scanned the transaction log to assemble the upload.

Actions of this procedure are committed immediately after execution.

See also

- "Synchronization event hook sequence" on page 211

Examples

Assume you use the following table to log synchronization events on the remote database.

```
CREATE TABLE SyncLog
(
 "event_id"          INTEGER NOT NULL DEFAULT AUTOINCREMENT ,
   "event_name"       VARCHAR(128) NOT NULL ,
   "ml_user"            VARCHAR(128) NULL ,
   "event_time"         TIMESTAMP NULL,
   "table_name"         VARCHAR(128) NULL ,
   "upsert_count"       VARCHAR(128) NULL ,
   "delete_count"       VARCHAR(128) NULL ,
```



```
    "exit_code"          INTEGER NULL ,
    "status_retval"      VARCHAR(128) NULL ,
    "pubs"                VARCHAR(128) NULL ,
    "sync_descr "         VARCHAR(128) NULL ,
     PRIMARY KEY ("event_id"),
);
```

The following example logs the MobiLink user and current timestamp immediately after the transaction log is scanned for upload. The #hook_dict log scan retry parameter indicates if the transaction log is scanned more than one time.

```
CREATE PROCEDURE sp_hook_dbmlsync_logscan_end ()
BEGIN

 DECLARE scan_retry VARCHAR(128);

 -- load the scan retry parameter from #hook_dict
 SELECT #hook_dict.value
  INTO scan_retry
  FROM #hook_dict
  WHERE #hook_dict.name = 'log scan retry';

 -- Determine if the log is being rescanned
 -- and log the synchronization event

 IF scan_retry='true' THEN
   INSERT INTO SyncLog (event_name, ml_user,event_time,sync_descr)
    SELECT 'logscan_end', #hook_dict.value, CURRENT TIMESTAMP,
     'Transaction log rescanned'
    FROM #hook_dict
    WHERE name = 'MobiLink user' ;
 ELSE
   INSERT INTO SyncLog (event_name, ml_user,event_time,sync_descr)
    SELECT 'logscan_end', #hook_dict.value, CURRENT TIMESTAMP,
     'Transaction log scanned normally'
    FROM #hook_dict
    WHERE name = 'MobiLink user' ;
 END IF;
END;
```


sp_hook_dbmlsync_misc_error

Use this stored procedure to process dbmlsync errors which are not categorized as database or communication errors. For example, you can implement the sp_hook_dbmlsync_misc_error hook to log errors or perform a specific action when a specific error occurs.

Rows in #hook_dict table

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.
error message (in)	error message text	This is the same text that is displayed in the dbmlsync log.
error id (in)	integer	An ID that uniquely identifies the message. Use this row to identify the error message, as the error message text may change.
error hook user state (in|out)	integer	This value can be set by the hook to pass state information to future calls to the sp_hook_dbmlsync_all_error, sp_hook_dbmlsync_communication_error, sp_hook_dbmlsync_misc_error, sp_hook_dbmlsync_sql_error, or sp_hook_dbmlsync_end hooks. The first time one of these hooks is called, the value of the row is 0. If the hook changes the value of the row, the new value is used in the next hook call. When you use this hook to pass state information to the sp_hook_dbmlsync_end hook, you can cause the _end hook to perform actions such as retrying the synchronization.

Remarks

If an error occurs during startup before a synchronization has been initiated, the #hook_dict entries for MobiLink user and Script version are set to an empty string, and no publication_*n* rows are set in the #hook_dict table.

This procedure executes on a separate connection to ensure that operations it performs are not lost if a rollback is performed on the synchronization connection. If dbmlsync cannot establish a separate connection, the procedure is not called.

By default on Windows CE devices, synchronization tables are locked in exclusive mode, which means that this hook cannot successfully execute if it requires access to any of the synchronization tables. It also cannot execute if it needs to access synchronization tables and you set the dbmlsync extended option LockTables to EXCLUSIVE. See "LockTables (lt) extended option" on page 181.

Actions of this procedure are committed immediately after execution.

See also

- "Handling errors and warnings in event hook procedures" on page 215
- "sp_hook_dbmlsync_communication_error" on page 224
- "sp_hook_dbmlsync_all_error" on page 219
- "sp_hook_dbmlsync_sql_error" on page 268

Examples

Assume you use the following table to log errors in the remote database.

```
CREATE TABLE error_log
(
 pk INTEGER DEFAULT AUTOINCREMENT PRIMARY KEY,
 err_id INTEGER,
 err_msg VARCHAR(10240),
);
```

The following example sets up sp_hook_dbmlsync_misc_error to log all types of error messages.

```
CREATE PROCEDURE sp_hook_dbmlsync_misc_error()
BEGIN
 DECLARE msg VARCHAR(10240);
 DECLARE id INTEGER;

 // get the error message text
 SELECT value INTO msg
  FROM #hook_dict
  WHERE name ='error message';

 // get the error id
 SELECT value INTO id
  FROM #hook_dict
  WHERE name = 'error id';

 // log the error information
 INSERT INTO error_log(err_msg,err_id)
  VALUES (msg,id);
END;
```

To see possible error id values, test run dbmlsync. For example, the following dbmlsync command line references an invalid publication.

```
dbmlsync -c eng=custdb;uid=DBA;pwd=sql -n test
```

Now, the error_log table contains the following row, associating the error with the error id 9931.

```
1,9931,
 'There is no synchronization subscription to publication "test"'
```

To provide custom error handling, check for the error id 9931 in sp_hook_dbmlsync_misc_error.

```
ALTER PROCEDURE sp_hook_dbmlsync_misc_error()
BEGIN
```



```
 DECLARE msg VARCHAR(10240);
 DECLARE id INTEGER;

 // get the error message text
 SELECT value INTO msg
  FROM #hook_dict
  WHERE name ='error message';

 // get the error id
 SELECT value INTO id
  FROM #hook_dict
  WHERE name = 'error id';

 // log the error information
 INSERT INTO error_log(err_msg,err_id)
  VALUES (msg,id);

 IF id = 9931 THEN
  // handle invalid publication
 END IF;

END;
```


sp_hook_dbmlsync_ml_connect_failed

Use this stored procedure to retry failed attempts to connect to the MobiLink server using a different communication type or address.

Rows in #hook_dict table

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.
connection address (in|out)	connection address	When the hook is invoked, this is the address used in the most recent failed communication attempt. You can set this value to a new connection address that you want to try. If retry is set to true, this value is used for the next communication attempt. For a list of protocol options, see "MobiLink client network protocol options" on page 32.
connection type (in|out)	network protocol	When the hook is invoked, this is the network protocol (such as TCPIP) that was used in the most recent failed communication attempt. You can set this value to a new network protocol that you want to try. If retry is set to true, this value is used for the next communication attempt. For a list of network protocols, see "CommunicationType (ctp) extended option" on page 167.
user data (in|out)	user-defined data	State information to be used if the next connection attempt fails. For example, you might find it useful to store the number of retries that have occurred. The default is an empty string.
allow remote ahead (in|out)	**true** | **false**	This is true only if dbmlsync was started with the -ra option. You can use this row to read or change the -ra option for the current synchronization only. See "-r option" on page 149.
allow remote behind (in|out)	**true** | **false**	This is true only if dbmlsync was started with the -rb option. You can use this row to read or change the -rb option for the current synchronization only. See "-r option" on page 149.

Name	Value	Description
retry (in|out)	**true** | **false**	Set this value to true if you want to retry a failed connection attempt. The default is FALSE.

Remarks

If a procedure of this name exists, it is called if dbmlsync fails to connect to the MobiLink server.

This hook only applies to connection attempts to the MobiLink server, not the database.

When a progress offset mismatch occurs, dbmlsync disconnects from the MobiLink server and reconnects later. In this kind of reconnection, this hook is not called, and failure to reconnect causes the synchronization to fail.

Actions of this procedure are committed immediately after execution.

Examples

This example uses the sp_hook_dbmlsync_ml_connect_failed hook to retry the connection up to five times.

```
CREATE PROCEDURE sp_hook_dbmlsync_ml_connect_failed ()
BEGIN
    DECLARE idx integer;

    SELECT value
      INTO buf
      FROM #hook_dict
      WHERE name = 'user data';

  IF idx <= 5 THEN
        UPDATE #hook_dict
        SET value = idx
        WHERE name = 'user data';

        UPDATE #hook_dict
        SET value = 'TRUE'
        WHERE name = 'retry';
  END IF;
END;
```

The next example uses a table containing connection information. When an attempt to connect fails, the hook tries the next server in the list.

```
CREATE TABLE conn_list (
    label   INTEGER PRIMARY KEY,
    addr  VARCHAR( 128 ),
    type  VARCHAR( 64 )
);
INSERT INTO conn_list
 VALUES ( 1, 'host=server1;port=91', 'tcpip' );
INSERT INTO conn_list
 VALUES ( 2, 'host=server2;port=92', 'http' );
INSERT INTO conn_list
 VALUES ( 3, 'host=server3;port=93', 'tcpip' );
COMMIT;

CREATE PROCEDURE sp_hook_dbmlsync_ml_connect_failed ()
BEGIN
 DECLARE idx INTEGER;
```



```
 DECLARE cnt INTEGER;

 SELECT value
  INTO idx
  FROM #hook_dict
  WHERE name = 'user data';

 SELECT COUNT( label ) INTO cnt FROM conn_list;

 IF idx <= cnt THEN
   UPDATE #hook_dict
       SET value = ( SELECT addr FROM conn_list WHERE label = idx )
       WHERE name = 'connection address';


   UPDATE #hook_dict
    SET value = (SELECT type FROM conn_list WHERE label=idx)
    WHERE name = 'connection type';

   UPDATE #hook_dict
    SET value = idx
        WHERE name = 'user data';

       UPDATE #hook_dict
        SET value = 'TRUE'
        WHERE name = 'retry';
 END IF;
END;
```

sp_hook_dbmlsync_process_exit_code

Use this stored procedure to manage exit codes.

Rows in #hook_dict table

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
fatal error (in)	**true** | **false**	True when the hook is called because of an error that will cause dbmlsync to terminate.
aborted synchronization (in)	**true** | **false**	True when the hook is called because of an abort request from the sp_hook_dbmlsync_abort hook.
exit code (in)	number	The exit code from the most recent synchronization attempt. 0 indicates a successful synchronization. Any other value indicates that the synchronization failed. This value can be set by sp_hook_dbmlsync_abort when that hook is used to abort synchronization.
last exit code (in)	number	The value stored in the **new exit code** row of the #hook_dict table the last time this hook was called, or 0 if this is the first call to the hook.
new exit code (in|out)	number	The desired exit code for the process. When dbmlsync exits, its **exit code** is the value stored in this row by the last call to the hook. The value must be -32768 to 32767.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

A dbmlsync session can run multiple synchronizations when you specify the -n option more than once on the command line, when you use scheduling, or when you use the restart parameter in sp_hook_dbmlsync_end. In these cases, if one or more of the synchronizations fail, the default exit code does not indicate which failed. Use this hook to define the exit code for the dbmlsync process based on the exit codes from the synchronizations. This hook can also be used to log exit codes.

If an error occurs during startup before a synchronization has been initiated, the #hook_dict entries for MobiLink user and Script version are set to an empty string, and no publication_*n* rows are set in the #hook_dict table.

Example

Suppose that you run dbmlsync to perform five synchronizations and you want the exit code to indicate how many of the synchronizations failed, with an exit code of 0 indicating that there were no failures, an exit code of 1 indicating that one synchronization failed, and so on. You can achieve this by defining the sp_hook_dbmlsync_process_exit_code hook as follows. In this case, if three synchronizations fail, the new exit code is 3.

```
CREATE PROCEDURE sp_hook_dbmlsync_process_exit_code()
BEGIN
   DECLARE  rc INTEGER;

   SELECT value INTO rc FROM #hook_dict WHERE name = 'exit code';
   IF rc <> 0 THEN
      SELECT value INTO rc FROM #hook_dict WHERE name = 'last exit code';
      UPDATE #hook_dict SET value = rc + 1 WHERE name = 'new exit code';
   END IF;
END;
```

See also

- "Synchronization event hook sequence" on page 211
- "sp_hook_dbmlsync_abort" on page 217

sp_hook_dbmlsync_schema_upgrade

Use this stored procedure to run a SQL script that revises your schema.

Rows in #hook_dict table

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version	name of script version	The script version used for the synchronization.
drop hook (out)	**never** | **always** | **on success**	The values can be: **never** - (the default) Do not drop the sp_hook_dbmlsync_schema_upgrade hook from the database. **always** - After attempting to run the hook, ,drop the sp_hook_dbmlsync_schema_upgrade hook from the database. **on success** - If the hook runs successfully, drop the sp_hook_dbmlsync_schema_upgrade hook from the database. On success is identical to always if the dbmlsync -eh option is used, or the dbmlsync extended option IgnoreHookErrors is set to true.

Remarks

This stored procedure is intended for making schema changes to deployed remote databases. Using this hook for schema upgrades ensures that all changes on the remote database are synchronized before the schema is upgraded, which is required to ensure that the database will continue to be able to synchronize. When this hook is being used you should not set the dbmlsync extended option LockTables to off (LockTables is on by default).

During any synchronization where the upload was applied successfully and acknowledged by MobiLink, this hook is called after the sp_hook_dbmlsync_download_end hook and before the sp_hook_dbmlsync_end hook. This hook is not called during download-only synchronization or when a file-based download is being created or applied.

Actions performed in this hook are committed immediately after the hook completes.

See also

- "Schema Changes in Remote Clients" on page 71

Examples

The following example uses the sp_hook_dbmlsync_schema_upgrade procedure to add a column to the Dealer table on the remote database. If the upgrade is successful the sp_hook_dbmlsync_schema_upgrade hook is dropped.

```
CREATE PROCEDURE sp_hook_dbmlsync_schema_upgrade()
BEGIN
 -- Upgrade the schema of the Dealer table. Add a column:
 ALTER TABLE Dealer
  ADD dealer_description VARCHAR(128);

 -- If the schema upgrade is successful, drop this hook:
 UPDATE #hook_dict
  SET value = 'on success'
  WHERE name = 'drop hook';
END;
```


sp_hook_dbmlsync_set_extended_options

Use this stored procedure to programmatically customize the behavior of an upcoming synchronization by specifying extended options to be applied to that synchronization.

Rows in #hook_dict table

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
dxtended options (out)	*opt*=*val*;...	Extended options to add for the next synchronization.

Remarks

If a procedure of this name exists, it is called one or more times before each synchronization.

Extended options specified by this hook apply only to the synchronization identified by the publication and MobiLink user entries, and they apply only until the next time the hook is called for the same synchronization.

Scheduling options may not be specified using this hook.

Actions of this procedure are committed immediately after execution.

See also

- "Synchronization event hook sequence" on page 211
- "MobiLink SQL Anywhere Client Extended Options" on page 161
- "Priority order" on page 163

Examples

The following example uses sp_hook_dbmlsync_set_extended_options to specify the SendColumnNames extended option. The extended option is only applied if pub1 is synchronizing.

```
CREATE PROCEDURE sp_hook_dbmlsync_set_extended_options ()
BEGIN
 IF exists(SELECT * FROM #hook_dict
  WHERE name LIKE 'publication_%' AND value='pub1')
 THEN
   -- specify the SendColumnNames=on extended option
   UPDATE #hook_dict
          SET value = 'SendColumnNames=on'
    WHERE name = 'extended options';
 END IF;
END;
```


sp_hook_dbmlsync_set_ml_connect_info

Use this stored procedure to set the network protocol and network protocol options.

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.
connection type (in/out)	tcpip, tls, http, or https	The network protocol that is used to connect to the MobiLink server.
connection address (in/out)	protocol options	The communication address that is used to connect to the MobiLink server. See "MobiLink client network protocol options" on page 32.

Remarks

You can use this hook to set the network protocol and network protocol options.

The protocol and options can also be set in the sp_hook_dbmlsync_set_extended_options, a hook that is called at the beginning of a synchronization. sp_hook_dbmlsync_set_ml_connect_info is called immediately before dbmlsync attempts to connect to the MobiLink server.

This hook is useful when you want to set options in a hook, but want to do so later in the synchronization process than the sp_hook_dbmlsync_set_extended_options. For example, if the options should be set based on the availability of signal strength of the network that is being used.

See also

- "Introduction to dbmlsync hooks" on page 211
- "Synchronization event hook sequence" on page 211
- "CommunicationType (ctp) extended option" on page 167
- "MobiLink client network protocol options" on page 32
- "sp_hook_dbmlsync_set_extended_options" on page 263

Example

```
CREATE PROCEDURE sp_hook_dbmlsync_set_ml_connect_info()
begin
    UPDATE #hook_dict
    SET VALUE = 'tcpip'
      WHERE name = 'connection type';

    UPDATE #hook_dict
    SET VALUE = 'host=localhost'
```



```
        WHERE name = 'connection address';
    end
```

sp_hook_dbmlsync_set_upload_end_progress

This stored procedure can be used to define an ending progress when a scripted upload subscription is synchronized. This procedure is called only when a scripted upload publication is being synchronized.

Rows in #hook_dict table

Name	Value	Description
generating download exclusion list (in)	TRUE | FALSE	TRUE if no upload will be sent during the synchronization (for example, in a download-only synchronization or when a file-based download is applied). In these cases the upload scripts are still called and the operations generated are used to identify download operations that will change rows that need to be uploaded. When such an operation is found, the download is not applied.
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
start progress as timestamp_*n*	progress as timestamp	The starting progress for each publication being synchronized expressed as a timestamp, where *n* is the same integer used to identify the publication.
start progress as bigint_*n*	progress as bigint	The starting progress for each publication being synchronized expressed as a bigint, where *n* is the same integer used to identify the publication.
script version (n)	script version name	The MobiLink script version to be used for the synchronization.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
end progress is bingint (in|out)	TRUE | FALSE	When this row is set to TRUE, the end progress value is assumed to be an unsigned bigint that is represented as a string (for example, '12345'). When this row is set to FALSE, the end progress value is assumed to be a timestamp that is represented as a string (for example, '1900/01/01 12:00:00.000'). The default is FALSE.

Name	Value	Description
end progress (in|out)	timestamp	The hook can modify this row to change the "end progress as bigint" and "end progress as timestamp" values passed to the upload scripts. These values define the point in time up to which all operations are included in the upload that is being generated. The value of this row can be set as either an unsigned bigint or as a timestamp according to the setting of the "progress is bigint" row. The default value for this row is the current timestamp.

Remarks

For a scripted upload, each time an upload procedure is called it is passed a start progress value and an end progress value. The procedure must return all appropriate operations that occurred during the period defined by those two values. The begin progress value is always the same as the end progress value from the last successful synchronization, unless this is a first synchronization, in which case the begin progress is January 1, 1900, 00:00:00.000. By default, the end progress value is the time when dbmlsync began building the upload.

This hook lets you override the default end progress value. You could define a shorter period for the upload or you could implement a progress tracking scheme based on something other than timestamps (for example, generation numbers).

If "end progress is bigint" is set to true, the end progress must be an integer less than or equal to the number of milliseconds from 1900-01-01 00:00:00 to 9999-12-31 23:59:59:9999, which is 255,611,203,259,999.

See also

- “Custom progress values in scripted upload” on page 323
- “Synchronization event hook sequence” on page 211
- “Scripted Upload” on page 313

sp_hook_dbmlsync_sql_error

Use this stored procedure to handle database errors that occur during synchronization. For example, you can implement the sp_hook_dbmlsync_sql_error hook to perform a specific action when a specific SQL error occurs.

Rows in #hook_dict table

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.
error message (in)	error message text	This is the same text that is displayed in the dbmlsync log.
error id (in)	numeric	An ID that uniquely identifies the message. Use this row to identify the error message, as the error message text may change.
error hook user state (in|out)	integer	This value can be set by the hook to pass state information to future calls to the sp_hook_dbmlsync_all_error, sp_hook_dbmlsync_communication_error, sp_hook_dbmlsync_misc_error, sp_hook_dbmlsync_sql_error, or sp_hook_dbmlsync_end hooks. The first time one of these hooks is called, the value of the row is 0. If the hook changes the value of the row, the new value is used in the next hook call. When you use this hook to pass state information to the sp_hook_dbmlsync_end hook, you can cause the _end hook to perform actions such as retrying the synchronization.
sql code (in)	SQL error code	The SQL error code returned by the database when the operation failed. These values are defined in *sqlerr.h* in the *h* subdirectory of your SQL Anywhere installation.
sql state (in)	SQLSTATE value	The SQL state returned by the database when the operation failed.

Remarks

If an error occurs during startup before a synchronization has been initiated, the #hook_dict entries for MobiLink user and Script version are set to an empty string, and no publication_*n* rows are set in the #hook_dict table.

You can identify SQL errors using the SQL Anywhere SQLCODE or the ANSI SQL standard SQLSTATE. For a list of SQLCODE or SQLSTATE values, see "Database Error Messages" [*SQL Anywhere 10 - Error Messages*].

This procedure executes on a separate connection to ensure that operations it performs are not lost if a rollback is performed on the synchronization connection. If dbmlsync cannot establish a separate connection, the procedure is not called.

By default on Windows CE devices, synchronization tables are locked in exclusive mode, which means that this hook cannot successfully execute if it requires access to any of the synchronization tables. It also cannot execute if it needs to access synchronization tables and you set the dbmlsync extended option LockTables to EXCLUSIVE. See "LockTables (lt) extended option" on page 181.

Actions of this procedure are committed immediately after execution.

See also

- "Handling errors and warnings in event hook procedures" on page 215
- "sp_hook_dbmlsync_all_error" on page 219
- "sp_hook_dbmlsync_communication_error" on page 224
- "sp_hook_dbmlsync_misc_error" on page 253
- "Database Error Messages" [*SQL Anywhere 10 - Error Messages*]

sp_hook_dbmlsync_upload_begin

Use this stored procedure to add custom actions immediately before the transmission of the upload.

Rows in #hook_dict table

Name	Value	Description
Publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
Script version (in)	script version name	The MobiLink script version to be used for the synchronization.

Remarks

If a procedure of this name exists, it is called immediately before dbmlsync sends the upload.

Actions of this procedure are committed immediately after execution.

See also

- "Synchronization event hook sequence" on page 211

Examples

Assume you use the following table to log synchronization events on the remote database.

```
CREATE TABLE SyncLog
(
 "event_id"          INTEGER NOT NULL DEFAULT AUTOINCREMENT ,
   "event_name"       VARCHAR(128) NOT NULL ,
   "ml_user"            VARCHAR(128) NULL ,
   "event_time"         TIMESTAMP NULL,
   "table_name"         VARCHAR(128) NULL ,
   "upsert_count"       VARCHAR(128) NULL ,
   "delete_count"       VARCHAR(128) NULL ,
   "exit_code"          INTEGER NULL ,
   "status_retval"      VARCHAR(128) NULL ,
   "pubs"                VARCHAR(128) NULL ,
   "sync_descr "         VARCHAR(128) NULL ,
    PRIMARY KEY ("event_id"),
);
```

The following example logs the MobiLink user and current timestamp immediately before the transmission of the upload.

```
CREATE PROCEDURE sp_hook_dbmlsync_upload_begin ()
BEGIN
 INSERT INTO SyncLog (event_name, ml_user,event_time)
  SELECT 'upload_begin', #hook_dict.value, CURRENT TIMESTAMP
  FROM #hook_dict
```



```
  WHERE name = 'MobiLink user';
END;
```


sp_hook_dbmlsync_upload_end

Use this stored procedure to add custom actions after dbmlsync has verified receipt of the upload by the MobiLink server.

Rows in #hook_dict table

Name	Value	Description
failure cause (in)	See range of values in Remarks, below	The cause of failure of an upload. For more information, see Description.
upload status (in)	**retry** | **committed** | **failed** | **unknown**	Specifies the status returned by the MobiLink server when dbmlsync attempted to verify receipt of the upload. **retry** - The MobiLink server and dbmlsync had different values for the log offset from which the upload should start. The upload was not committed by the MobiLink server. The dbmlsync utility will attempt to send another upload starting from a new log offset. **committed** - The upload was received by the MobiLink server and committed. **failed** - The MobiLink server did not commit the upload. **unknown** - Dbmlsync was started with the -tu option, causing transaction-level uploads. For each transaction that is uploaded, the sp_hook_dbmlsync_upload_begin and sp_hook_dbmlsync_upload_end hooks are called and the upload status value is **unknown** - each time except the last one.
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
script version (in)	script version name	The MobiLink script version to be used for the synchronization.
authentication value (in)	value	This value is generated by the authenticate_user, authenticate_user_hashed, or authenticate_parameters script on the server. The value is an empty string when the upload status is unknown or when the upload_end hook is called after an upload is resent because of a conflict between the log offsets stored in the remote and consolidated databases.

Remarks

If a procedure of this name exists, it is called immediately after dbmlsync has sent the upload and received confirmation of it from the MobiLink server.

Actions of this procedure are committed immediately after execution.

The range of possible parameter values for the failure cause row in the #hook_dict table includes:

- **UPLD_ERR_ABORTED_UPLOAD** The upload failed due to an error that occurred on the remote. Typical causes of the failure include communication errors and out-of-memory conditions.
- **UPLD_ERR_COMMUNICATIONS_FAILURE** A communication error occurred.
- **UPLD_ERR_LOG_OFFSET_MISMATCH** The upload failed because of conflict between log offset stored on the remote and consolidated databases.
- **UPLD_ERR_GENERAL_FAILURE** The upload failed for an unknown reason.
- **UPLD_ERR_INVALID_USERID_OR_PASSWORD** The user ID or password was incorrect.
- **UPLD_ERR_USERID_OR_PASSWORD_EXPIRED** The user ID or password expired.
- **UPLD_ERR_USERID_ALREADY_IN_USE** The user ID was already in use.
- **UPLD_ERR_DOWNLOAD_NOT_AVAILABLE** The upload was committed on the consolidated but an error occurred that prevented MobiLink from generating a download.
- **UPLD_ERR_PROTOCOL_MISMATCH** dbmlsync received unexpected data from the MobiLink server.
- **UPLD_ERR_SQLCODE_n** Here, *n* is an integer. A SQL error occurred in the consolidated database. The integer specified is the SQLCODE for the error encountered.

See also

- "Synchronization event hook sequence" on page 211

Examples

Assume you use the following table to log synchronization events on the remote database.

```
CREATE TABLE SyncLog(
   "event_id"          INTEGER NOT NULL DEFAULT AUTOINCREMENT ,
   "event_name"       VARCHAR(128) NOT NULL ,
   "ml_user"            VARCHAR(128) NULL ,
   "event_time"         TIMESTAMP NULL,
   "table_name"         VARCHAR(128) NULL ,
   "upsert_count"       VARCHAR(128) NULL ,
   "delete_count"       VARCHAR(128) NULL ,
   "exit_code"          INTEGER NULL ,
   "status_retval"      VARCHAR(128) NULL ,
   "pubs"                VARCHAR(128) NULL ,
   "sync_descr "         VARCHAR(128) NULL ,
     PRIMARY KEY ("event_id"),
);
```

The following example logs the MobiLink user and current timestamp after dbmlsync verifies that the MobiLink server has received the upload.


```
CREATE PROCEDURE sp_hook_dbmlsync_upload_end ()
BEGIN

 DECLARE status_return_value VARCHAR(255);

 -- store status_return_value
  SELECT #hook_dict.value
  INTO status_return_value
  FROM #hook_dict
  WHERE #hook_dict.name = 'upload status';

   INSERT INTO SyncLog (event_name, ml_user,
     status_retval, event_time)
   SELECT 'upload_end', #hook_dict.value,
     status_return_value, CURRENT TIMESTAMP
  FROM #hook_dict
  WHERE name = 'MobiLink user';
END;
```

sp_hook_dbmlsync_validate_download_file

Use this hook to implement custom logic to decide if a download file can be applied to the remote database. This hook is called only when a file-based download is applied.

Rows in #hook_dict table

Name	Value	Description
publication_*n* (in)	publication	The publications being synchronized, where *n* is an integer. There is one publication_*n* entry for each publication being uploaded. The *n* in publication_*n* and generation number_*n* match. The numbering of *n* starts at zero.
MobiLink user (in)	MobiLink user name	The MobiLink user for which you are synchronizing.
file last download time (in)		The download file's last download time. (The download file contains all rows that were changed between its last download time and its next last download time.)
file next last download time (in)		The download file's next last download time. (The download file contains all rows that were changed between its last download time and its next last download time.)
file creation time (in)		The time when the download file was created.
file generation number_*n* (in)	number	The generation numbers from the download file. There is one file generation number_*n* for each publication_*n* entry. The *n* in publication_*n* and generation number_*n* match. The numbering of *n* starts at zero.
user data (in)	string	The string specified with the dbmlsync -be option when the download file was created.
apply file (in|out)	**True**|**False**	If true (the default), the download file will be applied only if it passes dbmlsync's other validation checks. If false, the download file will not be applied to the remote database.
check generation number (in|out)	**True**|**False**	If true (the default), dbmlsync validates generation numbers. If the generation numbers in the download file do not match those in the remote database, dbmlsync does not apply the download file. If false, dbmlsync does not check generation numbers.

Name	Value	Description
setting generation number (in)	**true** | **false**	True if the -bg option was used when the download file was created. If -bg was used, the generation numbers on the remote database are updated from the download file and normal generation number checks are not performed.

Remarks

Use this stored procedure to implement custom checks to decide if a download file can be applied.

If you want to compare the generation numbers or timestamps contained in the file with those stored in the remote database, they can be queried from the SYSSYNC and SYSPUBLICATION system views.

This hook is called when the -ba option is specified. It is called before the download file is applied to the remote database.

The actions of this hook are committed immediately after it completes.

See also

- "-be option" on page 120
- "-bg option" on page 121
- "MobiLink File-Based Download" [*MobiLink - Server Administration*]

Examples

The following example prevents application of download files that don't contain the user string 'sales manager data'.

```
CREATE PROCEDURE sp_hook_dbmlsync_validate_download_file ()
BEGIN
  IF NOT exists(SELECT * FROM #hook_dict
   WHERE name = 'User data' AND value='sales manager data')
  THEN
    UPDATE #hook_dict
             SET value = 'false' WHERE name = 'Apply file';
  END IF;
END;
```


CHAPTER 11

Dbmlsync Integration Component

Contents

Introduction to Dbmlsync Integration Component

The Dbmlsync Integration Component is an ActiveX that you can use to add synchronization to your applications. It provides a set of properties, events, and methods to regulate the behavior of SQL Anywhere clients.

The Dbmlsync Integration Component is available in two forms, both of which expose the same properties, events and methods:

- A visual component that provides an easy way to integrate the standard dbmlsync user interface into your applications.
- A non-visual component that allows you to access the component's functionality with no user interface or with a custom user interface that you create yourself.

Using the Dbmlsync Integration Component, your application can initiate synchronization, receive information about the progress of a synchronization, and implement special processing based on synchronization events.

DBTools interface for dbmlsync

As an alternative to the Dbmlsync Integration Component, you can use DBTools interface for dbmlsync.

See "Database Tools Interface" [*SQL Anywhere Server - Programming*].

Supported platforms

You can use the Dbmlsync Integration Component on all MobiLink supported Windows operating systems, including Windows CE versions supporting ActiveX.

Supported development environments include Microsoft Visual Basic 6.0, eMbedded Visual Basic, and Visual Studio .NET.

Setting up the Dbmlsync Integration Component

The Dbmlsync Integration Component is an ActiveX and can be used in a wide variety of programming environments. You should consult the documentation for your programming environment for information about how to set it up.

Dbmlsync Integration Component methods

The following are methods implemented by the DbmlsyncCOM.Dbmlsync class.

Run method

Begins one or more synchronizations using dbmlsync command line options.

Syntax

Run(ByVal *cmdLine* As String **)**
Member of **DbmlsyncCOM.Dbmlsync**

Parameters

cmdLine A string specifying dbmlsync options.

Remarks

For a list of options, see "dbmlsync syntax" on page 111.

The run method returns immediately and does not wait for the synchronization to complete. You can use the DoneExecution event to determine when your synchronization is complete.

The cmdLine parameter should contain the same options you would use if you were performing a synchronization with the dbmlsync command line utility. For example, the following command line and Run method invocation are equivalent:

```
dbmlsync -c uid=DBA;pwd=sql

dbmlsync1.Run "-c uid=DBA;pwd=sql"
```

Example

The following example initiates a synchronization for a remote database called remote1.

```
dbmlsync1.Run "-c eng=remote1;uid=DBA;pwd=sql"
```

Stop method

Requests active synchronizations to terminate.

Syntax

Stop( )
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

The Stop method issues a request to terminate any active synchronizations. It returns immediately.

The stop button built into the visual Dbmlsync Integration Component automatically invokes this method.

Example

The following example stops synchronizations being run by the Dbmlsync Integration Component instance dbmlsync1.

```
dbmlsync1.Stop
```


Dbmlsync Integration Component properties

Dbmlsync Integration Component properties let you customize the behavior of the component and examine the state of a running synchronization.

Path property

Specifies the location of *dbmlsync.exe*.

Syntax

Public Property **Path( )** As String
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

You do not need to set this property if *dbmlsync.exe* is located in a directory specified by the Windows PATH environment variable.

Example

The following example sets the path of a Dbmlsync Integration Component instance.

```
dbmlsync1.Path = "c:\program files\sql anywhere 10\win32"
```

UploadEventsEnabled property

Enables the UploadRow event.

Syntax

Public Property **UploadEventsEnabled()** As Boolean
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

If you handle the UploadRow event, you should set this property to true. The default is false, which disables the UploadRow event. Setting the property to true will reduce performance.

See "UploadRow event" on page 298.

Example

The following example sets UploadEventsEnabled to true:

```
dbmlsync1.UploadEventsEnabled = True
```

DownloadEventsEnabled property

Enables the DownloadRow event.

Syntax

Public Property **DownloadEventsEnabled( )** As Boolean
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

If you handle the DownloadRow event, you should set this property to true. The default is false, which disables the DownloadRow event. Setting the property to true will reduce performance.

See "DownloadRow event" on page 290.

Example

The following example sets DownloadEventsEnabled to true:

```
dbmlsync1.DownloadEventsEnabled = True
```

ErrorMessageEnabled property

Prevents the Message event from being called for messages of type MsgError.

Syntax

Public Property **ErrorMessageEnabled( )** As Boolean
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

If you do not handle error information in the Message event, you should set this property to false to improve performance. The default is true, which enables messages of type MsgError to trigger the Message event.

See "Message event" on page 294.

Example

The following example sets ErrorMessageEnabled to false:

```
dbmlsync1.ErrorMessageEnabled = False
```

WarningMessageEnabled property

Prevents the Message event from being called for messages of type MsgWarning.

Syntax

Public Property **WarningMessageEnabled( )** As Boolean
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

If you do not handle warning information in the Message event, you should set this property to false to improve performance. The default is true, which enables messages of type MsgWarning to trigger the Message event.

See "Message event" on page 294.

Example

The following example sets WarningMessageEnabled to false:

```
dbmlsync1.WarningMessageEnabled = False
```

InfoMessageEnabled property

Prevents the Message event from being called for messages of type MsgInfo.

Syntax

Public Property **InfoMessageEnabled( )** As Boolean
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

If you do not handle general progress information in the Message event, you should set this property to false to improve performance. The default is true, which enables messages of type MsgInfo to trigger the Message event.

See "Message event" on page 294.

Example

The following example sets InfoMessageEnabled to false:

```
dbmlsync1.InfoMessageEnabled = False
```

DetailedInfoMessageEnabled property

Prevents the Message event from being called for messages of type MsgDetailedInfo.

Syntax

Public Property **DetailedInfoMessageEnabled( )** As Boolean
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

If you do not handle detailed progress information in the Message event, you should set this property to false to improve performance. The default is true, which enables messages of type MsgDetailedInfo to trigger the Message event.

See "Message event" on page 294.

Example

The following example sets DetailedInfoMessageEnabled to false:

```
dbmlsync1.DetailedInfoMessageEnabled = False
```


UseVB6Types property

If you are using Visual Basic 6, set this property to true to simplify handling of row data returned by the UploadRow and DownloadRow events.

Syntax

Public Property **DetailedInfoMessageEnabled( )** As Boolean
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

Visual Basic 6 does not support unsigned 32 bit values and any 64 bit values. Data of these types may be returned by the ColumnValue property of an IRowTransferData object. When UseVB6Types is set to true, data of these types is converted to other types supported by Visual Basic 6 for easier processing. Uint32 values are converted to double; 64 bit values are converted to strings.

See also

- "IRowTransferData interface" on page 301
- "UploadRow event" on page 298
- "DownloadRow event" on page 290

Example

The following example enables data type coercion for a Dbmlsync Integration Component instance used in Visual Basic 6.0:

```
dbmlsync1.UseVB6Types = True
```

ExitCode property

Returns the exit code from synchronizations started by the most recent Run method invocation.

Syntax

Public Property **ExitCode( )** As Integer
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

The ExitCode property returns the exit code for the synchronizations started by the last Run method invocation. 0 indicates successful synchronizations. Any other value indicates that a synchronization failed.

> **Note:**
> Retrieving the value of this property before the DoneExecution event is triggered may result in a meaningless exit code value.

Example

The following example displays the exit code from the most recent synchronization attempt when the DoneExecution event is triggered.


```
Private Sub dbmlsync1_DoneExecution() Handles dbmlsync1.DoneExecution
        MsgBox(dbmlsync1.ExitCode)
    End Sub
```

EventChannelSize property

Specifies the size of an internal buffer used for processing method calls.

Syntax

Public Property **EventChannelSize( )** As Integer
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

Most users will never have to change this property.

DispatchChannelSize property

Specifies the size of an internal buffer used for processing event information.

Syntax

Public Property **DispatchChannelSize( )** As Integer
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

Most users will never have to change this property.

Dbmlsync Integration Component events

Events provide a mechanism for client applications to receive and act on information about the progress of a synchronization.

BeginDownload event

The BeginDownload event is triggered at the beginning of the download stage of a synchronization.

Syntax

Public Event **BeginDownload( )**
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

Use this event to add custom actions at the beginning of the download stage of a synchronization.

Example

The following Visual Basic .NET example outputs a message when the BeginDownload event is triggered.

```
Private Sub dbmlsync1_BeginDownload()
Handles dbmlsync1.BeginDownload

        MsgBox("Beginning Download")

End Sub
```

BeginLogScan event

The BeginLogScan event is triggered immediately before dbmlsync scans the transaction log to assemble the upload. This event is not fired for scripted uploads.

Syntax

Public Event **BeginLogScan(** ByVal *rescanLog* As Boolean **)**
Member of **DbmlsyncCOM.Dbmlsync**

Parameters

rescanLog If this is the first time the transaction log has been scanned for this synchronization, the value is false; otherwise it is true. The log is scanned twice when the MobiLink server and dbmlsync have different information about where scanning should begin.

Remarks

Use this event to add custom actions immediately before the transaction log is scanned for upload.

Example

The following Visual Basic .NET example outputs a message when the BeginLogScan event is triggered.

```
Private Sub dbmlsync1_BeginLogScan(
 ByVal rescanLog As Boolean
```



```
)
Handles dbmlsync1.BeginLogScan

        MsgBox("Begin Log Scan")

End Sub
```

BeginSynchronization event

The BeginSynchronization event is triggered at the beginning of each synchronization.

Syntax

Public Event **BeginSynchronization(_**
ByVal *userName* As String, _
ByVal *pubNames* As String _
)
Member of **DbmlsyncCOM.Dbmlsync**

Parameters

userName The MobiLink user for which you are synchronizing.

pubNames The publication being synchronized. If there is more than one publication this is a comma-separated list.

Remarks

Use this event to add custom actions at the beginning of a synchronization.

Example

The following Visual Basic .NET example outputs a message when the BeginSynchronization event is triggered. The message outputs the user and publication names.

```
Private Sub dbmlsync1_BeginSynchronization(
 ByVal userName As String,
 ByVal pubNames As String
)
Handles dbmlsync1.BeginSynchronization

       MsgBox("Beginning synchronization for: " + userName _
     + " publication: " + pubNames)

End Sub
```

BeginUpload event

The BeginUpload event is triggered immediately before the transmission of the upload.

Syntax

Public Event **BeginUpload( )**
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

Use this event to add custom actions immediately before the transmission of the upload to the MobiLink server.

Example

The following Visual Basic .NET example outputs a message when the BeginUpload event is triggered.

```
Private Sub dbmlsync1_BeginUpload()
Handles dbmlsync1.BeginUpload

        MsgBox("Begin Upload")

End Sub
```

ConnectMobilink event

The ConnectMobilink event is triggered immediately before the component connects to the MobiLink server.

Syntax

Public Event **ConnectMobilink( )**
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

Use this event to add custom actions immediately before the remote database connects to the MobiLink server. At this stage, dbmlsync has generated the upload.

The ConnectMobiLink event occurs after the BeginSynchronization event.

Example

The following Visual Basic .NET example outputs a message when the ConnectMobilink event is triggered.

```
Private Sub dbmlsync1_ConnectMobilink()
Handles dbmlsync1.ConnectMobilink

        MsgBox("Connecting to the MobiLink server")

End Sub
```

DisconnectMobilink event

The DisconnectMobilink event is triggered immediately after the component disconnects from the MobiLink server.

Syntax

Public Event **DisconnectMobilink( )**
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

Use this event to add custom actions immediately after the remote database disconnects from the MobiLink server.

Example

The following Visual Basic .NET example outputs a message when the DisconnectMobilink event is triggered.

```
Private Sub dbmlsync1_DisconnectMobilink()
Handles dbmlsync1.DisconnectMobilink

        MsgBox("Disconnected from the MobiLink server")

End Sub
```

DoneExecution event

The DoneExecution event is triggered when all synchronizations started by a Run method invocation have completed.

Syntax

Public Event **DoneExecution( )**
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

Use this event to add custom actions when all synchronizations started by a Run method invocation have completed.

Example

Using the ExitCode property, the following Visual Basic .NET example outputs the exit code from the synchronizations started by the last Run method invocation:

```
Private Sub dbmlsync1_DoneExecution()
Handles dbmlsync1.DoneExecution

        MsgBox(dbmlsync1.ExitCode)

End Sub
```

DownloadRow event

The DownloadRow event is triggered when a row is downloaded from the MobiLink server.

Syntax

Public Event **DownloadRow(**
ByVal *rowData* As DbmlsyncCOM.IRowTransferData
)
Member of **DbmlsyncCOM.Dbmlsync**

Parameters

rowData An IRowTransferData object containing detailed information about the downloaded row.

For more information about the IRowTransferData interface, see "IRowTransferData interface" on page 301.

Remarks

Use this event to examine rows being downloaded from the MobiLink server.

To enable the DownloadRow event, use the DownloadEventsEnabled property.

See "DownloadEventsEnabled property" on page 282.

When a delete operation is encountered in the download row event, only primary key column values are available.

Example

The following Visual Basic .NET example iterates through all the columns for a row in the DownloadRow event. It determines if a column value is null, and outputs column names and values.

```
Private Sub dbmlsync1_DownloadRow(
 ByVal rowData As DbmlsyncCOM.IRowTransferData
)
Handles dbmlsync1.DownloadRow

Dim liX As Integer
For liX = 0 To rowData.ColumnCount - 1
    If VarType(rowData.ColumnValue(liX)) <> VariantType.Null Then
        ' output the non-null column value
        MsgBox("Column " + CStr(liX) + ": " + rowData.ColumnName(liX) + _
        ", " + CStr(rowData.ColumnValue(liX)))
    Else
        ' output 'NULL' for the column value
        MsgBox("Column " + CStr(liX) + ": " + rowData.ColumnName(liX) + _
        ", " + "NULL")
    End If
Next liX

End Sub
```

EndDownload event

The EndDownload event is triggered at the end of the download stage of the synchronization process.

Syntax

Public Event **EndDownload(**
  long *upsertRows*,
  long *deleteRows*
)
Member of **DbmlsyncCOM.Dbmlsync**

Parameters

upsertRows Indicates the number of rows updated or inserted by the download.

deleteRows Indicates the number of rows deleted by the download.

Remarks

Use this event to add custom actions at the end of the download stage of synchronization.

Example

The following Visual Basic .NET example outputs a message and the number of inserted, updated, and deleted rows when the EndDownload event is triggered.

```
Private Sub dbmlsync1_EndDownload(
 ByVal upsertRows As Integer,
 ByVal deleteRows As Integer
)
Handles dbmlsync1.EndDownload

    MsgBox("Download complete." + _
     CStr(upsertRows) + "Rows updated or inserted" + _
     CStr(deleteRows) + "Rows deleted")

End Sub
```

EndLogScan event

The EndLogScan event is triggered immediately after the transaction log is scanned for upload. This event is not fired for scripted uploads.

Syntax

Public Event **EndLogScan( )**
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

Use this event to add custom actions immediately after the transaction log is scanned for upload.

Example

The following Visual Basic .NET example outputs a message when the EndLogScan event is triggered.

```
Private Sub dbmlsync1_EndLogScan()
Handles dbmlsync1.EndLogScan

        MsgBox("Scan of transaction log complete...")

End Sub
```

EndSynchronization event

The EndSynchronization event is triggered when a synchronization is complete.

Syntax

Public Event **EndSynchronization(**
 ByVal *exitCode* As Integer,
 ByRef *restart* As Boolean
)
Member of **DbmlsyncCOM.Dbmlsync**

Parameters

exitCode If set to anything other than zero, this indicates that a synchronization error occurred.

restart This value is set to false when the event is called. If the event changes its value to true, dbmlsync will restart the synchronization.

Remarks

Use this event to add custom actions when a synchronization is complete.

Example

The following Visual Basic .NET example uses the EndSynchronization event to restart up to five failed synchronization attempts. If all restart attempts failed, the message "All restart attempts failed" is output, along with the exit code. If a synchronization is successful, the message "Synchronization succeeded " is output, along with the exit code.

```
' Global variable for the number of restarts
Dim numberOfRestarts As Integer

Private Sub dbmlsync1_EndSynchronization(
 ByVal ExitCode As Integer,
 ByRef restart As Boolean
)
Handles dbmlsync1.EndSynchronization

    If numberOfRestarts < 5 Then
        MsgBox("Restart Number: " + CStr(numberOfRestarts + 1))
        If ExitCode <> 0 Then
            ' restart the failed synchronization
            restart = True
            numberOfRestarts = numberOfRestarts + 1
        Else
            ' the last synchronization succeeded
            MsgBox("Synchronization succeeded. " + _
              "Exit code: " + CStr(ExitCode))
        End If
    Else
        MsgBox("All restart attempts failed. " + _
             "Exit code: " + CStr(ExitCode))
    End If

End Sub
```

EndUpload event

The EndUpload event is triggered immediately after transmission of the upload to the MobiLink server.

Syntax

Public Event **EndUpload( )**
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

Use this event to add custom actions immediately after transmission of the upload from dbmlsync to the MobiLink server.

Example

The following Visual Basic .NET example outputs a message when the EndUpload event is triggered.


```
Private Sub dbmlsync1_EndUpload()
Handles dbmlsync1.EndUpload

    MsgBox("End Upload")

End Sub
```

Message event

The Message event is triggered when dbmlsync logs information.

Syntax

Public Event **Message(_**
ByVal *msgClass* As DbmlsyncCOM.MessageClass, _
ByVal *msgID* As Integer, ByVal *msg* As String_
)
Member of **DbmlsyncCOM.Dbmlsync**

Parameters

msgClass indicates the severity of the message. Values can be:

- **MsgInfo** A message containing progress information about the synchronization.
- **MsgDetailedInfo** Like MsgInfo, but containing more detailed information.
- **MsgWarning** A message indicating a potential problem but one that will not prevent successful synchronization.
- **MsgError** A message indicating a problem that will prevent successful synchronization.

msgID A unique identifier for the message. If msgID is zero, the message does not have a unique identifier.

msg The text of the message.

Remarks

Use this event to receive information logged by dbmlsync. If you want to add special processing when a specific message is generated, check for it by MsgID. That way your code will continue to work if the text of the message changes.

Example

The following Visual Basic .NET example adds messages logged by dbmlsync to a listbox control.

```
Private Sub dbmlsync1_Message(
 ByVal msgClass As DbmlsyncCOM.MessageClass,
 ByVal msgId As Integer, ByVal msg As String
)
Handles dbmlsync1.Message

    Select Case msgClass
        Case DbmlsyncCOM.MessageClass.MsgError
            lstMessages.Items.Add("Error: " + msg)
        Case DbmlsyncCOM.MessageClass.MsgWarning
            lstMessages.Items.Add("Warning: " + msg)
        Case DbmlsyncCOM.MessageClass.MsgInfo
```



```
            lstMessages.Items.Add("Info: " + msg)
        Case DbmlsyncCOM.MessageClass.MsgDetailedInfo
            lstMessages.Items.Add("DetInfo: " + msg)
    End Select

End Sub
```

Example

The following Visual Basic .NET example sets up the Message event to handle errors. Error messages are added to a ListBox control called lstMessages.

```
Private Sub dbmlsync1_Message(ByVal msgClass As DbmlsyncCOM.MessageClass,
ByVal msgId As Integer, ByVal msg As String) Handles dbmlsync1.Message
  If msgClass = DbmlsyncCOM.MessageClass.MsgError Then
   lstMessages.Items.Add("Error: " + msgId.ToString() + " " + msg)
  End If
End Sub
```

To see possible error id values, test run the Dbmlsync Integration Component. For example, if dbmlsync returns the error "Unable to connect to MobiLink server", the Message event inserts the following entry in lstMessages:

```
Error: 14173 Unable to connect to MobiLink server.
```

Now, you can associate the error "Unable to connect to MobiLink server" with the error id 14173. The following example sets up the Dbmlsync Integration Component to retry a synchronization whenever error 14173 occurs. The Message event sets a variable called restartSynchronization and resets a variable called numberOfRestarts in response to error 14173. The EndSynchronization event retries the synchronization up to five times.

```
' variables for restarting synchronization
Dim numberOfRestarts As Integer = 0
Dim restartSynchronization As Integer = 0



Private Sub dbmlsync1_Message
(
 ByVal msgClass As DbmlsyncCOM.MessageClass,
 ByVal msgId As Integer, ByVal msg As String ) Handles dbmlsync1.Message


 If msgClass = DbmlsyncCOM.MessageClass.MsgError Then
     lstMessages.Items.Add("Error: " + msgId.ToString() + " " + msg)


     If msgId = 14173 Then
       restartSynchronization = 1
       numberOfRestarts = 0

     End If
 End If
End Sub



Private Sub dbmlsync1_EndSynchronization(ByVal ExitCode As Integer, _
    ByRef restart As Boolean _
```



```
    ) Handles dbmlsync1.EndSynchronization


    If restartSynchronization = 1 Then
      If numberOfRestarts < 5 Then
         restart = True
         numberOfRestarts = numberOfRestarts + 1
      End If
    End If
End Sub
```

ProgressIndex event

The ProgressIndex event is triggered when dbmlsync updates its progress bar.

Syntax

Public Event **ProgressIndex(_**
 ByVal *index* As Integer, _
 ByVal *max* As Integer _
)
Member of **DbmlsyncCOM.Dbmlsync**

Parameters

index An integer representing the progress of the synchronization.

max The maximum progress value. The percentage done = `index/max x 100`. If this value is zero, the maximum value has not changed since the last time the event was fired.

Remarks

Use this event to update a progress indicator such as a progress bar.

Example

The following Visual Basic .NET example updates a progress bar control based on the Index value. The maximum index value is set at the beginning of the synchronization.

```
Private Sub dbmlsync1_ProgressIndex(
 ByVal index As Integer,
 ByVal max As Integer
)
Handles dbmlsync1.ProgressIndex

    If max <> 0 Then
        ProgressBar1.Maximum = max
    End If
    ProgressBar1.Value = index

End Sub
```

ProgressMessage event

The ProgressMessage event is triggered when synchronization progress information changes.

Syntax

Public Event **ProgressMessage(** ByVal *msg* As String **)**
Member of **DbmlsyncCOM.Dbmlsync**

Parameters

msg The new progress string.

Remarks

Use this event to receive the string normally displayed with the dbmlsync progress bar.

Example

The following Visual Basic .NET example sets the value of a progress label when the ProgressMessage event is triggered.

```
Private Sub dbmlsync1_ProgressMessage(
 ByVal msg As String
)
Handles dbmlsync1.ProgressMessage

    lblProgressMessage.Text = msg

End Sub
```

SetTitle event

The SetTitle event is triggered when status information changes. In the dbmlsync utility, this information is displayed in the title bar.

Syntax

Public Event **SetTitle(** ByVal *title* **)** As String
)
Member of **DbmlsyncCOM.Dbmlsync**

Parameters

title The title in the dbmlsync window title bar.

Remarks

Use this event to receive the title normally seen on the dbmlsync window when its value changes.

Example

The following Visual Basic .NET example sets the title of a Windows form when the SetTitle event is triggered.

```
Private Sub dbmlsync1_SetTitle(
 ByVal title As String
)
Handles dbmlsync1.SetTitle

        Me.Text = title

End Sub
```


UploadAck event

The UploadAck event is triggered after the component has received acknowledgement of the upload from the MobiLink server.

Syntax

Public Event **UploadAck(** _
  ByVal *status* As DbmlsyncCOM.UploadAckStatus _
)
Member of **DbmlsyncCOM.Dbmlsync**

Parameters

status Indicates the status returned by MobiLink to the remote after the upload is processed. Its value is one of:

- **StatCommitted** Indicates that the upload was received by the MobiLink server and committed.
- **StatRetry** Indicates that the MobiLink server and the remote database had different values for the log offset from which the upload should start. The upload was not committed by the MobiLink server. The component will attempt to send another upload starting from the MobiLink server's log offset.
- **StatFailed** Indicates that the MobiLink server did not commit the upload.

Remarks

Use this event to add custom actions after dbmlsync has received acknowledgement of the upload from the MobiLink server.

Example

The following Visual Basic .NET example outputs a message if the upload has failed when the UploadAck event is triggered.

```
Private Sub dbmlsync1_UploadAck(ByVal status As DbmlsyncCOM.UploadAckStatus)
Handles dbmlsync1.UploadAck

    If status = DbmlsyncCOM.UploadAckStatus.StatFailed Then
         MsgBox("Upload Failed")
    End If

End Sub
```

UploadRow event

The UploadRow event is triggered when a row is uploaded to the MobiLink server.

Syntax

Public Event **UploadRow(**
  ByVal *rowData* As DbmlsyncCOM.IRowTransferData
)
Member of **DbmlsyncCOM.Dbmlsync**

Parameters

rowData An IRowTransferData object containing detailed information about the uploaded row.

See "IRowTransferData interface" on page 301.

Remarks

Use this event to examine rows being uploaded to the MobiLink server.

To enable the UploadRow event, use the UploadEventsEnabled property. See "UploadEventsEnabled property" on page 282.

Example

The following Visual Basic .NET example iterates through all the columns for a row in the UploadRow event. It determines if a column value is null and outputs column names and values.

```
Private Sub dbmlsync1_UploadRow(
 ByVal rowData As DbmlsyncCOM.IRowTransferData
)
Handles dbmlsync1.UploadRow

Dim liX As Integer
For liX = 0 To rowData.ColumnCount - 1
    If VarType(rowData.ColumnValue(liX)) <> VariantType.Null Then
        ' output the non-null column value
        MsgBox("Column " + CStr(liX) + ": " + rowData.ColumnName(liX) + _
        ", " + CStr(rowData.ColumnValue(liX)))
    Else
        ' output 'NULL' for the column value
        MsgBox("Column " + CStr(liX) + ": " + rowData.ColumnName(liX) + _
        ", " + "NULL")
    End If
Next liX

End Sub
```

WaitingForUploadAck event

The WaitingForUploadAck event is triggered when the component begins waiting for upload acknowledgement from the MobiLink server.

Syntax

Public Event **WaitingForUploadAck( )**
Member of **DbmlsyncCOM.Dbmlsync**

Remarks

Use this event to add custom actions when the component is waiting for upload acknowledgement from the MobiLink server.

Example

The following Visual Basic .NET example outputs a message when the WaitingForUploadAck event is triggered.


```
Private Sub dbmlsync1_WaitingForUploadAck()
Handles dbmlsync1.WaitingForUploadAck

    MsgBox("Waiting for Upload Acknowledgement")

End Sub
```


IRowTransferData interface

Public Interface **IRowTransferData**
Member of **DbmlsyncCOM**

The UploadRow and DownloadRow events accept DbmlsyncCOM.IRowTransferData objects as parameters to examine uploaded and downloaded rows. This interface defines detailed row information including the table name, row operation, and column names.

RowOperation property

Specifies the operation performed on the row.

Syntax

Public Property **RowOperation( )** As DbmlsyncCOM.RowEventOp
Member of **DbmlsyncCOM.IRowTransferData**

Remarks

This property has one of the following values:

OpInsert The row was inserted.

OpUpdate The row was updated.

OpDelete The row was deleted.

OpTruncate The table was truncated (all the rows in the table were deleted). When the RowOperation property has this value, the ColumnName and ColumnValue properties return invalid information.

Note: For the DownloadRow event, upsert (update or insert) operations are given the OpInsert value.

TableName property

The name of the table on which an upload or download operation occurred.

Syntax

Public Property **TableName( )** As String
Member of **DbmlsyncCOM.IRowTransferData**

Remarks

The TableName property specifies the name of the table on which an upload or download operation occurred. The following example illustrates the use of the TableName property in the UploadRow event.

See "UploadRow event" on page 298.

Example

Following is a Visual Basic .NET example.


```
Private Sub dbmlsync1_UploadRow(
 ByVal rowData As DbmlsyncCOM.IRowTransferData
)
Handles dbmlsync1.UploadRow

    MsgBox ("Table name:" + rowData.TableName)

End Sub
```

ColumnName property

Retrieves the column names for a row on which an upload or download operation occurred.

Syntax

Public Property **ColumnName(**ByVal *index* As Integer**)** As Object
Member of **DbmlsyncCOM.IRowTransferData**

Parameters

index A zero based integer specifying the column name to be retrieved. Index values range from zero to one less than the ColumnCount property value.

See "ColumnCount property" on page 303.

Remarks

Associated column values can be retrieved using the ColumnValue property with the same index.

Example

The following Visual Basic .NET example iterates through all the columns for a row in the UploadRow event. It determines if a column value is null and outputs column names and values.

See "UploadRow event" on page 298.

```
Private Sub dbmlsync1_UploadRow(
 ByVal rowData As DbmlsyncCOM.IRowTransferData
)
Handles dbmlsync1.UploadRow

Dim liX As Integer
For liX = 0 To rowData.ColumnCount - 1
    If VarType(rowData.ColumnValue(liX)) <> VariantType.Null Then
        ' output the non-null column value
        MsgBox("Column " + CStr(liX) + ": " + rowData.ColumnName(liX) + _
        ", " + CStr(rowData.ColumnValue(liX)))
    Else
        ' output 'NULL' for the column value
        MsgBox("Column " + CStr(liX) + ": " + rowData.ColumnName(liX) + _
        ", " + "NULL")
    End If
Next liX

End Sub
```


ColumnValue property

Retrieves the value of columns on which an upload or download operation occurred.

Syntax

Public Property **ColumnValue(** ByVal *index* As Integer **)** As Object
Member of **DbmlsyncCOM.IRowTransferData**

Parameters

index The zero based integer specifying the column value to be retrieved. Index values range from zero to one less than the ColumnCount property value.

See "ColumnCount property" on page 303.

Remarks

When an update operation is encountered, the column values given by this property are the values after the update is applied.

Associated column names can be retrieved using the ColumnName property with the same index.

BLOB column values are not available through this property. When a BLOB column is encountered, the ColumnValue is the string "(blob)".

Example

The following Visual Basic .NET example iterates through all the columns for a row in the UploadRow event. It determines if a column value is null and outputs column names and values.

See "UploadRow event" on page 298.

```
Private Sub dbmlsync1_UploadRow(
 ByVal rowData As DbmlsyncCOM.IRowTransferData
)
Handles dbmlsync1.UploadRow

Dim liX As Integer
For liX = 0 To rowData.ColumnCount - 1
    If VarType(rowData.ColumnValue(liX)) <> VariantType.Null Then
        ' output the non-null column value
        MsgBox("Column " + CStr(liX) + ": " + rowData.ColumnName(liX) + _
        ", " + CStr(rowData.ColumnValue(liX)))
    Else
        ' output 'NULL' for the column value
        MsgBox("Column " + CStr(liX) + ": " + rowData.ColumnName(liX) + _
        ", " + "NULL")
    End If
Next liX

End Sub
```

ColumnCount property

The number of columns contained in a row on which an upload or download operation occurred.

Syntax

Public Property **ColumnCount( )** As Integer
Member of **DbmlsyncCOM.IRowTransferData**

Remarks

The ColumnCount property specifies the number of columns for a row on which an upload or download operation occurred. The following example illustrates the use of the ColumnCount property in the UploadRow event.

See "UploadRow event" on page 298.

Example

Following is a Visual Basic .NET example.

```
Private Sub dbmlsync1_UploadRow(
 ByVal rowData As DbmlsyncCOM.IRowTransferData
)
Handles dbmlsync1.UploadRow

    MsgBox "Number of Columns:" + CStr(rowData.ColumnCount)

End Sub
```


CHAPTER 12

DBTools Interface for dbmlsync

Contents

Introduction to DBTools interface for dbmlsync

Database tools (DBTools) is a library you can use to integrate database management, including synchronization, into your applications. All the database management utilities are built on DBTools.

See "Database Tools Interface" [*SQL Anywhere Server - Programming*].

You can use the DBTools interface for dbmlsync to integrate synchronization functionality into your MobiLink synchronization client applications. For example, you can use the interface to display dbmlsync output messages in a custom user interface.

The DBTools interface for dbmlsync consists of the following elements that let you configure and run the MobiLink synchronization client:

- **a_sync_db structure** This structure holds settings, corresponding to dbmlsync command line options, that allow you to customize synchronization. This structure also contains pointers to callback functions receiving synchronization and progress information.

  See "a_sync_db structure" [*SQL Anywhere Server - Programming*].

- **a_syncpub structure** This structure holds publication information. You can specify a linked list of publications for synchronization.

  See "a_syncpub structure" [*SQL Anywhere Server - Programming*].

- **DBSynchronizeLog function** This function starts the synchronization process. Its only parameter is a pointer to an a_sync_db instance.

  See "DBSynchronizeLog function" [*SQL Anywhere Server - Programming*].

Dbmlsync Integration Component

As an alternative to the DBTools interface for dbmlsync, you can use the Dbmlsync Integration Component.

See "Dbmlsync Integration Component" on page 277.

Setting up the DBTools interface for dbmlsync

This section guides you through the basic steps for using the DBTools interface for dbmlsync.

For more information about the DBTools library, see "Introduction to the database tools interface" [*SQL Anywhere Server - Programming*].

For more information about using import libraries for your development environment, see "Using the database tools interface" [*SQL Anywhere Server - Programming*].

♦ To configure and start dbmlsync using the DBTools interface in C or C++

1. Include the DBTools header file.

   The DBTools header file, *dbtools.h*, lists the entry points to the DBTools library and defines required data types.

   ```
   #include "dbtools.h"
   ```

2. Start the DBTools interface.

   - Declare and initialize the a_dbtools_info structure.

     ```
     a_dbtools_info   info;
     short ret;
     ...
     // clear a_dbtools_info fields
     memset( &info, 0, sizeof( info ) );
     info.errorrtn = dbsyncErrorCallBack;
     ```

     The dbsyncErrorCallBack function handles error messages and is defined in step 4 of this procedure.

   - Use the DBToolsInit function to initialize DBTools.

     ```
     ret = DBToolsInit( &info );
     if( ret != 0 ) {
      printf("dbtools initialization failure \n");
     }
     ```

     For more information about DBTools initialization, see:

     - "Using the database tools interface" [*SQL Anywhere Server - Programming*]
     - "a_dbtools_info structure" [*SQL Anywhere Server - Programming*]
     - "DBToolsInit function" [*SQL Anywhere Server - Programming*]

3. Initialize the a_sync_db structure.

   - Declare an a_sync_db instance. For example, declare an instance called dbsync_info:

     ```
     a_sync_db dbsync_info;
     ```

   - Clear a_sync_db structure fields.

     ```
     memset( &dbsync_info, 0, sizeof( dbsync_info ) );
     ```


- Set required a_sync_db fields.

  ```
  dbsync_info.version = DB_TOOLS_VERSION_NUMBER;
  dbsync_info.output_to_mobile_link = 1;
  dbsync_info.default_window_title
    = "dbmlsync dbtools sample";
  ```

- Set the database connection string.

  ```
  dbsync_info.connectparms = "uid=DBA;pwd=sql";
  ```

  For more information about database connection parameters, see "-c option" on page 122.

- Set other a_sync_db fields to customize synchronization.

  Most fields correspond to dbmlsync command line options. For more information about this correspondence, see *dbtools.h*.

  In the example below, verbose operation is enabled.

  ```
  dbsync_info.verbose_upload = 1;
  dbsync_info.verbose_option_info = 1;
  dbsync_info.verbose_row_data = 1;
  dbsync_info.verbose_row_cnts = 1;
  ```

For more information about a_sync_db fields, see "a_sync_db structure" [*SQL Anywhere Server - Programming*].

4. Create callback functions to receive feedback during synchronization and assign these functions to the appropriate a_sync_db fields.

   The following functions use the standard output stream to display dbmlsync error, log, and progress information.

   For more information about DBTools callback functions, see "Using callback functions" [*SQL Anywhere Server - Programming*].

   - For example, create a function called dbsyncErrorCallBack to handle generated error messages:

     ```
     extern short _callback dbsyncErrorCallBack( char *str )
     {
         if( str != NULL ) {
             printf( "Error Msg    %s\n", str );
         }
         return 0;
     }
     ```

   - For example, create a function called dbsyncWarningCallBack to handle generated warning messages:

     ```
     extern short _callback dbsyncWarningCallBack( char *str )
     {
         if( str != NULL ) {
             printf( "Warning Msg  %s\n", str );
         }
         return 0;
     }
     ```


- For example, create a function called dbsyncLogCallBack to receive verbose informational messages that you might choose to log to a file instead of displaying in a window:

```
extern short _callback dbsyncLogCallBack( char *str )
{
    if( str != NULL ) {
        printf( "Log Msg      %s\n", str );
    }
    return 0;
}
```

- For example, create a function called dbsyncMsgCallBack to receive informational messages generated during synchronization.

```
extern short _callback dbsyncMsgCallBack( char *str )
{
    if( str != NULL ) {
        printf( "Display Msg  %s\n", str );
    }
    return 0;
}
```

- For example, create a function called dbsyncProgressMessageCallBack to receive the progress text. In the dbmlsync utility, this text is displayed directly above the progress bar.

```
extern short _callback dbsyncProgressMessageCallBack(
 char *str )
{
    if( str != NULL ) {
        printf( "ProgressText %s\n", str );
    }
    return 0;
}
```

- For example, create a function called dbsyncProgressIndexCallBack to receive information for updating a progress indicator or progress bar. This function receives two parameters:

  - **index** An integer representing the current progress of a synchronization.

  - **max** The maximum progress value. If this value is zero, the maximum value has not changed since the last time the event was fired.

```
extern short _callback dbsyncProgressIndexCallBack
(a_sql_uint32 index, a_sql_uint32 max )
{
    printf( "ProgressIndex    Index %d Max: %d\n",
            index, max );
    return 0;
}
```

  A typical sequence of calls to this callback is shown below

```
// example calling sequence
dbsyncProgressIndexCallBack( 0, 100 );
dbsyncProgressIndexCallBack( 25, 0 );
dbsyncProgressIndexCallBack( 50, 0 );
```



```
dbsyncProgressIndexCallBack( 75, 0 );
dbsyncProgressIndexCallBack( 100, 0 );
```

This sequence should result in the progress bar being set to 0% done, 25% done, 50% done, 75% done, and 100% done.

- For example, create a function called dbsyncWindowTitleCallBack to receive status information. In the dbmlsync utility, this information is displayed in the title bar.

```
extern short _callback dbsyncWindowTitleCallBack(
 char *title )
{
    printf( "Window Title     %s\n", title );
    return 0;
}
```

- The dbsyncMsgQueueCallBack function is called when a delay or sleep is required. It must return one of the following values, which are defined in *dllapi.h*.

  - **MSGQ_SLEEP_THROUGH** indicates that the routine slept for the requested number of milliseconds. In most cases this is the value you should return.

  - **MSGQ_SHUTDOWN_REQUESTED** indicates that you would like the synchronization to terminate as soon as possible.

  - **MSGQ_SYNC_REQUESTED** indicates that the routine slept for less than the requested number of milliseconds and that the next synchronization should begin immediately if a synchronization is not currently in progress.

```
extern short _callback dbsyncMsgQueueCallBack(
            a_sql_uint32 sleep_period_in_milliseconds )
{

 printf( "Sleep %d ms\n", sleep_period_in_milliseconds );
 Sleep( sleep_period_in_milliseconds );
 return MSGQ_SLEEP_THROUGH;
}
```

- Assign callback function pointers to the appropriate a_sync_db synchronization structure fields.

```
// set call back functions
dbsync_info.errorrtn    = dbsyncErrorCallBack;
dbsync_info.warningrtn  = dbsyncWarningCallBack;
dbsync_info.logrtn      = dbsyncLogCallBack;
dbsync_info.msgrtn      = dbsyncMsgCallBack;
dbsync_info.msgqueuertn = dbsyncMsgQueueCallBack;
dbsync_info.progress_index_rtn
     = dbsyncProgressIndexCallBack;
dbsync_info.progress_msg_rtn
     = dbsyncProgressMessageCallBack;
dbsync_info.set_window_title_rtn
     = dbsyncWindowTitleCallBack;
```

5. Create a linked list of a_syncpub structures to specify which publications should be synchronized.

   Each node in the linked list corresponds to one instance of the -n option on the dbmlsync command line.

   - Declare an a_syncpub instance. For example, call it publication_info:


```
a_syncpub publication_info;
```

- Initialize a_syncpub fields, specifying publications you want to synchronize.

  For example, to identify the template_p1 and template_p2 publications together in a single synchronization session:

  ```
  publication_info.next = NULL; // linked list terminates
  publication_info.pub_name = "template_p1,template_p2";
  publication_info.ext_opt  = "sv=template_ver1";
  publication_info.alloced_by_dbsync = 0;
  ```

  This is equivalent to specifying `-n template_p1,template_p2` on the dbmlsync command line.

  The associated script version specified using the ext_opt field, provides the same functionality as the dbmlsync -eu option.

  See "-eu option" on page 132.

- Assign the publication structure to the upload_defs field of your a_sync_db instance.

  ```
  dbsync_info.upload_defs   = &publication_info;
  ```

You can create a linked list of a_syncpub structures. Each a_syncpub instance in the linked list is equivalent to one specification of the -n option on the dbmlsync command line.

See "-n option" on page 138 and "a_syncpub structure" [*SQL Anywhere Server - Programming*].

6. Run dbmlsync using the DBSynchronizeLog function.

   In the following code listing, sync_ret_val contains the return value 0 for success or non-0 for failure.

   ```
   short sync_ret_val;
   printf("Running dbmlsync using dbtools interface...\n");
   sync_ret_val = DBSynchronizeLog(&dbsync_info);
   printf("\n Done... synchronization return value is: %I \n",
   sync_ret_val);
   ```

   You can repeat step 6 multiple times with the same or different parameter values.

7. Shutdown the DBTools interface.

   The DBToolsFini function frees DBTools resources.

   ```
   DBToolsFini( &info );
   ```

   See "DBToolsFini function" [*SQL Anywhere Server - Programming*].

CHAPTER 13

Scripted Upload

Contents

Introduction to scripted upload

Scripted upload applies only to MobiLink applications that use SQL Anywhere remote databases.

Warning
When you implement scripted upload, dbmlsync does not use the transaction log to determine what to upload. As a result, if your scripts do not capture all changes, data on remote databases can be lost. For these reasons, log-based synchronization is the recommended synchronization method for most applications.

In most MobiLink applications, the upload is determined by the database transaction log so that changes made to the remote database since the last upload are synchronized. This is the appropriate design for most applications and ensures that data on the remote is not lost.

However, in some rare cases you may want to ignore the transaction log and define the upload yourself. Using scripted upload you can define exactly what data you want to upload. When doing scripted upload you do not have to maintain a transaction log for your remote database. Transaction logs take up space that may be at a premium on small devices. However, transaction logs are very important for database backup and recovery, and improve database performance.

To implement scripted upload, you create a special kind of publication that specifies the names of stored procedures that you create. The stored procedures define an upload by returning result sets that contain the rows to insert, update, or delete on the consolidated database.

Note: Do not confuse scripted upload with upload scripts. Upload scripts are MobiLink event scripts on the consolidated database that you write to tell the MobiLink server what to do with the upload. When you use scripted upload, you still need to write upload scripts to apply uploads to the consolidated database and download scripts to determine what to download.

Scenarios

Following are some scenarios where scripted upload may be useful:

- Your remote database is running on a device with limited storage and there is not enough space for a transaction log.
- You want to upload all the data from all your remote databases to create a new consolidated database.
- You want to write custom logic to determine which changes are uploaded to the consolidated database.

Warnings

Before implementing scripted upload, be sure to read this entire chapter. In particular, take note of the following points:

- If you do not set up your scripted upload correctly, you can lose data.
- When you implement scripted upload, you need to maintain or reference things that dbmlsync normally handles for you. These include pre- and post-images of data, as well as the progress of the synchronization.

- You will probably need to lock tables on the remote database while you synchronize via scripted upload. With log-based synchronization, locking is not required.
- Transactional uploads are extremely difficult to implement with scripted upload.

Setting up scripted upload

The following steps provide an overview of the tasks required to set up scripted upload, assuming that you already have MobiLink synchronization set up.

♦ **Overview of setting up scripted upload**

1. Create stored procedures that identify the rows to upload. You can define three stored procedures per table: one each for upload, insert, and delete.

   See "Defining stored procedures for scripted upload" on page 323.

2. Create a publication that contains the keywords WITH SCRIPTED UPLOAD and that specifies the names of the stored procedures.

   See "Creating publications for scripted upload" on page 326.

When using scripted upload, it is strongly recommended that you use the default setting for the dbmlsync extended option LockTables.
You can avoid many problems with scripted uploads by using the default setting for LockTables, which causes dbmlsync to obtain locks on all synchronization tables before the upload is built. This prevents other connections from changing the synchronization tables while your scripts are building the upload. It also ensures that there are no uncommitted transactions that affect synchronization tables open while your scripts are building the upload.

Other resources for getting started

♦ "Scripted upload example" on page 328

Design considerations for scripted upload

One operation per row

The upload may not contain more than one operation (insert, update, or delete) for a single row. However, you can combine multiple operations into a single upload operation; for example, if a row is inserted and then updated you can replace the two operations with a single insert of the final values.

Order of operations

When the upload is applied to the consolidated database, insert and update operations are applied before delete operations. You cannot make any other assumptions about the order of operations within a given table.

Handling conflicts

A conflict occurs when a row is updated on more than one database between synchronizations. The MobiLink server can identify conflicts because each update operation in an upload contains the pre-image of the row being updated. The pre-image is the value of all the columns in the row the last time it was successfully uploaded or downloaded. The MobiLink server identifies a conflict when the pre-image does not match the values in the consolidated database when the upload is applied.

If your application needs conflict detection and you are using scripted upload, then on the remote database you need to keep track of the value of each row the last time it was successfully uploaded or downloaded. This allows you to upload the correct pre-images.

One way to maintain pre-image data is to create a pre-image table that is identical to your synchronization table. You can then create a trigger on your synchronization table that populates the pre-image table each time an update executes. After a successful upload you can delete the rows in the pre-image table.

For an example that implements conflict resolution, see "Scripted upload example" on page 328.

Not handling conflicts

If you do not need to handle conflict detection, you can simplify your application considerably by not tracking pre-images. Instead, you upload updates as insert operations. You can then write an upload_insert script on the consolidated database that inserts a row if it does not already exist or updates the row if it does exist. If you are using a SQL Anywhere consolidated database, you can achieve this with the ON EXISTING clause in the INSERT statement in your upload_insert script.

See "INSERT statement" [*SQL Anywhere Server - SQL Reference*].

When you do not handle conflicts and two or more remote databases change the same row, the last one to synchronize overrides the earlier changes.

Handling forced conflicts

For delete operations, it is essential that the primary key of a row that is uploaded is correct. However, in most cases it doesn't matter if the values of the non-primary key columns match those in the consolidated database. The only case where the value of non-primary key columns is important is when forced conflict mode is used at the MobiLink server. In that case, all the column values are passed to the upload_old_row_insert script on the consolidated database. Depending on how you have implemented this script, it may be necessary for non-primary key column values to be correct.

See "Forced conflicts" [*MobiLink - Server Administration*].

Locking

You can avoid many problems with scripted uploads by using the default setting for the dbmlsync extended option LockTables, which causes dbmlsync to obtain exclusive locks on all synchronization tables before the upload is built. This prevents other connections from changing the synchronization tables while your scripts are building the upload. It also ensures that there are no uncommitted transactions that affect synchronization tables open while your scripts are building the upload.

If you must turn off table locking, see "Scripted upload with no table locking" on page 320.

Redundant uploads

In most cases, you will want to upload each operation on the remote database exactly once. To help you with this, MobiLink maintains a progress value for each subscription. By default the progress value is the time at which dbmlsync began building the last successful upload. This progress value can be overridden with a different value using the sp_hook_dbmlsync_set_upload_end_progress hook.

See "sp_hook_dbmlsync_set_upload_end_progress" on page 266.

Each time one of your upload procedures is called, values are passed to it through the #hook_dict table. Among these are the 'start progress' and 'end progress' values. These define the period of time for which the upload being built should include changes to the remote database. Operations that occurred before the 'start progress' have already been uploaded. Those that occur after the 'end progress' should be uploaded during the next synchronization.

Unknown Upload Status

A common mistake in the implementation of scripted upload is creating stored procedures that can only tell whether an upload was successfully applied to the consolidated database by using the sp_hook_dbmlsync_upload_end or sp_hook_dbmlsync_end hooks. This approach is unreliable.

For example, the following example tries to handle inserts by using a bit on each row to keep track of whether the row needs to be uploaded. The bit is set when a row is inserted, and it is cleared in the sp_hook_dbmlsync_upload_end hook when the upload is successfully committed.

```
//
// DO NOT DO THIS!
//
CREATE TABLE t1 (
   pk    integer primary key,
   val      varchar( 256 ),
   to_upload   bit DEFAULT 1
);

CREATE PROCEDURE t1_ins()
RESULT( pk integer, val varchar(256) )
BEGIN
    SELECT pk, val
    FROM t1
    WHERE to_upload = 1;
END;

CREATE PROCEDURE sp_hook_dbmlsync_upload_end()
BEGIN
    DECLARE     upload_status   varchar(256);
```



```
    SELECT value
    INTO upload_status
    FROM #hook_dict
    WHERE name = 'upload status';

    if upload_status = 'committed' THEN
        UPDATE t1 SET to_upload = 0;
    END IF
END;

    CREATE PUBLICATION p1 WITH SCRIPTED UPLOAD (
        TABLE t1 USING ( PROCEDURE t1_ins FOR UPLOAD INSERT )
    );
```

This approach will work most—but not all—of the time. It fails when a hardware or software failure occurs that stops dbmlsync after the upload has been sent but before it has been acknowledged by the server. In that case, the upload may be applied to the consolidated database but the sp_hook_dbmlsync_upload_end hook will not be called and the to_upload bits will not be cleared. As a result, in the next synchronization, inserts are uploaded for rows that have already been uploaded. Usually this causes the synchronization to fail because it generates a duplicate primary key error on the consolidated database.

The other case where problems can occur is when communication with the MobiLink server is lost after the upload is sent but before it has been acknowledged. In this case dbmlsync cannot tell if the upload was successfully applied. Dbmlsync calls the sp_hook_dbmlsync_upload_end hook and sets the upload status to unknown. As the hook is written this will prevent it from clearing the to_upload bits. If the upload was not applied by the server, this is correct. However, if the upload was applied then the same problem occurs as in the previous paragraph. In both of these cases, the affected remote database is unable to synchronize again until someone manually intervenes to resolve the problem.

Preventing data loss during download

When using scripted uploads, it is possible for data in the remote database that needs to be uploaded to be overwritten by data being downloaded from the consolidated database. This results in the loss of changes made to the remote database. Dbmlsync will prevent this data loss if each upload built by your upload procedures includes all changes that were committed in the remote database before the sp_hook_dbmlsync_set_upload_end_progress hook was called.

The following example shows how data can be lost if you violate this rule:

Time	
1:05:00	A row, R, that exists both in the consolidated and remote databases is updated with some new values, R1, in the remote database and the change is committed.
1:06:00	The row R is updated in the consolidated database to some new values R2 and the change is committed.
1:07:00	A synchronization occurs. The upload scripts are written so that the upload only contains operations committed before 1:00:00. This violates our rule because it prevents all operations that occurred before the upload was built from being uploaded. The change to row R is not included upload because it occurred after 1:00:00. The download received from the server contains the row R2. When the download is applied, the row R2 will replace the row R1 in the remote database. The update on the remote database will be lost.

Dbmlsync uses a number of mechanisms to ensure that the download does not overwrite any change the was uncommitted when the sp_hook_dbmlsync_set_upload_end_progress hook was called or was committed after the sp_hook_dbmlsync_set_upload_end_progress hook was called.

Any change committed before the hook was called is not protected and may be overwritten when the download is applied. However, as long as the change was included in the upload (which is sent before the download is built) the change will be sent to the MobiLink server and your server-side scripts will be able to resolve it with the data in the consolidated database before the download is built.

Scripted upload with no table locking

By default, dbmlsync locks the tables being synchronized before any upload scripts are called, and it maintains these locks until the download is committed. You can prevent table locking by setting the extended option LockTables to off.

When possible, it is recommended that you use the default table locking behavior. Doing scripted uploads without table locking significantly increases the number of issues you must consider and the difficulty of creating a correct and workable solution. This should only be attempted by advanced users with a good understanding of database concurrency and synchronization concepts.

Using isolation levels with no table locks

When table locking is off, the isolation level at which your upload stored procedures run is very important because it determines how uncommitted transactions are handled. This is not an issue when table locking is on because table locks ensure that there are no uncommitted changes on the synchronized tables when the upload is built.

Your upload stored procedures run at the default isolation level for the database user who is specified on the dbmlsync command line unless you explicitly change the isolation level in your upload stored procedure.

Isolation level 0 is the default isolation level for the database, but it is recommended that you do not run your upload procedures at isolation level 0 when using scripted upload with no table locks. If you implement scripted upload without table locks and use isolation level 0, you may upload changes that are not committed, which could result in the following problems:

- The uncommitted changes could be rolled back, which would result in incorrect data being sent to the consolidated database.
- The uncommitted transaction may not be complete, in which case you might upload only part of a transaction and thus leave the consolidated database in an inconsistent state.

Your alternatives are to use isolation levels 1, 2, 3, or snapshot. All of these isolation levels ensure that you will not upload uncommitted transactions.

Using isolation levels 1, 2, or 3 could result in your upload stored procedures blocking if there are uncommitted changes on the table. Since your upload stored procedures are called while dbmlsync is connected to the MobiLink server, this could tie up server connections. If you use isolation level 1, you may be able to avoid blocking by using the READPAST table-hint clause in your select statements.

Snapshot isolation is a good choice since it prevents both blocking and reads of uncommitted changes.

Losing Uncommitted Changes

If you choose to forgo table locking, you must have a mechanism for handling operations that are not committed when a synchronization occurs. To see why this is a problem, consider the following example.

Suppose a table is being synchronized by scripted upload. For simplicity, assume that only inserts are being uploaded. The table contains an insert_time column that is a timestamp that indicates the time when each row was inserted.

Each upload is built by selecting all the committed rows in the table whose insert_time is after the last successful upload and before the time when you started to build the current upload (which is the time when the sp_hook_dbmlsync_set_upload_end_progress hook was called). Suppose the following takes place.

Time	
1:00:00	A successful synchronization occurs.
1:04:00	Row R is inserted into the table but not committed. The insert_time column for R is set to 1:04:00.
1:05:00	A synchronization occurs. Rows with insert times between 1:00:00 and 1:05:00 are uploaded. Row R is not uploaded because it is uncommitted. The synchronization progress is set to 1:05:00.
1:07:00	The row inserted at 1:04:00 is committed. The insert_time column for R continues to contain 1:04:00.
1:10:00	A synchronization occurs. Rows with insert times between 1:05:00 and 1:10:00 are uploaded. Row R is not uploaded because its insert_time is not in the range. In fact, row R will never be uploaded.

In general, any operation that occurs before a synchronization but is committed after the synchronization is susceptible to loss in this way.

Handling Uncommitted Transactions

The simplest way to handle uncommitted transactions is to use the sp_hook_dbmlsync_set_upload_end_progress hook to set the end progress for each synchronization to the start time of the oldest uncommitted transaction at the time the hook is called. You can determine this time using the sa_transactions system procedure as follows:

```
SELECT min( start_time )
FROM sa_transactions()
```

In this case, your upload stored procedures must ignore the end progress that was calculated in the sp_hook_dbmlsync_set_upload_end_progress hook using sa_transactions and passed in using the #hook_dict table. The stored procedures should just upload all committed operations that occurred after the start progress. This will ensure that the download does not overwrite rows with changes that still need to be uploaded. It will also ensure that operations are uploaded in a timely manner even when there are uncommitted transactions.

This solution ensures that no operations will be lost, but some operations may be uploaded more than once. Your scripts on the server side must be written to handle operations being uploaded more than once. Below is an example that shows how a row can be uploaded more than once in this setup.

Time	
1:00:00	A successful synchronization occurs.
2:00:00	Row R1 is inserted but not committed.
2:10:00	Row R2 is inserted and committed.
3:00:00	A synchronization occurs. Operations that occurred between 1:00 and 3:00 are uploaded. Row R2 is uploaded and the progress is set to 2:00 because that is the start time of the oldest uncommitted transaction.
4:00:00	Row R1 is committed.
5:00:00	A synchronization occurs. Operations that occurred between 2:00 and 5:00 are uploaded and the progress is set to 5:00. The upload contains rows R1 and R2 because they both have timestamps within the upload range. Thus R2 has been uploaded twice.

If your consolidated database is SQL Anywhere, you can handle redundantly uploaded insert operations by using the INSERT … ON EXISTING UPDATE statement in your upload_insert script in the consolidated database.

For other consolidated databases, you can implement similar logic in a stored procedure that is called by your upload_insert script. Just write a check to see if a row with the primary key of the row being inserted already exists in the consolidated database. If the row exists update it, otherwise insert the new row.

Redundantly uploaded delete and update operations are a problem when you have conflict detection or resolution logic on the server side. If you write conflict detection and resolution scripts on the server side, they must be able to handle redundant uploads.

Redundantly uploaded deletes can be a major concern if primary key values can be reused by the consolidated database. Consider the following sequence of events:

1. Row R with primary key 100 is inserted into a remote database and uploaded to the consolidated database.
2. Row R is deleted on the remote database and the delete operation is uploaded.
3. A new row R’ with primary key 100 is inserted into the consolidated database.
4. The delete operation on row R from step 2 is uploaded again from the remote database. This could easily result in R’ being deleted inappropriately from the consolidated database.

See also

- “sa_transactions system procedure” [*SQL Anywhere Server - SQL Reference*]
- “Setting the isolation level” [*SQL Anywhere Server - SQL Usage*]

Defining stored procedures for scripted upload

To implement scripted upload, you create stored procedures that define the upload by returning result sets that contain the rows to update, insert, or delete on the consolidated database.

When the stored procedures are called, a temporary table called #hook_dict is created that has two columns: name and value. The table is used to pass name-value pairs to your stored procedures. Your stored procedures can retrieve useful information from this table.

The following name-value pairs are defined:

Name	Value	Description
start progress	timestamp as string	The time up to which all changes on the remote database have been uploaded. Your upload should only reflect operations that occur after this time.
raw start progress	64-bit unsigned integer	The start progress expressed as an unsigned integer.
end progress	timestamp as string	The end of the upload period. Your upload should only reflect operations that occur before this time.
raw end progress	64-bit unsigned integer	The end progress expressed as an unsigned integer.
generating download exclusion list	true|false	True if the synchronization is download-only or file-based. In those cases no upload is sent, and the download is not applied if it affects any row selected by a scripted upload stored procedure. (This ensures that changes made at the remote that need to be uploaded will not be overwritten by the download.)
publication_*n*	publication name	The publications being synchronized, where *n* is an integer. The numbering of *n* starts at zero.
script version	version name	The MobiLink script version to be used for the synchronization.
MobiLink user	MobiLink user name	The MobiLink user for which you are synchronizing.

See "#hook_dict table" on page 213.

Custom progress values in scripted upload

By default, the start progress and end progress values passed to your scripted upload procedures represent timestamps. By default the end progress is the time when dbmlsync starts to build the upload. The start

progress for a synchronization is always the end progress used for the most recent successful upload of that subscription. This default behavior is appropriate for most implementations.

The sp_hook_dbmlsync_set_upload_end_progress hook is provided for the rare cases where different behavior is required. Using this hook, you can set the end progress to be used for an upload. The end progress you choose must be greater than the start progress. You cannot alter the start progress.

In the sp_hook_dbmlsync_set_upload_end_progress hook you can specify the end progress either as a timestamp or as an unsigned integer. The value is available in either form to the upload stored procedures. For your convenience, the sa_convert_ml_progress_to_timestamp and sa_convert_timestamp_to_ml_progress functions can be used to convert progress values between the two forms.

See:

- "sp_hook_dbmlsync_set_upload_end_progress" on page 266
- "sa_convert_ml_progress_to_timestamp system procedure" [*SQL Anywhere Server - SQL Reference*]
- "sa_convert_timestamp_to_ml_progress system procedure" [*SQL Anywhere Server - SQL Reference*]

Defining stored procedures for inserts

The stored procedures for inserts must return result sets containing all the columns to be uploaded, as defined in the CREATE PUBLICATION statement, in the same order that the columns were declared in the CREATE TABLE statement.

Column order

You can find the creation order of columns in a table called T1 with the following query:

```
SELECT column.name
FROM SYSTAB JOIN SYSTABCOL
   WHERE table_name = 't1'
ORDER BY column_id
```

Example

For a detailed explanation of how to define stored procedures for inserts, see "Scripted upload example" on page 328.

The following example creates a table called t1 and a publication called p1. The publication specifies WITH SCRIPTED UPLOAD and registers the stored procedure t1_insert as the insert procedure. In the definition of the t1_insert stored procedure, the result set includes all columns listed in the CREATE PUBLICATION statement but in the order in which the columns were declared in the CREATE TABLE statement.

```
CREATE TABLE t1(
   //The column ordering is taken from here
   pk integer primary key,
   c1 char( 30),
   c2,   float,
   c3 double );

CREATE PROCEDURE t1_insert ()
RESULT( pk integer, c1 char(30), c3 double )
begin
   …
```



```
end

CREATE PUBLICATION WITH SCRIPTED UPLOAD p1(
   // Order of columns here is ignored
   TABLE t1( c3, pk, c1 ) USING (
     PROCEDURE t1_insert FOR UPLOAD INSERT
   )
)
```

Defining stored procedures for deletes

The stored procedures for deletes must return result sets containing all the columns to be uploaded, as defined in the CREATE PUBLICATION statement, in the same order that the columns were declared in the CREATE TABLE statement.

Column order

You can find the creation order of columns in a table called T1 with the following query:

```
SELECT column.name
FROM SYSTAB JOIN SYSTABCOL
   WHERE table_name = 't1'
ORDER BY column_id
```

Example

For a detailed explanation of how to define stored procedures for deletes, see "Scripted upload example" on page 328.

The following example creates a table called t1 and a publication called p1. The publication specifies WITH SCRIPTED UPLOAD and registers the stored procedure t1_delete as the delete procedure. In the definition of the t1_delete stored procedure, the result set includes all columns listed in the CREATE PUBLICATION statement but in the order in which the columns were declared in the CREATE TABLE statement.

```
CREATE TABLE t1(
   //The column ordering is taken from here
   pk integer primary key,
   c1 char( 30),
   c2,   float,
   c3 double );

CREATE PROCEDURE t1_delete ()
RESULT( pk integer, c1 char(30), c3 double )
begin
   …
end

CREATE PUBLICATION WITH SCRIPTED UPLOAD p1(
   // Order of columns here is ignored
   TABLE t1( c3, pk, c1 ) USING (
     PROCEDURE t1_delete FOR UPLOAD DELETE
   )
)
```


Defining stored procedures for updates

The stored procedure for updates must return a result set that includes two sets of values:

- The first set of values specifies the pre-image for the update (the values in the row the last time it was received from, or successfully uploaded to, the MobiLink server).
- The second set of values specifies the post-image of the update (the values the row should be updated to in the consolidated database).

This means that the stored procedure for updates must return a result set with twice as many columns as the insert or delete stored procedure.

Example

For a detailed explanation of how to define stored procedures for updates, see "Scripted upload example" on page 328.

The following example creates a table called t1 and a publication called p1. The publication specifies WITH SCRIPTED UPLOAD and registers the stored procedure t1_update as the update procedure. The publication specifies three columns to be synchronized: pk, c1 and c3. The update procedure returns a result set with six columns. The first three columns contain the pre-image of the pk, c1 and c3 columns; the second three columns contain the post-image of the same columns. Note that in both cases the columns are ordered as they were when the table was created, not as they are ordered in the CREATE PUBLICATION statement.

```
CREATE TABLE t1(
   //Column ordering is taken from here
   pk integer primary key,
   c1 char( 30),
   c2 float,
   c3 double );

CREATE PROCEDURE t1_update ()
RESULT( preimage_pk integer, preimage_c1 char(30), preimage_c3 double,
postimage_pk integer, postimage_c1 char(30), postimage_c3 double  )
BEGIN
   …
END

CREATE PUBLICATION WITH SCRIPTED UPLOAD p1 (
         // Order of columns here is ignored
         TABLE t1( c3, pk, c1 ) USING (
   PROCEDURE t1_update FOR UPLOAD UPDATE
   )
)
```

Creating publications for scripted upload

To create a scripted upload publication, use the keywords WITH SCRIPTED UPLOAD and specify the stored procedures in the USING clause.

If you do not define a stored procedure for a table in the scripted upload publication, no operations are uploaded for the table. You cannot use ALTER PUBLICATION to change a regular publication into a scripted upload publication.

Example

The following publication uses stored procedures to upload data for two tables, called t1 and t2. Inserts, deletes, and updates are uploaded for table t1. Only inserts are uploaded for table t2.

```
CREATE PUBLICATION pub WITH SCRIPTED UPLOAD (
      TABLE t1 (col1, col2, col3) USING (
         PROCEDURE my.t1_ui FOR UPLOAD INSERT,
         PROCEDURE my.t1_ud FOR UPLOAD DELETE,
         PROCEDURE my.t1_uu FOR UPLOAD UPDATE
      ),
      TABLE t2 USING (
         PROCEDURE my.t2_ui FOR UPLOAD INSERT
      )
   )
```

See also

- "CREATE PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*]
- "ALTER PUBLICATION statement [MobiLink] [SQL Remote]" [*SQL Anywhere Server - SQL Reference*]

Scripted upload example

This example shows you how to set up a scripted upload that provides conflict detection. The example creates the consolidated and remote databases, stored procedures, publications and subscriptions that are required by scripted upload. This example is presented in such a way that you can either just read through it, or you can cut and paste the text to run the sample.

Create the consolidated database

Create a directory to hold the sample files. For example, call it scriptedupload. Open a command prompt and navigate to that directory.

(In this example, we specify file names and assume they are in the current directory. In a real application, you should specify the full path to the file.)

Run the following command to create a consolidated database:

```
dbinit consol.db
```

Next, run the following command to define an ODBC data source for the consolidated database:

```
dbdsn -w dsn_consol -y -c "uid=DBA;pwd=sql;dbf=consol.db;eng=consol"
```

To use a database as a consolidated database, you must run a setup script that adds system tables, views, and stored procedures that are used by MobiLink. The following command sets up consol.db as a consolidated database:

```
dbisql -c "dsn=dsn_consol" %sqlany10%\MobiLink\setup\syncsa.sql
```

Open Interactive SQL and connect to consol.db using the dsn_consol DSN. Run the following SQL statements. They create the employee table on the consolidated database, insert values into the table, and create the required synchronization scripts.

```
CREATE TABLE employee (
   id      unsigned integer primary key,
   name    varchar( 256),
   salary  numeric( 9, 2 )
);

INSERT INTO employee VALUES( 100, 'smith', 225000 );
COMMIT;

CALL ml_add_table_script( 'default', 'employee', 'upload_insert',
       'INSERT INTO employee ( id, name, salary ) VALUES ( ?, ?, ? )' );

CALL ml_add_table_script( 'default', 'employee', 'upload_update',
       'UPDATE employee SET name = ?, salary = ? WHERE id = ?' );

CALL ml_add_table_script( 'default', 'employee', 'upload_delete',
       'DELETE FROM employee WHERE id = ?' );

CALL ml_add_table_script( 'default', 'employee', 'download_cursor',
       'SELECT * from employee' );
```

Create the remote database

At a command prompt in your samples directory, run the following command to create a remote database:


```
dbinit remote.db
```

Next, run the following command to define an ODBC data source:

```
dbdsn -w dsn_remote -y -c "uid=dba;pwd=sql;dbf=remote.db;eng=remote"
```

In Interactive SQL, connect to remote.db using the dsn_remote DSN. Run the following set of statements to create objects in the remote database.

First, create the table to be synchronized. The insert_time and delete_time columns will not be synchronized but contain information used by the upload stored procedures to determine which rows to upload.

```
CREATE TABLE employee (
     id            unsigned integer primary key,
     name          varchar( 256),
     salary        numeric( 9, 2 ),
     insert_time   timestamp default '1900-01-01'
);
```

Next, you need to define stored procedures and other things to handle the upload. You do this separately for inserts, deletes, and updates.

Handle inserts

First, create a trigger to set the insert_time on each row when it is inserted. This timestamp is used to determine if a row has been inserted since the last synchronization. This trigger is not fired when dbmlsync is applying downloaded inserts from the consolidated database because later in this example you will set the FireTriggers extended option to off. Rows inserted by the download will get an insert_time of 1900-01-01, the default value defined when the employee table was created. This value should always be before the start progress so those rows will not be treated as new inserts and will not be uploaded during the next synchronization.

```
CREATE TRIGGER emp_ins AFTER INSERT ON employee
REFERENCING NEW AS newrow
FOR EACH ROW
BEGIN
    UPDATE employee SET insert_time = CURRENT TIMESTAMP
    WHERE id = newrow.id
END;
```

Next, create a procedure to return as a result set all the inserted rows to be uploaded. This procedure returns all rows that (based on the insert_time) have been inserted since the last successful upload but were not subsequently deleted. The time of the last successful upload is determined from the start progress value in the #hook_dict table. This example uses the default setting for the dbmlsync extended option LockTables, which causes dbmlsync to lock the tables being synchronized. As a result, you do not need to exclude rows inserted after the end progress: the table locks will prevent any operations from occurring after the end progress, while the upload is built.

```
CREATE PROCEDURE employee_insert()
RESULT( id  unsigned integer,
          name varchar( 256 ),
          salary numeric( 9,2 )
      )
BEGIN
    DECLARE start_time timestamp;
    SELECT value
    INTO start_time
    FROM #hook_dict
    WHERE name = 'start progress as timestamp';
```



```
    // Upload as inserts all rows inserted after the start_time
    // that were not subsequently deleted
    SELECT id, name, salary
    FROM employee e
    WHERE insert_time > start_time AND
       NOT EXISTS( SELECT id FROM employee_delete ed  WHERE ed.id = e.id );

END;
```

Handle updates

To handle uploads, you need to ensure that the correct pre-image is used based on the start progress when the upload was built.

First, create a table that maintains pre-images of updated rows. The pre-images are used when generating the scripted upload.

```
CREATE TABLE employee_preimages (
   id           unsigned integer NOT NULL,
   name         varchar( 256),
   salary       numeric( 9, 2 ),
   img_time     timestamp default CURRENT TIMESTAMP,
   primary key( id, img_time )
);
```

Next, create a trigger to store a pre-image for each row when it is updated. As with the insert trigger, this trigger will not be fired on download.

Note that this trigger stores a pre-image row each time a row is updated (unless two updates come so close together that they get the same timestamp). At first glance this looks wasteful. It would be tempting to only store a pre-image for the row if there is not already one in the table, and then count on the sp_hook_dbmlsync_upload_end hook to delete pre-images once they have been uploaded.

However, the sp_hook_dbmlsync_upload_end hook is not reliable for this purpose. The hook may not be called if a hardware or software failure stops dbmlsync after the upload is sent but before it is acknowledged, resulting in rows not being deleted from the pre-images table even though they have been successfully uploaded. Also, when a communication failure occurs dbmlsync may not receive an acknowledgement from the server for an upload. In this case, the upload status passed to the hook will be ‘unknown’. When this happens there is no way for the hook to tell if the pre-images table should be cleaned or left intact. By storing multiple pre-images, the correct one can always be selected based on the start progress when the upload is built.

```
CREATE TRIGGER emp_upd AFTER UPDATE OF name,salary ON employee
   REFERENCING OLD AS oldrow
   FOR EACH ROW
BEGIN
   INSERT INTO employee_preimages ON EXISTING SKIP VALUES(
      oldrow.id, oldrow.name, oldrow.salary, CURRENT TIMESTAMP );
END;
```

Next, create an upload procedure to handle updates. This stored procedure returns one result set that has twice as many columns as the other scripts: it contains the pre-image (the values in the row the last time it was received from, or successfully uploaded to, the MobiLink server), as well as the post-image (the values to be entered into the consolidated database).

The pre-image is the earliest set of values in employee_preimages that was recorded after the start_progress. Note that this example does not correctly handle existing rows that are deleted and then reinserted. In a more complete solution, these would be uploaded as an update.

```
CREATE PROCEDURE employee_update()
RESULT(
       preimage_id  unsigned integer,
       preimage_name varchar( 256),
       preimage_salary numeric( 9,2 ),
       postimage_id  unsigned integer,
       postimage_name varchar( 256),
       postimage_salary numeric( 9,2 )
      )

BEGIN
    DECLARE start_time timestamp;

    SELECT value
    INTO start_time
    FROM #hook_dict
    WHERE name = 'start progress';

    // Upload as an update all rows that have been updated since
    // start_time that were not newly inserted or deleted.
    SELECT ep.id, ep.name, ep.salary, e.id, e.name, e.salary
    FROM employee e JOIN employee_preimages ep
        ON ( e.id = ep.id )
    // Do not select rows inserted since the start time. These should be
    // uploaded as inserts.
    WHERE insert_time <= start_time
      // Do not upload deleted rows.
      AND NOT EXISTS( SELECT id FROM employee_delete ed  WHERE ed.id = e.id )
      // Select the earliest pre-image after the start time.
      AND ep.img_time = ( SELECT MIN( img_time )
            FROM employee_preimages
            WHERE id = ep.id
            AND img_time > start_time );
END;
```

Handle deletes

First, create a table to maintain a list of deleted rows:

```
CREATE TABLE employee_delete (
    id           unsigned integer  primary key NOT NULL,
    name         varchar( 256 ),
    salary       numeric( 9, 2 ),
    delete_time  timestamp
);
```

Next, create a trigger to populate the employee_delete table as rows are deleted from the employee table. This trigger will not be called during download because later you will set the dbmlsync extended option FireTriggers to false. Note that this trigger assumes that a deleted row is never reinserted; therefore it does not deal with the same row being deleted more than once.

```
CREATE TRIGGER emp_del AFTER DELETE ON employee
REFERENCING OLD AS delrow
FOR EACH ROW
BEGIN
     INSERT INTO employee_delete
VALUES( delrow.id, delrow.name, delrow.salary, CURRENT TIMESTAMP );
END;
```


The next SQL statement creates an upload procedure to handle deletes. This stored procedure returns a result set that contains the rows to delete on the consolidated database. The stored procedure uses the employee_preimages table so that if a row is updated and then deleted, the image uploaded for the delete is the last one that was successfully downloaded or uploaded.

```
CREATE PROCEDURE employee_delete()
RESULT( id  unsigned integer,
          name varchar( 256),
          salary numeric( 9,2 )
      )
BEGIN
    DECLARE start_time timestamp;

    SELECT value
    INTO start_time
    FROM #hook_dict
    WHERE name = 'start progress as timestamp';


   // Upload as a delete all rows that were deleted after the
   // start_time that were not inserted after the start_time.
   // If a row was updated before it was deleted, then the row
   // to be deleted is the pre-image of the update.
    SELECT IF ep.id IS NULL THEN ed.id ELSE ep.id ENDIF,
           IF ep.id IS NULL THEN ed.name ELSE ep.name ENDIF,
           IF ep.id IS NULL THEN ed.salary ELSE ep.salary ENDIF
    FROM employee_delete ed LEFT OUTER JOIN employee_preimages ep
          ON( ed.id = ep.id AND ep.img_time > start_time )
    WHERE
      // Only upload deletes that occurred since the last sync.
      ed.delete_time > start_time
      // Don't upload a delete for rows that were inserted since
      // the last upload and then deleted.
    AND NOT EXISTS (
      SELECT id
         FROM employee e
         WHERE e.id = ep.id AND e.insert_time > start_time )
    // Select the earliest preimage after the start time.
    AND ( ep.id IS NULL OR ep.img_time = (SELECT MIN( img_time )
                                          FROM employee_preimages
                                          WHERE id = ep.id
                                           AND img_time > start_time ) );
END;
```

Clear out the pre-image table

Next, create an upload_end hook to clean up the employee_preimage and employee_delete tables when an upload is successful. This example uses the default setting for the dbmlsync extended option LockTables, so the tables will be locked during synchronization. Hence, you do not have to worry about leaving rows in the tables for operations that occurred after the end_progress. Locking prevents such operations from occurring.

```
CREATE PROCEDURE sp_hook_dbmlsync_upload_end()
BEGIN
    DECLARE val   varchar(256);

    SELECT value
    INTO val
    FROM #hook_dict
    WHERE name = 'upload status';
```



```
    IF val = 'committed' THEN
      DELETE FROM employee_delete;
      DELETE FROM employee_preimages;
    END IF;
END;
```

Create a publication, MobiLink user, and subscription

The publication called pub1 uses the scripted upload syntax (WITH SCRIPTED UPLOAD). It creates an article for the employee table, and registers the three stored procedures you just created for use in the scripted upload. It creates a MobiLink user called u1, and a subscription between v1 and pub1. The extended option FireTriggers is set to off to prevent triggers from being fired on the remote database when the download is applied, which prevents downloaded changes from being uploaded during the next synchronization.

```
CREATE PUBLICATION pub1 WITH SCRIPTED UPLOAD (
TABLE employee( id, name, salary ) USING (
   PROCEDURE employee_insert FOR UPLOAD INSERT,
   PROCEDURE employee_update FOR UPLOAD UPDATE,
   PROCEDURE employee_delete FOR UPLOAD DELETE,
      )
)

CREATE SYNCHRONIZATION USER u1;

CREATE SYNCHRONIZATION SUBSCRIPTION TO pub1 FOR u1
TYPE 'tcpip'
ADDRESS 'host=localhost'
OPTION FireTriggers='off';
```

Demonstrate the scripted upload

Connect to the remote database and insert data to synchronize using scripted upload. For example, run the following SQL statements against the remote database in Interactive SQL:

```
INSERT INTO employee(id, name, salary) VALUES( 7, 'black', 700 );
INSERT INTO employee(id, name, salary) VALUES( 8, 'anderson', 800 );
INSERT INTO employee(id, name, salary) VALUES( 9, 'dilon', 900 );
INSERT INTO employee(id, name, salary) VALUES( 10, 'dwit', 1000 );
INSERT INTO employee(id, name, salary) VALUES( 11, 'dwit', 1100 );
COMMIT;
```

At a command prompt, start the MobiLink server:

```
mlsrv10 -c "dsn=dsn_consol" -o mlserver.mls -v+ -dl -zu+
```

Start a synchronization using dbmlsync:

```
dbmlsync -c "dsn=dsn_remote" -k -uo -o remote.mlc -v+
```

You can now verify that the inserts were uploaded.

Example cleanup

To clean up your computer after completing the example, perform the following steps:

```
mlstop -h -w
dbstop -y -c eng=consol
dbstop -y -c eng=remote

dberase -y consol.db
```



```
dberase -y remote.db
del remote.mlc mlserver.mls
```


Part III. UltraLite Clients

This part contains material that describes how to set up and run UltraLite clients for MobiLink synchronization.

CHAPTER 14

UltraLite Clients

Contents

Introduction to UltraLite clients

Because the UltraLite runtime includes a built-in bi-directional synchronization framework that links field and mobile workers with enterprise back-end systems, synchronizing UltraLite data is less involved than other remote clients. This built-in framework means that all data in an UltraLite database is synchronized automatically by default. Users new to MobiLink synchronization may use this default behavior, until business requirements necessitate a custom synchronization design to alter what UltraLite data gets synchronized to the consolidated database.

For more information about UltraLite, see "Introducing UltraLite" [*UltraLite - Database Management and Reference*]. For information about how to use SQL Anywhere databases as MobiLink clients, see "SQL Anywhere Clients" on page 79.

Tip
The best way to backup an UltraLite application is to synchronize with a consolidated database. To restore an UltraLite database, take an empty database and populate it from the consolidated database through synchronization.

Tip
If you have multiple files you need to deploy, or if you need to target versions of the file to specific user IDs, consider using the MobiLink server to transfer files. See "Using MobiLink file transfers" on page 354.

Built-in synchronization features for UltraLite

UltraLite contains MobiLink synchronization technology in the data management layer for UltraLite. Consequently, you do not need to increase the size of the UltraLite footprint to include synchronization functionality, as is the case with a SQL Anywhere remote.

Important synchronization features built into the UltraLite runtime include a row-state tracking mechanism and the progress counter.

The row-state tracking mechanism

Tracking the state of tables and rows is particularly important for data synchronization. Each row in an UltraLite database has a one-byte marker to keep track of the state of the row. In addition to synchronization, UltraLite also uses the row states to control transaction processing and data recovery. See "UltraLite row states" [*UltraLite - Database Management and Reference*].

The progress counter

UltraLite uses a progress counter to ensure robust synchronization. Each upload is given a unique number to identify it. This allows UltraLite to determine whether or not an upload was successful, should a communications error occur.

When you first create a new database, UltraLite always sets the synchronization progress counter to zero. A progress counter value of zero identifies the database as a new UltraLite database, which tells the MobiLink server to reset its state information for this client.

Caution
Because UltraLite increments the progress counter each time a synchronization occurs, you cannot synchronize an UltraLite database to different consolidated databases. If the progress counter value is not zero and does not match that sequence number stored in the consolidated database, MobiLink synchronization reports an offset mismatch and synchronization fails.

See also

- "ml_subscription" [*MobiLink - Server Administration*]

Customizing UltraLite client synchronization behaviors

Adding custom synchronization support to UltraLite can involve up to three tasks:

- **Maintain primary key uniqueness in synchronization models that include more than one remote client** Required. In a synchronization system, the primary key is the only way to identify the same row in different databases (remote and consolidated) and the only way to detect conflicts. Therefore, multiple clients must adhere to the following rules:

  - Every table that is to be synchronized must have a primary key.
  - Never update the values of primary keys.
  - Primary keys must be unique across all synchronized databases.

  See "Maintaining unique primary keys" [*MobiLink - Server Administration*] and "Primary key uniqueness in UltraLite" on page 341.

- **Ensure your date columns are set up so fractional data is not lost** For SQL Anywhere consolidated database this is not typically an issue. However, for databases like Oracle, there may be compatiblity issues that you need to consider. For example, UltraLite and Oracle databases must share the same timestamp precision. Additionally, you should also add a TIMESTAMP to the Oracle database to avoid loosing fractional second data when the UltraLite remote databases uploads data to the consolidated database. See "Oracle consolidated database" [*MobiLink - Server Administration*] and "UltraLite precision property" [*UltraLite - Database Management and Reference*].

- **Describe what data subsets you want to upload to the consolidated database** Optional: you only need to do this when you do not want to synchronize all data by default. To target what data you want to synchronize, use one or more subsetting techniques. See "Designing synchronization in UltraLite" on page 345.

  For example, you may want to create a publication for high-priority data. The user can synchronize this data over high-speed wireless networks. Because wireless networks can have high usage costs associated with them, you would want to limit these usage fees to those that are business-critical only. You can then synchronize less time-sensitive data from a cradle at a later time.

- **Initialize synchronization from your UltraLite application and supply the parameters that describe the session** Required. Programming synchronization has two parts: describing the session, then initializing the synchronization operation.

  Describing the session primarily involves choosing a synchronization communication stream (also known as a network protocol) as well as the parameters for that stream, setting the version of your synchronization scripts, and assigning the MobiLink user. However, there are other parameters you can configure as well: for example, use the upload_only and download_only parameters to change the default bi-directional synchronization to one-way only. See "Adding synchronization to your UltraLite application" on page 349.

All other important synchronization behaviors are controlled with MobiLink synchronization scripts. You need multiple scripts because each MobiLink remote database can contain a different subset of the data in the consolidated database.

These include:

- What data is downloaded as updates to tables in the UltraLite remote.
- What processing is required on uploaded changes from a remote database.

This means that you can write your synchronization scripts so that data is partitioned among remote databases in an appropriate manner.

See also

- "MobiLink Consolidated Databases" [*MobiLink - Server Administration*]
- "Introduction to synchronization scripts" [*MobiLink - Server Administration*]
- "Direct Row Handling" [*MobiLink - Server Administration*]
- "Partitioning rows among remote databases" [*MobiLink - Server Administration*]

Primary key uniqueness in UltraLite

UltraLite can maintain primary key uniqueness using any of the techniques supported by MobiLink. See "Maintaining unique primary keys" [*MobiLink - Server Administration*].

One of these methods is to use a global ID. The global ID affects how the GLOBAL AUTOINCREMENT column values are generated. You need to use columns declared as GLOBAL AUTOINCREMENT when a MobiLink server must manage synchronizations for multiple clients.

GLOBAL AUTOINCREMENT is similar to AUTOINCREMENT, except that the domain is partitioned. UltraLite supplies column values only from the partition assigned to the database's global ID.

See also

- "UltraLite global database ID considerations" [*UltraLite - Database Management and Reference*]
- "UltraLite global_database_id option" [*UltraLite - Database Management and Reference*]

Using GLOBAL AUTOINCREMENT in UltraLite

You can declare the default value of a column in an UltraLite database to be of type GLOBAL AUTOINCREMENT. However, before you can autoincrement these column IDs, you must first set the global ID for the UltraLite remote.

Caution
GLOBAL AUTOINCREMENT column values downloaded via MobiLink synchronization do not update the GLOBAL AUTOINCREMENT value counter. As a result, an error can occur should one MobiLink client insert a value into another client's partition. To avoid this problem, ensure that each copy of your UltraLite application inserts values only in its own partition.

♦ To declare GLOBAL AUTOINCREMENT columns in your UltraLite database

1. Assign each copy of the database a unique global ID number.

   The global_database_id database option sets the value in your UltraLite database. When deploying UltraLite, you must assign a different identification number to each database. See "UltraLite global_database_id option" [*UltraLite - Database Management and Reference*].

2. Allow UltraLite to supply default values for the column using the partition uniquely identified by the UltraLite database's number. UltraLite follows these rules:

   - If the column contains no values in the current partition, the first default value is $pn + 1$. p represents the partition size and n represents the global ID number.
   - If the column contains values in the current partition, but all are less than $p(n + 1)$, the next default value will be one greater than the previous maximum value in this range.

- Default column values are not affected by values in the column outside of the current partition; that is, by numbers less than $pn + 1$ or greater than $p(n + 1)$. Such values may be present if they have been replicated from another database via MobiLink synchronization.

  For example, if you assigned your UltraLite database a global ID of 1 and the partition size is 1000, then the default values in that database would be chosen in the range 1001–2000. Another copy of the database, assigned the identification number 2, would supply default values for the same column in the range 2001–3000.

- Because you cannot set the global ID number to negative values, the values UltraLite chooses for GLOBAL AUTOINCREMENT columns are always positive. The maximum identification number is restricted only by the column data type and the partition size.

- If you do not set a global ID value, or if you exhaust values from the partition, a NULL value is inserted into the column. Should NULL values not be permitted, the attempt to insert the row causes an error.

3. If you exhaust or will soon exhaust available values for columns declared as GLOBAL AUTOINCREMENT, you need to set a new global ID. UltraLite chooses GLOBAL AUTOINCREMENT values from the partition identified by the global ID number, but only until the maximum value is reached. If you exceed values, UltraLite begins to generate NULL values. By assigning a new global ID number, you allow UltraLite to set appropriate values from another partition.

   One method of choosing a new global ID is to maintain a pool of unused global ID values. This pool is maintained in the same manner as a pool of primary keys. See "Using primary key pools" [*SQL Remote*].

Tip
UltraLite APIs provide means of obtaining the proportion of numbers that have been used. The return value is a SHORT in the range 0–100 that represents the percent of values used thus far. For example, a value of 99 indicates that very few unused values remain and the database should be assigned a new identification number. The method of setting this identification number varies according to the programming interface you are using.

See also

- "Overriding partition sizes for autoincremented columns" on page 343
- "UltraLite global database ID considerations" [*UltraLite - Database Management and Reference*]
- UltraLite for AppForge: "Properties" [*UltraLite - AppForge Programming*]
- UltraLite.NET: "Connection property" [*UltraLite - .NET Programming*]
- UltraLite C/C++: "Synchronize function" [*UltraLite - C and C++ Programming*]
- UltraLite for M-Business Anywhere: " setDatabaseID method" [*UltraLite - M-Business Anywhere Programming*]
- UltraLite for embedded SQL: "ULSetDatabaseID function" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "Properties" [*UltraLite - AppForge Programming*]
- UltraLite.NET: "GlobalAutoIncrementUsage property" [*UltraLite - .NET Programming*]
- UltraLite C/C++: "GetSynchResult function" [*UltraLite - C and C++ Programming*]
- UltraLite for M-Business Anywhere: " getGlobalAutoIncrementUsage method" [*UltraLite - M-Business Anywhere Programming*]

- UltraLite for embedded SQL: "ULGlobalAutoincUsage function" [*UltraLite - C and C++ Programming*]

Determining the most recently assigned GLOBAL AUTOINCREMENT value

You can retrieve the GLOBAL AUTOINCREMENT value that was chosen during the most recent insert operation. Since these values are often used for primary keys, knowing the generated value may let you more easily insert rows that reference the primary key of the first row. You can check the value with:

- **UltraLite for C/C++** Use the GetLastIdentity function on the ULConnection object. See "GetLastIdentity function" [*UltraLite - C and C++ Programming*].
- **UltraLite for Mobile VB** Use the GetLastIdentity function on the ULConnection object.
- **UltraLite.NET** Use the LastIdentity property on the ULConnection class. See "LastIdentity property" [*UltraLite - .NET Programming*].
- **UltraLite for M-Business Anywhere** Use the GetLastIdentity method on the Connection class. See " getLastIdentity method" [*UltraLite - M-Business Anywhere Programming*].

The returned value is an unsigned 64-bit integer, database data type UNSIGNED BIGINT. Since this statement only allows you to determine the most recently assigned default value, you should retrieve this value soon after executing the insert statement to avoid spurious results.

Note
Occasionally, a single INSERT statement may include more than one column of type GLOBAL AUTOINCREMENT. In this case, the return value is one of the generated default values, but there is no reliable means to determine which one. For this reason, you should design your database and write your INSERT statements in a way that avoids this situation.

Overriding partition sizes for autoincremented columns

The partition size is any positive integer, although the partition size is generally chosen so that the supply of numbers within any one partition will rarely, if ever, be exhausted.

For columns of type INT or UNSIGNED INT, the default partition size is $2^{16} = 65536$; for columns of other types the default partition size is $2^{32} = 4294967296$. Since these defaults may be inappropriate it is best to specify the partition size explicitly.

Default partition sizes for some data types are different in UltraLite applications than in SQL Anywhere databases. Declare the partition size explicitly if you want different databases to remain consistent.

To override UltraLite partition values (Sybase Central)

1. Connect to the UltraLite database.
2. Right click the selected column and click Properties from the popup menu.

The Column property sheet appears.

3. Click the Value tab.
4. Enter any positive integer in the Partition Size field.

♦ To declare autoincrement columns in UltraLite (Interactive SQL)

1. Connect to the UltraLite database.
2. Execute a CREATE TABLE or ALTER TABLE statement with a DEFAULT GLOBAL AUTOINCREMENT phrase with the partition size specified in parentheses immediately following the AUTOINCREMENT keyword. See "UltraLite CREATE TABLE statement" [*UltraLite - Database Management and Reference*] and "UltraLite ALTER TABLE statement" [*UltraLite - Database Management and Reference*].

   For example, the following statement creates a simple reference table with two columns: an integer that holds a customer identification number and a character string that holds the customer's name. A partition size of 5000 is required for this table.

```
CREATE TABLE customer (
   id   INT          DEFAULT GLOBAL AUTOINCREMENT (5000),
   name VARCHAR(128) NOT NULL,
   PRIMARY KEY (id)
)
```

See also

- UltraLite for AppForge: "Properties" [*UltraLite - AppForge Programming*]
- UltraLite.NET: "GetColumnPartitionSize method" [*UltraLite - .NET Programming*]
- UltraLite C/C++: "GetGlobalAutoincPartitionSize function" [*UltraLite - C and C++ Programming*]
- UltraLite for M-Business Anywhere: " getColumnPartitionSize method" [*UltraLite - M-Business Anywhere Programming*]
- UltraLite for embedded SQL: "ULGlobalAutoincUsage function" [*UltraLite - C and C++ Programming*]

Designing synchronization in UltraLite

All data in the UltraLite database is synchronized by default. If you are new to deploying UltraLite as a MobiLink remote database, plan to synchronize the entire UltraLite remote initially.

Once you become comfortable with the process, you may decide to customize the behavior of the synchronization operation to capture more complex business logic. Designing custom synchronization behavior requires that you ask yourself the following questions. If your business requirements are simple, you may only need to use a single synchronization feature. However, in very complex deployments, you may need to use multiple synchronization features to better control the synchronization behavior you require.

Design questions	If you answer yes, use the following
Do you want to exclude tables from synchronization?	The nosync table name suffix allows you to identify any tables that you do not want to synchronize. See "Nosync tables in UltraLite" on page 346.
Do you only want to synchronize entire tables even when data hasn't changed?	The allsync table name suffix allows you to synchronize the entire table, even when no changes are detected. See "Allsync tables in UltraLite" on page 346.
Do you want to synchronize an entire table or just rows that meet specific conditions? Does some of the data require synchronization priority due to its importance or time-sensitivity?	A publication includes articles that list the tables that require synchronization. An article can include a WHERE clause that specifies the rows to upload based on whether or not the rows meet the defined criteria. Multiple publications can address priority issues that require certain UltraLite data be uploaded before others. See "Publications in UltraLite" on page 347.
Do you require a table order for synchronization because you have cycles of foreign keys?	The Table Order synchronization parameter allows you to determine the order of synchronization operations when you have foreign key cycles. However, foreign key cycles are generally not recommended for UltraLite. See "Table order in UltraLite" on page 348.
Do you want to control synchronization behaviors? For example, do you need downloads to occur at the same time as uploads? Or do you want to change bi-directional synchronization to one-way only?	Use the appropriate synchronization parameter as part of: ♦ Your application's synchronization structure (or the synchronization enumeration). ♦ The ulsync utility's -e option. See "UltraLite Synchronization Parameters and Network Protocol options" on page 369.
Do you want synchronization triggers to be time-based (that is scheduled), cradle-triggered, user-initiated? Or do you require a combination of the above?	Different behaviors can be achieved programmatically via an appropriate interface. In some cases, HotSync or ActiveSync may manage the synchronization process. See "Adding synchronization to your UltraLite application" on page 349.

Design questions	If you answer yes, use the following
Do you want your UltraLite client to be TLS-enabled?	What encryption algorithm you choose determines how your device must be set up according to the platform that runs on that device. See XX.

See also

- "The synchronization process" [*MobiLink - Getting Started*]
- "The upload and the download" [*MobiLink - Getting Started*]

Nosync tables in UltraLite

By adding the **_nosync** suffix to the table name, you control when to exclude the entire table from the upload operation. You can use these non-synchronizing tables for client-specific persistent data that is not required in the consolidated database. Other than being excluded from synchronization, you can use these tables in exactly the same way as other tables in the UltraLite database.

If you create a table with a nosync suffix, you can only rename that table so it retains the nosync suffix. For example, the following ALTER TABLE statement with a rename clause is not allowed because the new name no longer ends in nosync:

```
ALTER TABLE purchase_comments_nosync
RENAME comments
```

To correct this, the statement must be rewritten to include this suffix:

```
ALTER TABLE purchase_comments_nosync
RENAME comments_nosync
```

You can alternatively use publications to achieve the same effect. See "Publications in UltraLite" on page 347.

Allsync tables in UltraLite

By adding the **_allsync** suffix to the table name, you control whether to change the synchronization behavior during upload so that it synchronizes all table data—even if nothing has changed since the previous synchronization session.

Some UltraLite applications require user/client-specific data that you can store in allsync tables. Therefore, if you upload the data in the table to a temporary table in the consolidated database, you can use the data to control synchronization by your other scripts without having the data maintained in the consolidated database. For example, you may want your UltraLite applications to indicate which of a number of channels or topics they are interested in, and use this information to download the appropriate rows.

Publications in UltraLite

By using publications you define a set of articles that describe the data to be synchronized. In general, each article can be a whole table, or can define a subset of the data in a table. You can include an optional predicate (a WHERE clause) if you want to define a subset of rows from a given table.

Publications are more flexible than the nosync table suffix approach and allow you to have more granular control. To synchronize data subsets of an UltraLite database *separately*, use multiple publications. You can then combine publications with upload-only or download-only synchronization parameters to synchronize high-priority changes efficiently.

Adding publications

You can add publications to the UltraLite database with Sybase Central, or from Interactive SQL. For UltraLite synchronization, each article in a publication may include either a complete table, or may include a WHERE clause (except with HotSync on Palm OS).

Notes
UltraLite publications do not support the definition of column subsets, nor the SUBSCRIBE BY clause. If columns in an UltraLite table do not exactly match tables in a SQL Anywhere consolidated database, use MobiLink scripts to resolve those differences.
You do not need to set a table synchronization order in a publication. If table order is important for your deployment, you can set the table order when you synchronize the UltraLite database by setting the Table Order synchronization parameter.

♦ To publish data from an UltraLite database (Sybase Central)

1. Connect to the UltraLite database using the UltraLite plug-in.
2. Open the Publications folder and double-click Add Publication.
3. Enter a name for the new publication. Click Next.
4. On the Tables tab, select a table from the list of Matching Tables. Click Add. The table appears in the list of Selected Tables on the right.
5. Add additional tables.
6. If necessary, click the Where tab to specify the rows to be included in the publication. You cannot specify column subsets. If you are using HotSync synchronization, do not specify a WHERE clause.
7. Click Finish.

♦ To publish data from an UltraLite database (Interactive SQL)

1. Connect to the UltraLite database.
2. Execute a CREATE PUBLICATION statement that specifies the name of the new publication and the tables you want to publish.

See also

- "Table Order synchronization parameter" on page 389
- "Download Only synchronization parameter" on page 374
- "Upload Only synchronization parameter" on page 391
- "Publishing data" on page 84
- "UltraLite CREATE PUBLICATION statement" [*UltraLite - Database Management and Reference*]
- "Working with UltraLite publications" [*UltraLite - Database Management and Reference*]
- "Introduction to synchronization scripts" [*MobiLink - Server Administration*]

Table order in UltraLite

By setting the Table Order synchronization parameter you can control the order of synchronization operations. If you want to specify a table order for synchronization, you can use the Table Order parameter programmatically or as part of the ulsync utility during testing. The Table Order parameter specifies the order of tables that are to be uploaded. See "Table Order synchronization parameter" on page 389.

You only need to explicitly set the table order, if your UltraLite database has:

- Foreign key cycles. You must then list all tables that are part of a cycle.
- Different foreign key relationships from those used in the consolidated database.

Avoiding synchronization issues with foreign key cycles

Table order is particularly important for UltraLite databases that use foreign key cycles. A cycle occurs when you link a series of tables together such that a circle is formed. However, due to complexities that arise when cycles between the consolidated database and the UltraLite remote differ, foreign key cycles are not recommended.

With foreign key cycles, you should order your tables so that operations for a primary table come before the associated foreign table. A Table Order parameter ensures that the insert in the foreign table will have its foreign key referential integrity constraint satisfied (likewise for other operations like delete).

In addition to table ordering, another method you can use to avoid synchronization issues is to check the referential integrity before committing operations. If your consolidated database is a SQL Anywhere database, set one of the foreign keys to **check on commit**. This ensures that foreign key referential integrity is checked during the commit phase rather than when the operation is initiated. For example:

```
create table c (
    id integer not null primary key,
    c_pk integer not null
);
create table p (
    pk integer not null primary key,
    c_id integer not null,
    foreign key p_to_c (c_id) references c(id)
);
alter table c
   add foreign key c_to_p (c_pk)
   references p(pk)
   check on commit;
```


If your consolidated database is from another database vendor, check to see if the database has similar methods of checking referential integrity. If so, you should implement this method. Otherwise, you must redesign table relationships to eliminate all foreign key cycles.

See also

- "Referential integrity and synchronization" [*MobiLink - Getting Started*]

Adding synchronization to your UltraLite application

In UltraLite, synchronization begins by opening a specific connection with the MobiLink server over the configured communication stream (also known as a network protocol). In addition to synchronization support for direct network connections, Palm OS devices also support HotSync synchronization, and Windows CE devices also support ActiveSync synchronization.

Defining the connection

Each UltraLite remote that synchronizes with a MobiLink server does so over a network protocol. You set the network protocol with the synchronization stream parameter. Supported network protocols include TCP/IP, HTTP, HTTPS, and TLS. For the protocol you choose, you also need to supply stream parameters that define other required connection information like the MobiLink server host and the port.

Remember to also supply the MobiLink user information and the synchronization script version with the user_name and version parameters.

Defining the synchronization behavior

You can control synchronization behaviors by setting various synchronization parameters. The way you set parameters depends on the specific UltraLite interface you are using.

Important behaviors to consider include:

- **Synchronization direction** By default, synchronization is bi-directional. If you require one-way synchronizations only, remember to use the appropriate upload_only or download_only parameter. By performing one-way synchronizations, you minimize the synchronization time required. Also, with download-only synchronization, you do not have to commit all changes to the UltraLite database before synchronization. Uncommitted changes to tables not involved in synchronization are not uploaded, and so incomplete transactions do not cause problems.

  To use download-only synchronization, you must ensure that rows overlapping with the download are not changed locally. If any data is changed locally, synchronization fails in the UltraLite application with a SQLE_DOWNLOAD_CONFLICT error.

- **Concurrent changes during synchronization** During the upload phase, UltraLite applications can access UltraLite databases in a read-only fashion. During the download phase, read-write access is permitted, but if an application changes a row that the download then attempts to change, the download will fail and roll back. You can disable concurrent access to data during synchronization by setting the disable_concurrency synchronization parameter.

♦ To add synchronization code to your UltraLite application

1. Supply the necessary synchronization parameters and protocol options you require for the session as fields of a synchronization information structure.

   For example, using the C/C++ API, you add synchronization to the UltraLite application by setting appropriate values in the ul_synch_info structure:

   ```
   ul_synch_info info;
         // define a sync structure named "info"
          ULEnableTcpipSynchronization( &sqlca );
         // use a TCP/IP stream
         conn->InitSynchInfo( &info );
         // initialize the structure
         info.stream = ULSocketStream();
         // specify the Socket Stream
         info.stream_parms= UL_TEXT( "host=myMLserver;port=2439"  );
         // set the MobiLink host information
         info.version = UL_TEXT( "custdb 10.0" );
         // set the MobiLink version information
         info.user_name = UL_TEXT( "50" );
         // set the MobiLink user name
         info.download_only =ul_true;
         // make the synchronization download-only
   ```

2. Initialize synchronization.

   For direct TCP/IP-based synchronization, you would call an API-specific synchronization function. These functions return a boolean indicating success or failure of the synchronization operation. If the synchronization fails, you can examine detailed error status fields in another structure to get additional error information.

   For HotSync synchronization, you must the ULSetSynchInfo function, supplying the ul_synch_info structure as an argument. This attaches the ul_synch_info structure to the current database for use on a subsequent synchronization.

   For ActiveSync synchronization, you must catch the synchronization message from the ActiveSync provider and use the DoSync function to call ULSynchronize.

3. Use an observer callback function if you want to report the progress of the synchronization to the user.

> **Tip**
> If you have an environment where DLLs fail either because the DLL is very large or the network connection is unreliable, you may want to implement resumable downloads. See “Handling failed downloads” [*MobiLink - Server Administration*] and “Resuming failed downloads” [*MobiLink - Server Administration*].

See also

- “Deploying ActiveSync and HotSync for UltraLite clients” on page 357
- “Upload-only and download-only synchronizations” [*MobiLink - Server Administration*]
- “The upload and the download” [*MobiLink - Getting Started*]
- “UltraLite Synchronization Parameters and Network Protocol options” on page 369
- UltraLite for AppForge: “Synchronizing data” [*UltraLite - AppForge Programming*]

- UltraLite.NET: "Synchronization in UltraLite applications" [*UltraLite - .NET Programming*]
- UltraLite C/C++ : "Synchronizing data" [*UltraLite - C and C++ Programming*]
- UltraLite C/C++: "Adding HotSync synchronization to Palm applications" [*UltraLite - C and C++ Programming*]
- UltraLite C/C++: "Adding ActiveSync synchronization to your application" [*UltraLite - C and C++ Programming*]
- UltraLite for M-Business Anywhere: "Synchronizing data" [*UltraLite - M-Business Anywhere Programming*]
- UltraLite for embedded SQL: "Adding synchronization to your application" [*UltraLite - C and C++ Programming*]

Setting up TLS-enabled synchronization in UltraLite

UltraLite client applications of MobiLink must be configured to use enable TLS synchronization. Transport-layer security enables encryption, tamper detection, and certificate-based authentication. See "Introduction to transport-layer security" [*SQL Anywhere Server - Database Administration*].

Separately licensed component required
ECC encryption and FIPS-certified encryption require a separate license. All strong encryption technologies are subject to export regulations.
See "Separately licensed components" [*SQL Anywhere 10 - Introduction*].

Platform support
RSA, ECC, and FIPS encryption are not available on all platforms. For details on which platforms support which encryption method, see the UltraLite table in SQL Anywhere 10.0.1 Components by Platform.

♦ To set up TLS synchronization on a UltraLite client application and device

1. Enable encrypted synchronization by calling one of the following:
   - To enable RSA encryption, call ULEnableRsaSyncEncryption. See "ULEnableRsaSyncEncryption function" [*UltraLite - C and C++ Programming*].
   - To enable ECC encryption, call ULEnableEccSyncEncryption. See "ULEnableEccSyncEncryption function" [*UltraLite - C and C++ Programming*].
   - To enable FIPS RSA encryption, call ULEnableRsaFipsSyncEncryption. This function is only required for Palm OS clients. See "ULEnableRsaFipsSyncEncryption function" [*UltraLite - C and C++ Programming*].
2. Set the synchronization information stream to either TLS or HTTPS.
3. If you are enabling ECC or FIPS encryption, you also need to:
   - **ECC** Set the **tls_type** network protocol option to **ECC**. See "tls_type" on page 61.
   - **FIPS** Set the **fips** network protocol option to **Yes**. See "fips" on page 46.

4. Ensure that for you have linked to the appropriate libraries:

Platform	Linking	RSA encryption	ECC encryption	FIPS encryption
Windows desktop	static[1]	*ulrsa.lib*	*ulecc.lib*	none
Windows desktop	dynamic [2]	none	none	none
Windows CE	static [1]	*ulrsa.lib*	*ulecc.lib*	none
Windows CE	dynamic [2]	none	none	none
Palm OS	static [1]	*ulrsa.lib*	*ulecc.lib*	*ulfips.lib*, *gse1st.lib*

1 You must also link to ulrt.lib.

2 You must also link to ulimp.lib.

5. Ensure that the appropriate files are copied to the device:

Platform	Linking	RSA encryption	ECC encryption	FIPS encryption
Windows desktop	static	none	none	*mlcrsafips10.dll* *sbgse2.dll*
Windows desktop	dynamic [1]	*mlcrsa10.dll*	*mlcecc10.dll*	*mlcrsafips10.dll* *sbgse2.dll*
Windows CE	static	none	none	*mlcrsafips10.dll* *sbgse2.dll*
Windows CE	dynamic [1]	*mlcrsa10.dll*	*mlcecc10.dll*	*mlcrsafips10.dll* *sbgse2.dll*
Palm OS	static	none	none	*libsbgse_4i.prc*
Windows CE components and UltraLite engine	static[2]	*mlcrsa10.dll*	*mlcecc10.dll*	*mlcrsafips10.dll* *sbgse2.dll*

1 You must also deploy ulrt10.dll.

2 You must also deploy your component .DLL file and/or uleng10.exe.

See also

- "Configuring UltraLite clients to use transport-layer security" [*SQL Anywhere Server - Database Administration*]
- UltraLite for AppForge: "Encryption and obfuscation" [*UltraLite - AppForge Programming*]

- UltraLite.NET: "Encryption and obfuscation" [*UltraLite - .NET Programming*]
- UltraLite for C++: "Encrypting data" [*UltraLite - C and C++ Programming*]
- UltraLite for M-Business Anywhere: "Database encryption and obfuscation" [*UltraLite - M-Business Anywhere Programming*]

Using MobiLink file transfers

All UltraLite libraries support the ability to transfer files with the MobiLink server—except M-Business Anywhere. M-Business Anywhere does not need this functionality, because it has its own mechanism for file deployments or transfers (called channel synchronization).

For all other APIs, use the MobiLink file transfer mechanism when:

- You have multiple files that you need to deploy to multiple devices—particularly when corporate firewalls are used as a security measure. Because MobiLink is already configured to handle synchronization through these firewalls, the MLFileTransfer mechanism makes device provisioning for upgrades and other types of file transfers very convenient.
- You have files that you want to target to a specific MobiLink user ID. This requires that you create one or more user-specific directories on the MobiLink server for each user ID you require. Otherwise, if you only have a single version of the file, you can use a default directory.

How file transfers work

You can employ one of two MobiLink-initiated file transfer mechanisms to download files to a device: run the mlfiletransfer utility for desktop transfers, or call the appropriate function for the API you are using to code your UltraLite application. Both approaches require that you:

1. Describe the transfer destination.

   Whether you use the mlfiletransfer utility from the desktop, or whether you use the function appropriate to your API, you must set the local path and file name of the file on the target device or desktop computer. If none are supplied in the application or by the end user, then the source file name is assumed and the file is stored in the current directory.

   The destination directory of the target can vary depending on the device's operating system:

   - On Palm OS, if your destination is an external storage media, you must prefix the destination of the local path with **vfs:**.

     If the destination is NULL, mlfiletransfer assumes that the file you need to download is a Palm record database (a **.pdb* file) to the device's record store.

     The file name must follow file name conventions for Palm OS. See "Palm OS" [*UltraLite - Database Management and Reference*].

   - On Windows CE, if the destination is NULL, the file is stored in the root directory (\ ).

     The file name must follow file name conventions for Windows CE. See "Windows CE" [*UltraLite - Database Management and Reference*].

   - On the desktop, if the destination is NULL, the file is stored in the current directory.

     The file name must follow file name conventions for the desktop system. See "Windows desktop" [*UltraLite - Database Management and Reference*].

2. Set the user credentials that allow the user to be identified and the correct file(s) to be downloaded.

   This user name and password are separate from any database user ID and password, and serve to identify and authenticate the application to the MobiLink server.

3. Set the stream type you want to use, and define the parameters for the stream you require. These are the same parameters supported by UltraLite for MobiLink synchronization. See "UltraLite Synchronization Parameters and Network Protocol options" on page 369.

   Most synchronization streams require parameters to identify the MobiLink server address and control other behavior. If you set the stream type to a value that is invalid for the platform, the stream type is set to TCP/IP.

4. Describe the required behaviors for the transfer mechanism.

   For example, you can set properties that allow this mechanism to force a download even when the file already exists on the target and has not changed, or that allow partial downloads to be resumed. You can also set whether you want the download progress to be monitored and reported upon.

5. Ensure the MobiLink server is running and has been started with the -ftr option.

6. Start the transfer, and, if applicable, monitor the download progress.

   By displaying the download progress, the user can cancel and resume the download at a later time.

See also

- "-ftr option" [*MobiLink - Server Administration*]
- "MobiLink file transfer utility [mlfiletransfer]" on page 29
- UltraLite for C/C++: "MLFileTransfer function" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULFileTransfer class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"ULFileTransfer class" [*UltraLite - .NET Programming*]
- UltraLite for M-Business: Not supported

CHAPTER 15

Deploying ActiveSync and HotSync for UltraLite clients

Contents

HotSync on Palm OS

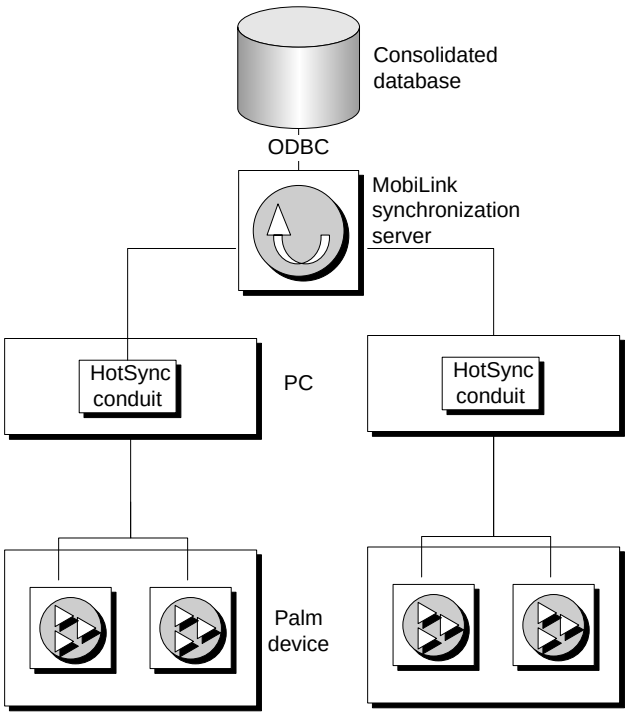
While you can synchronize data from a Palm OS device over an ethernet, Wi-Fi, or RAS connection, this section describes how to configure your desktop and device for HotSync synchronization.

HotSync synchronization allows you to manage synchronization for all UltraLite databases on the Palm device simultaneously from the user's desktop. HotSync synchronization is initiated externally by HotSync when the device is connected to the desktop. This requires that you program your application for HotSync synchronization. See "Adding HotSync synchronization to Palm applications" [*UltraLite - C and C++ Programming*].

If you were to synchronize UltraLite from an application directly (that is, without Hotsync), your end-users need to open each application separately and synchronize each database in turn. You implement this programmatically by initializing synchronization with an API specific synchronization function. See "Adding TCP/IP, HTTP, or HTTPS synchronization to Palm applications" [*UltraLite - C and C++ Programming*].

The HotSync architecture

The HotSync architecture requires a consolidated database to which data to and from remote databases are synchronized. The MobiLink server manages synchronization events among these databases. The UltraLite Hotsync conduit manages synchronization events locally from the end user's desktop.



You must use the HotSync Conduit Installation utility (ulcond10) to install a conduit and register each UltraLite database. By registering each database with the conduit, you are configuring the UltraLite Hotsync conduit to:

- Manage HotSync synchronization for all databases associated with an application (and therefore its registered creator ID). The conduit must be installed for each applicable creator ID.
- Connect to each database with the appropriate connection string. If you need to register multiple databases, use the -a option with the ulcond10 utility. This appends each additional connection string to the one you define with the -c option.

This allows you to synchronize all databases simultaneously by initializing synchronization with HotSync from the desktop.

See also

- "UltraLite HotSync Conduit Installation utility for Palm OS (ulcond10)" [*UltraLite - Database Management and Reference*]
- UltraLite for AppForge: "Synchronizing data" [*UltraLite - AppForge Programming*]
- UltraLite C/C++ : "Developing UltraLite Applications for the Palm OS" [*UltraLite - C and C++ Programming*]
- UltraLite for embedded SQL: "Adding synchronization to your application" [*UltraLite - C and C++ Programming*]
- UltraLite for M-Business Anywhere: "Synchronizing data" [*UltraLite - M-Business Anywhere Programming*]

HotSync synchronization overview

1. Ensure you have specified the required synchronization parameters in the application with the ul_sync_info structure. These synchronization parameters are then set for HotSync synchronization by calling the SetSynchInfo function. Part of the synchronization parameters also includes which network protocol options you need to communicate with the MobiLink server. See "Setting protocol options for MobiLink synchronization" on page 362.
2. When your UltraLite application is closed, the state of your UltraLite application is stored in a temporary file, separately from the database. See "Maintaining state in UltraLite Palm applications" [*UltraLite - C and C++ Programming*].
3. When you synchronize your Palm device, HotSync calls the UltraLite HotSync conduit on the desktop for a specific creator ID.
4. The UltraLite HotSync conduit connects to all registered databases using the appropriate connection string and then synchronizes them. Databases that do not call SetSynchInfo properly will fail to synchronize.
5. When your application is launched, it loads the previously saved state of your UltraLite application. See "Restoring state in UltraLite Palm applications" [*UltraLite - C and C++ Programming*].

See also

- "ul_synch_info_a struct" [*UltraLite - C and C++ Programming*]
- "SetSynchInfo function" [*UltraLite - C and C++ Programming*]

Deploying the UltraLite HotSync conduit to the end-user's desktop

During development you will have installed UltraLite onto your desktop with the SQL Anywhere installer. However, you then need to deploy required HotSync conduit files on the end-user's computer.

UltraLite HotSync conduit files

- *install-path**win32**condmgr**condmgr.dll*— The utility DLL that locates the HotSync installation path and registers the conduit with HotSync.
- *install-path**win32**ulcond10.exe*— The UltraLite HotSync Conduit Installation utility that installs or removes the UltraLite HotSync conduit on the desktop computer. See "UltraLite HotSync Conduit Installation utility for Palm OS (ulcond10)" [*UltraLite - Database Management and Reference*].
- *install-path**win32**dbhsync10.dll*— The conduit DLL that is called by HotSync.
- *install-path**win32**dblgen10.dll*— The language resource library. For languages other than English, the letters *en* in the file name are replaced by a two-letter abbreviation for the language, such as *dblgde10.dll* for German, or *dblgja10.dll* for Japanese.
- **Stream DLLs** Optional. The stream DLL required for encrypted network communication between the UltraLite HotSync conduit and the MobiLink server.
  - For RSA encryption with TLS and HTTPS, *install-path**win32**mlcrsa10.dll*.
  - For ECC encryption with TLS and HTTPS, *install-path**win32**mlcecc10.dll*.
  - For RSA FIPS encryption with TLS and HTTPS, *install-path**win32**mlcrsafips10.dll*.

Separately licensed component required
ECC encryption and FIPS-approved encryption stream DLLs require a separate license. All strong encryption technologies are subject to export regulations.
To order a separately licensed component, visit http://www.ianywhere.com/products/separately_licensed_components.html.
For information about component and platform support, see the Separately licensed components sections of the SQL Anywhere, UltraLite, and MobiLink tables in SQL Anywhere 10.0.1 Components by Platform.
For the most up-to-date supported component and platform support information, see http://www.ianywhere.com/products/components_platforms_1001.html.

♦ To deploy and register the UltraLite HotSync conduit

1. On the end-user's desktop, create the following directories:
   - *MyDir**win32*\
   - *MyDir**win32**condmgr*

2. Deploy a copy of the following files to the *MyDir\win32* directory:

   - *ulcond10.exe*
   - *dbhsync10.dll*
   - *dblgen10.dll*

3. Deploy a copy of the *Condmgr.dll* file to the *MyDir\win32\condmgr* directory.

4. Locate the following registry key:

   ```
   HKEY_CURRENT_USER\Software\Sybase\SQL Anywhere\10.0\
   ```

5. Create a value named **Location** in this key and set this value data as the root deployment folder for the conduit. For example, *MyDir*.

6. If the end-user requires a certificate to encrypt the communication stream, install the root certificate on the desktop computer so it can be accessed by the conduit.

7. Run ulcond10, ensuring that you have set connection string for each the UltraLite database with either the -c option, and possibly the -a option. Remember to also set the correct creator ID.

   This deploys and correctly configures the UltraLite HotSync conduit.

   Tip
   If you are using an encryption key, avoid setting the key in the connection string. This can pose a security risk. Instead, allow the conduit to prompt the user for the key.

   For example, the following command installs a conduit for the application with creator ID Syb2, named CustDB.

   ```
   ulcond10 -c "DBF=custdb.udb;UID=DBA;PWD=sql" -n CustDB Syb2
   ```

8. If you did not include synchronization parameters in your UltraLite application's ul_sync_info structure, configure this information either in HotSync or use ulcond10. See “Setting protocol options for MobiLink synchronization” on page 362,

♦ To check that the HotSync conduit is properly deployed

- Check that a conduit is deployed:

  a. In the computer's system tray, right-click HotSync Manager.

  b. From the popup menu, choose Custom.

  A list of conduits is displayed for each HotSync user. Verify that the conduit is listed. If the conduit is listed, you can then proceed to start the MobiLink server and test your synchronization operation.

Debugging HotSync operations

A HotSync log file is maintained in the *Palm-install\User-dir* directory. By default, this file contains information on:

- The time of the synchronization event.
- Status of each registered conduit.

However, you can obtain additional debugging information in this file by setting the UL_DEBUG_CONDUIT_LOG environment variable. There are two levels you can choose from, depending on the amount of information you need to capture:

UL_DEBUG_CONDUIT_LOG = 1 Record basic information. For example, synchronization parameters, and registry locations.

UL_DEBUG_CONDUIT_LOG = 2 Record additional UltraLite details, including input/output operations.

Restart HotSync so the new setting takes effect.

See also

- "Introduction to SQL Anywhere environment variables" [*SQL Anywhere Server - Database Administration*]

Setting protocol options for MobiLink synchronization

Protocol options describe the connection from the UltraLite HotSync conduit to the MobiLink server. Typically you would add this information as part of the application's synchronization code. However, you can also enter the required parameters from HotSync, or even ulcond10.

If you are using the ul_sync_info structure, the argument has the following form:

```
stream=stream_name;parameters
```

stream_name indicates the type of network protocol. The default value for the *stream_name* is TCP/IP.

parameters is a set of network protocol options for use by the conduit, and has the same form as the **stream_parms** argument for the protocol in use. For the given stream, the *parameters* adopts the same defaults as the **stream_parms** argument for the protocol.

Note
If you do not supply protocol options, the conduit searches in the registry for the protocol name and protocol options that you may have also supplied when you ran ulcond10.
If HotSync finds no valid network protocol, the default protocol and protocol options are used. This default stream parameter setting is:

```
stream=tcpip;host=localhost
```


See also

- "Network protocol options for UltraLite synchronization streams" on page 394
- UltraLite for MobileVB: "ULStreamType enumeration" [*UltraLite - AppForge Programming*]
- UltraLite.NET: "ULStreamType enumeration" [*UltraLite - .NET Programming*]
- UltraLite for embedded SQL: "ULSetSynchInfo function" [*UltraLite - C and C++ Programming*]
- UltraLite for C/C++: "SetSynchInfo function" [*UltraLite - C and C++ Programming*]
- UltraLite for C/C++: "ul_synch_info_a struct" [*UltraLite - C and C++ Programming*]
- UltraLite for M-Business: " setStream method" [*UltraLite - M-Business Anywhere Programming*]

ActiveSync on Windows CE

While you can synchronize data from a Windows CE over an ethernet or wi-fi connection, this section describes how to configure your desktop and device to use ActiveSync synchronization. If you want to synchronize directly using one of the other alternative methods, you need to program your application to do so using an appropriate synchronize function.

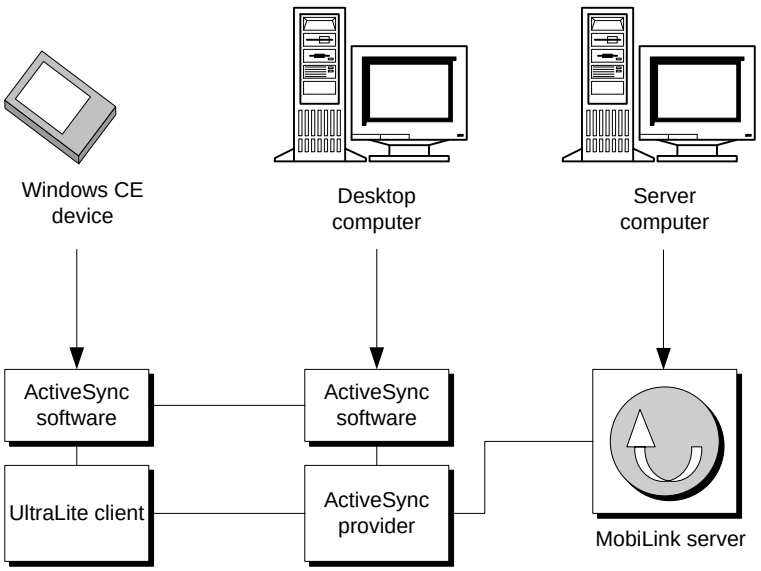
To use ActiveSync initiated synchronization requires that you:

- Register all applications that need to use ActiveSync initiated synchronization with ActiveSync.
- Have the ActiveSync provider installed on your desktop as well as deployed to your device.

  To determine which platforms the provider is supported on, see the Synchronization section of the UltraLite table in SQL Anywhere 10.0.1 Components by Platform.

The ActiveSync architecture

The following diagram shows the computing layers required by the ActiveSync architecture.



Notice that you must install the ActiveSync Manager on your device in addition to your desktop. You can only have a single ActiveSync provider on a single computer. However, if you have more than one UltraLite application installed on a Windows CE device, you can register them with the same provider so they are synchronized simultaneously.

See also

- UltraLite for AppForge: "Synchronizing data" [*UltraLite - AppForge Programming*]
- UltraLite C/C++ : "Adding ActiveSync synchronization to your application" [*UltraLite - C and C++ Programming*]

- UltraLite for embedded SQL: "Adding synchronization to your application" [*UltraLite - C and C++ Programming*]
- UltraLite for M-Business Anywhere: "Synchronizing data" [*UltraLite - M-Business Anywhere Programming*]

ActiveSync synchronization overview

1. The ActiveSync Manager begins a synchronization session.
2. The ActiveSync provider sends a synchronize notification message to the first registered application on the device. The application is started if it is not yet running.
3. WndProc is invoked for each registered application.
4. Once the application has determined that this is the synchronize notification message from ActiveSync, the application calls ULIsSynchronizeMessage to invoke the database synchronization procedure.
5. Once synchronization is complete, the application calls ULSignalSyncIsComplete to let the provider know that it has finished synchronizing.
6. Steps two through five are repeated for each application that has been registered with the provider.

Deploying the ActiveSync provider to the end-user's desktop

During development you will have installed UltraLite onto your desktop with the SQL Anywhere installer. However, when you deploy UltraLite the end user, you need to manually install and register the ActiveSync provider on the end-user's computer. This ensures that ActiveSync knows when to call a specific instance of a provider for a specific application.

- **mlasinst.exe** Installs the ActiveSync provider and registers it with the ActiveSync Manager. This utility also registers applications with the ActiveSync provider for synchronization.
- **mlasdesk.dll** The DLL that is loaded by the ActiveSync Manager on the desktop. *mlasinst.exe* registers the location of this file with the ActiveSync Manager.
- **mlasdev.dll** The DLL that is loaded by the ActiveSync Manager on the device. *mlasinst.exe* deploys this file to the correct location on the device.
- **dblgen10.dll** The language resource library.

To determine which platforms the provider is supported on, see the Synchronization section of the UltraLite table in SQL Anywhere 10.0.1 Components by Platform.

♦ To install ActiveSync applications

1. Ensure that the end-user has:
   - The ActiveSync Manager installed.

- The ActiveSync provider files copied from a development machine to the user's hard drive. If you want to use the default location, re-create the *install-dir\win32* directory.

2. Run mlasinst to install a provider for ActiveSync. You can also use it to possibly register and deploy the UltraLite application to the user's Windows CE device—depending on the command line syntax you use. If your UltraLite application uses multiple files, however, you must manually copy the required files.

   For example, because the *mlasdesk.dll* and *mlasdev.dll* have been copied to the user's *install-dir \win32* directory, the following command line has omitted both the -k and -v options. However, this utility must also copy the *myULapp.exe* application from *c:\My Files* to *\Program Files* on the device. The -p -x arguments are command line options for *myULapp.exe* when started by ActiveSync.

   ```
   mlasinst "C:\My Files\myULapp.exe" "\Program Files\myULapp.exe"
      "My Application" MYAPP -p -x
   ```

   Note
   You can also use the ActiveSync manager to register your UltraLite application at a later time if you choose. See "Registering applications with the ActiveSync Manager" on page 366.

3. Restart your computer so ActiveSync can recognize the new provider.

4. Enable the MobiLink provider.

   a. From the ActiveSync window, click Options.

   b. Check MobiLink Clients in the list and click OK to activate the provider.

   c. To see a list of registered applications, click Options, choose MobiLink Clients, and click Settings.

See also

- "Registering applications with the ActiveSync Manager" on page 366
- "ActiveSync provider installation utility [mlasinst]" on page 27

Registering applications with the ActiveSync Manager

You can register your application for use with ActiveSync either by using the ActiveSync provider install utility or using the ActiveSync Manager itself. This section describes how to use the ActiveSync Manager.

♦ To register an application for use with the ActiveSync Manager

1. Launch ActiveSync.
2. From the ActiveSync window, choose Options.
3. From the list of information types, choose MobiLink Clients and click Settings.
4. In the MobiLink Synchronization dialog, click New. The Properties dialog appears.
5. Enter the following information for your application:

- **Application name** A name identifying the application to be displayed in the ActiveSync user interface.
- **Class name** The registered class name for the application. See "Assigning class names for applications" [*UltraLite - C and C++ Programming*].
- **Path** The location of the application on the device.
- **Arguments** Any command line arguments to be used when ActiveSync starts the application.

6. Click OK to register the application.

See also

- "ActiveSync provider installation utility [mlasinst]" on page 27

CHAPTER 16

UltraLite Synchronization Parameters and Network Protocol options

Contents

Synchronization parameters for UltraLite

Synchronization parameters control the synchronization between an UltraLite database and the MobiLink server. The way you set parameters depends on the specific UltraLite interface you are using. This chapter describes the effects of the parameters, and provides links to other locations for information on how to set them.

Note
The parameters described in this chapter only apply to UltraLite remote databases. To synchronize SQL Anywhere remote databases, see "MobiLink SQL Anywhere Client Utility [dbmlsync]" on page 109.

For API-specific details, see:

- UltraLite for Embedded SQL: "ULSynchronize function" [*UltraLite - C and C++ Programming*]
- UltraLite for Mobile VB: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET: "ULSyncParms class" [*UltraLite - .NET Programming*]
- UltraLite C/C++: "Synchronize function" [*UltraLite - C and C++ Programming*]
- UltraLite for M-Business Anywhere: " SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Required parameters

The following parameters are required:

- the Stream Type parameter. See "Stream Type synchronization parameter" on page 386.
- the User Name parameter. See "User Name synchronization parameter" on page 392.
- the Version parameter. See"Version synchronization parameter" on page 393

If you do not set these parameters, the synchronization function throws an exception (for example, SQLCode.SQLE_SYNC_INFO_INVALID or its equivalent).

Conflicting parameters

You can only specify one of these parameters:

- the Download Only parameter. See "Download Only synchronization parameter" on page 374.
- the Ping parameter. See "Ping synchronization parameter" on page 380.
- the Upload Only parameter. See "Upload Only synchronization parameter" on page 391.

If you set more than one of these parameters to true, the synchronization function throws an exception (for example, SQLCode.SQLE_SYNC_INFO_INVALID or its equivalent).

Authentication Parameters synchronization parameter

Supplies parameters to authentication parameters in MobiLink events.

Syntax

The syntax varies depending on the API you use.

Remarks

Parameters may be a user name and password, for example.

If you use this parameter, you must also supply the number of parameters. See "Number of Authentication Parameters parameter" on page 377.

Allowed values

An array of strings. Null is not allowed as a value for any of the strings, but you can supply an empty string.

See also

- "Number of Authentication Parameters parameter" on page 377
- "Authentication parameters" [*MobiLink - Server Administration*]
- "authenticate_parameters connection event" [*MobiLink - Server Administration*]
- UltraLite for C/C++:"auth_parms variable" [*UltraLite - C and C++ Programming*]
- UltraLite MobileVB: "AddAuthenticationParm method" [*UltraLite - AppForge Programming*]
- UltraLite.NET: "AuthenticationParms property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere: " setAuthenticationParms method" [*UltraLite - M-Business Anywhere Programming*]

Example

UltraLite for C/C++ applications can set the parameters as follows:

```
ul_char * Params[ 3 ] = { UL_TEXT( "parm1" ),
                          UL_TEXT( "parm2" ),
                          UL_TEXT( "parm3" ) };
// ...
info.num_auth_parms = 3;
info.auth_parms = Params;
```

Authentication Status synchronization parameter

Reports the status of MobiLink user authentication. The MobiLink server provides this information to the client.

Syntax

The syntax varies depending on the API you use.

Allowed values

The allowed values are held in an interface-specific enumeration. For example, for C/C++ applications the enumeration is as follows.

Constant	Value	Description
UL_AUTH_STATUS_UNKNOWN	0	Authorization status is unknown, possibly because the connection has not yet synchronized.
UL_AUTH_STATUS_VALID	1	User ID and password were valid at the time of synchronization.
UL_AUTH_STATUS_VALID_BUT_EXPIRES_SOON	2	User ID and password were valid at the time of synchronization but will expire soon.
UL_AUTH_STATUS_EXPIRED	3	Authorization failed: user ID or password have expired.
UL_AUTH_STATUS_INVALID	4	Authorization failed: bad user ID or password.
UL_AUTH_STATUS_IN_USE	5	Authorization failed: user ID is already in use.

Remarks

If a custom **authenticate_user** synchronization script at the consolidated database returns a different value, the value is interpreted according to the rules given in an authenticate_user connection event. See "authenticate_user connection event" [*MobiLink - Server Administration*].

If you are implementing a custom authentication scheme, the authenticate_user or authenticate_user_hashed synchronization script must return one of the allowed values of this parameter.

The parameter is set by the MobiLink server, and so is read-only.

See also

- "MobiLink Users" on page 9.
- UltraLite for C/C++: "auth_status variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncResult class" [*UltraLite - AppForge Programming*]
- UltraLite.NET: "AuthStatus property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere: " SyncResult class" [*UltraLite - M-Business Anywhere Programming*]

Example

UltraLite for C/C++ applications can access the parameter as follows:

```
ul_synch_info_a info;
// ...
returncode = info.auth_status;
```


Authentication Value synchronization parameter

Reports results of a custom MobiLink user authentication script. The MobiLink server provides this information to the client.

Syntax

The syntax varies depending on the API you use.

Remarks

The values set by the default MobiLink user authentication mechanism are described in authenticate_user connection event and Authentication Status synchronization parameter.

The parameter is set by the MobiLink server, and so is read-only.

See also

- "authenticate_user connection event" [*MobiLink - Server Administration*]
- "authenticate_user_hashed connection event" [*MobiLink - Server Administration*]
- "Authentication Status synchronization parameter" on page 371
- UltraLite for C/C++: "auth_value variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncResult class" [*UltraLite - AppForge Programming*]
- UltraLite.NET: "AuthValue property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere: " SyncResult class" [*UltraLite - M-Business Anywhere Programming*]

Example

UltraLite for C/C++ applications can access the parameter as follows:

```
ul_synch_info_a info;
// ...
returncode = info.auth_value;
```

Checkpoint Store synchronization parameter

Adds additional checkpoints of the database during synchronization to limit database growth during the synchronization process.

Syntax

The syntax varies depending on the API you use.

Default

Limited checkpointing

Remarks

The checkpoint operation adds I/O operations for the application and for the Palm conduit and so slows synchronization. The option is most useful for large downloads with many updates. Devices with slow flash memory may not want to pay the performance penalty.

See also

- UltraLite for C/C++: "checkpoint_store variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET: "CheckpointStore property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere: " SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Example

UltraLite for C/C++ applications set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.checkpoint_store = ul_true ;
```

Disable Concurrency synchronization parameter

Disallow database access from other threads during synchronization.

Syntax

The syntax varies depending on the API you use.

Default

False (allowing concurrent database access). Data access is read-only during the upload phase, and read-write otherwise.

Allowed values

Boolean

See also

- "Concurrency in UltraLite" [*UltraLite - Database Management and Reference*]
- UltraLite for C/C++: "disable_concurrency variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: Not applicable
- UltraLite.NET:"DisableConcurrency property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Example

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.disable_concurrency = ul_true ;
```

Download Only synchronization parameter

Do not upload any changes from the UltraLite database during this synchronization.

Syntax

The syntax varies depending on the API you use. You can also set this paramter with ulsync.

Default

False

Allowed values

Boolean

Conflicts with

Ping and Upload Only

Remarks

When you have remotes that are synchronized by download-only synchronization, you should regularly do a full synchronization to reduce the amount of log that is scanned by the download-only synchronization. Otherwise, the download-only synchronizations will take an increasingly long time to complete.

For ulsync When download-only synchronization occurs, ulsync does not upload any changes to the data. Instead, it:

- Uploads information about the schema and the value stored in the progress counter
- Ensures that changes on the remote are not overwritten during download-only synchronization.

ulsync performs these actions by scanning the UltraLite database log to watch for rows with pending operations on the consolidated database. If ulsync detects a conflict, the download is rolled back and the synchronization fails. You must then do a full synchronization (that is an upload and a download) to correct this conflict.

See also

- “Upload Only synchronization parameter” on page 391
- “The progress counter” on page 338
- “UltraLite Synchronization utility (ulsync)” [*UltraLite - Database Management and Reference*]
- UltraLite for C/C++: “download_only variable” [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: “ULSyncParms class” [*UltraLite - AppForge Programming*]
- UltraLite.NET:“DownloadOnly property” [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:“ SyncParms class” [*UltraLite - M-Business Anywhere Programming*]

Examples

ulsync supports this parameter as an extended synchronization parameter:

```
ulsync -c DBF=myuldb.udb -k http -e
"Username=remoteA;Version=2;DownloadOnly=ON"
```

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
returncode=info.ignored_rows;
```


Ignored Rows synchronization parameter

Set to true if any rows were ignored by the MobiLink server during synchronization because of absent scripts.

Syntax

The syntax varies depending on the API you use.

Allowed values

Boolean

Remarks

The parameter is read-only.

See also

- UltraLite for C/C++: "ignored_rows variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncResult class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"IgnoredRows property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" SyncResult class" [*UltraLite - M-Business Anywhere Programming*]

Example

UltraLite for C/C++ applications can access the parameter as follows:

```
ul_synch_info_a info;
// ...
info.ignored_rows = ul_true;
```

Keep Partial Download synchronization parameter

Controls whether UltraLite holds on to the partial download rather than rolling back the changes, when a download fails because of a communications error during synchronization.

Syntax

The syntax varies depending on the API you use.

Default

False, which indicates that UltraLite rolls back all changes after a failed download.

Allowed values

Boolean

See also

- "Resuming failed downloads" [*MobiLink - Server Administration*]
- "Resume Partial Download synchronization parameter" on page 383
- UltraLite for C/C++: "keep_partial_download variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"KeepPartialDownload property" [*UltraLite - .NET Programming*]

- UltraLite for M-Business Anywhere:" SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Example

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.keep_partial_download = ul_true;
```

New Password synchronization parameter

Sets a new MobiLink password associated with the user name.

Syntax

The syntax varies depending on the API you use. You can also set this parameter with ulsync.

Allowed values

String

Remarks

The parameter is optional.

See also

- "MobiLink Users" on page 9.
- "UltraLite Synchronization utility (ulsync)" [*UltraLite - Database Management and Reference*]
- UltraLite for C/C++: "new_password variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"NewPassword property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Example

ulsync can set this parameter as an extended synchronization parameter as follows:

```
ulsync -c DBF=myuldb.udb -k http -e
"Username=remoteA;Version=2;Newpassword=mynewpassword"
```

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.password = UL_TEXT( "myoldpassword" );
info.new_password = UL_TEXT( "mynewpassword" );
```

Number of Authentication Parameters parameter

Supply the number of authentication parameters being passed to authentication parameters in MobiLink events.

Syntax

The syntax varies depending on the API you use.

Default

No parameters passed to a custom authentication script.

Remarks

The parameter is used together with Authentication Parameters to supply information to custom authentication scripts.

See also

- "Authentication Parameters synchronization parameter" on page 370
- "authenticate_parameters connection event" [*MobiLink - Server Administration*]
- "Authentication parameters" [*MobiLink - Server Administration*]
- UltraLite for C/C++: "num_auth_parms variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"AuthenticationParms property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Example

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.num_auth_parms = 3;
```

Observer synchronization parameter

A pointer to a callback function or event handler that monitors synchronization.

Syntax

The syntax varies depending on the API you use.

See also

- "User Data synchronization parameter" on page 392
- UltraLite for C/C++: "observer variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULConnection class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"ULSyncProgressListener members" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" synchronizeWithParm method" [*UltraLite - M-Business Anywhere Programming*]

Example

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.observer=callfunction;
```


Partial Download Retained synchronization parameter

Indicates whether UltraLite applied those changes that were downloaded rather than rolling back the changes, when a download fails because of a communications error during synchronization.

Syntax

The syntax varies depending on the API you use.

Allowed values

Boolean

Remarks

The parameter is set during synchronization if a download error occurs and a partial download was retained.

Partial downloads are retained only if Keep Partial Download is set to true. See "Keep Partial Download synchronization parameter" on page 376.

See also

- "Resuming failed downloads" [*MobiLink - Server Administration*]
- "Resume Partial Download synchronization parameter" on page 383
- UltraLite for C/C++: "partial_download_retained variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncResult class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"PartialDownloadRetained property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" SyncResult class" [*UltraLite - M-Business Anywhere Programming*]

Example

Access the parameter as follows:

```
ul_synch_info_a info;
// ...
returncode=info.partial_download_retained;
```

Password synchronization parameter

Specifies the MobiLink password associated with the user name.

Syntax

The syntax varies depending on the API you use. You can also set this parameter with ulsync.

Allowed values

String

Remarks

The parameter is optional.

This MobiLink user name and password are different than any database user ID and password, and serve to only identify and authenticate the application to the MobiLink server. See "User Name synchronization parameter" on page 392.

If the MobiLink client already has a password, use the New Password parameter to change it. See "New Password synchronization parameter" on page 377.

See also

- "MobiLink Users" on page 9.
- "UltraLite Synchronization utility (ulsync)" [*UltraLite - Database Management and Reference*]
- UltraLite for C/C++: "password variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"Password property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Examples

ulsync can set this parameter as an extended synchronization parameter as follows:

```
ulsync -c DBF=myuldb.udb -k http -e
"Username=remoteA;Version=2;Password=mypassword"
```

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.password = UL_TEXT( "mypassword" );
```

Ping synchronization parameter

Confirm communications between the UltraLite client and the MobiLink server. When this parameter is set to true, no synchronization takes place.

Syntax

The syntax varies depending on the API you use. You can also set this parameter with ulsync.

Default

False

Allowed values

Boolean

Remarks

When the MobiLink server receives a ping request, it connects to the consolidated database, authenticates the user, and then sends the authenticating user status and value back to the client.

If the ping succeeds, the MobiLink server issues an information message. If the ping does not succeed, it issues an error message.

If the MobiLink user ID cannot be found in the ml_user system table and the MobiLink server is running with the command line option -zu+, the MobiLink server adds the user to ml_user.

The MobiLink server may execute the following scripts, if they exist, for a ping request:

- begin_connection
- authenticate_user
- authenticate_user_hashed
- end_connection

See also

- "-pi option" on page 145
- "UltraLite Synchronization utility (ulsync)" [*UltraLite - Database Management and Reference*]
- UltraLite for C/C++: "ping variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"PingOnly property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Examples

ulsync can set this parameter as an extended synchronization parameter as follows:

```
ulsync -c DBF=myuldb.udb -k http -e "Username=remoteA;Version=2;Ping=True"
```

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.ping = ul_true;
```

Publication synchronization parameter

Specifies the publications to be synchronized.

Syntax

The syntax varies depending on the API you use. You can also use this parameter with ulsync.

Default

Synchronize all publications.

Remarks

When synchronizing in C/C++, set the publication synchronization parameter to a **publication mask**: an OR'd list of publication constants. See "PublicationMask synchronization parameter" on page 382.

See also

- "Publications in UltraLite" on page 347

- "Working with UltraLite publications" [*UltraLite - Database Management and Reference*]
- "UltraLite Synchronization utility (ulsync)" [*UltraLite - Database Management and Reference*]
- UltraLite for C/C++: "publication variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULPublicationSchema class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"ULPublicationSchema class" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" PublicationSchema class" [*UltraLite - M-Business Anywhere Programming*]

Example

ulsync can set this parameter as an extended synchronization parameter as follows:

```
ulsync -c DBF=myuldb.udb -k http -e
"Username=remoteA;Version=2;Publication=UL_PUB_MYPUB1,UL_PUB_MYPUB2"
```

PublicationMask synchronization parameter

An OR'd list of publications for which the last download time is retrieved. The set is supplied as a mask.

Syntax

The syntax varies depending on the API you use. You can also set this parameter with ulsync.

Default

0, or synchronize all data

Remarks

Each publication has a binary mask; by OR'ing the masks together, you specify which publications should be synchronized. The special publication mask UL_SYNC_ALL describes all the tables in the database, whether in a publication. The mask UL_SYNC_ALL_PUBS describes all tables in publications in the database.

> **Note**
> Since schema changes may update masks, you should use publications titled by name using the Publications synchronization parameter. See "Publication synchronization parameter" on page 381.

See also

- "Publications in UltraLite" on page 347
- "Working with UltraLite publications" [*UltraLite - Database Management and Reference*]
- "UltraLite Synchronization utility (ulsync)" [*UltraLite - Database Management and Reference*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"PublicationMask property" [*UltraLite - .NET Programming*]

Example

To set this parameter in an UltraLite for C/C+ application:

```
ul_synch_info_a info;
// ...
info.publication = UL_PUB_MYPUB1 | UL_PUB_MYPUB2 ;
```


Resume Partial Download synchronization parameter

Resume a failed download.

Syntax

The syntax varies depending on the API you use. You can also set this parameter with ulsync.

Default

False

Allowed values

Boolean

Remarks

The synchronization does not upload changes; it only downloads those changes that were to be downloaded in the failed download.

See also

- "Resuming failed downloads" [*MobiLink - Server Administration*]
- "Keep Partial Download synchronization parameter" on page 376
- "Partial Download Retained synchronization parameter" on page 379
- "UltraLite Synchronization utility (ulsync)" [*UltraLite - Database Management and Reference*]
- UltraLite for C/C++: "resume_partial_download variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"ResumePartialDownload property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Example

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.resume_partial_download = ul_true;
```

Send Column Names synchronization parameter

Specifies that column names should be sent in the upload.

Syntax

The syntax varies depending on the API you use. You can also set this parameter with ulsync.

Default

False

Allowed values

Boolean

Remarks

This option is used by the MobiLink server for direct row handling. When using direct row handling, you should enable this option. Otherwise, it has no effect. See "Direct Row Handling" [*MobiLink - Server Administration*].

See also

- "UltraLite Synchronization utility (ulsync)" [*UltraLite - Database Management and Reference*]
- UltraLite for C/C++: "send_column_names variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"SendColumnNames property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Examples

ulsync can set this parameter as an extended synchronization parameter as follows:

```
ulsync -c DBF=myuldb.udb -k http -e
"Username=remoteA;Version=2;SendColumnNames = true"
```

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.send_column_names = ul_true;
```

Send Download Acknowledgment synchronization parameter

Instructs the MobiLink server whether or not the client will provide a download acknowledgment.

Syntax

The syntax varies depending on the API you use. You can also set this parameter with ulsync.

Default

False

Allowed values

Boolean

See also

- "UltraLite Synchronization utility (ulsync)" [*UltraLite - Database Management and Reference*]
- UltraLite for C/C++: "send_download_ack variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"SendDownloadAck property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Examples

ulsync can set this parameter as an extended synchronization parameter as follows:


```
ulsync -c DBF=myuldb.udb -k http -e
"Username=remoteA;Version=2;SendDownloadACK = true"
```

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.send_download_ack = ul_true;
```

Stream Error synchronization parameter

Provide a structure to hold communications error reporting information.

Syntax

The syntax varies depending on the API you use.

Applies To

This parameter applies only to C/C++ interfaces.

Allowed values

The parameter has no default value, and must be explicitly set using one of the supported fields. The **ul_stream_error** fields are as follows:

- **stream_id** Not required. The value is always 0.
- **stream_context** The basic network operation being performed, such as open, read, or write. For details, see *sserror.h*.
- **stream_error_code** Not required. The value is always 0.

  For a listing of error numbers, see "MobiLink Communication Error Messages" [*SQL Anywhere 10 - Error Messages*]. For the error code suffixes, see *sserror.h*.
- **system_error_code** A system-specific error code. For more information about the error code, you must look at your platform documentation. For Windows platforms, this is the Microsoft Developer Network documentation.
  The following are common system errors on Windows:
  - **10048 (WSAADDRINUSE)** Address already in use.
  - **10053 (WSAECONNABORTED)** Software caused connection abort.
  - **10054 (WSAECONNRESET)** The other side of the communication closed the socket.
  - **10060 (WSAETIMEDOUT)** Connection timed out.
  - **10061 (WSAECONNREFUSED)** Connection refused. Typically, this means that the MobiLink server is not running or is not listening on the specified port. See the Microsoft Developer Network web site.

- **error_string** An application-provided error message. The string may or may not be empty. A non-empty error_string provides information in addition to the stream_error_code. For instance, for a write error (error code 9) the error string is a number showing how many bytes it was trying to write.
- **error_string_length** The size of the error string buffer.

Remarks

UltraLite applications other than the UltraLite C++ Component receive communications error information as part of the Sync Result parameter. See "Sync Result synchronization parameter" on page 388.

The **stream_error** field is a structure of type **ul_stream_error**.

```
typedef struct ss_error_a {
    ss_stream_id         stream_id;
    ss_stream_context    stream_context;
    ss_error_code        stream_error_code;
    asa_uint32           system_error_code;
    char              *error_string;
    asa_uint32           error_string_length;
} ss_error_a, *p_ss_error_a;
```

The structure is defined in *sserror.h*, in the *h* subdirectory of your SQL Anywhere installation directory.

Check for SQLE_COMMUNICATIONS_ERROR as follows:

```
Connection conn;
auto ul_synch_info_a info;
...
conn.InitSynchInfo( &info );
info.stream_error.error_string = error_buff;
info.stream_error.error_string_length =
                  sizeof( error_buff );
if( !conn.Synchronize( &synch_info ) ){
    if( SQLCODE == SQLE_COMMUNICATIONS_ERROR ){
        printf( error_buff );
    // more error handline here
```

See also

- "stream_error variable" [*UltraLite - C and C++ Programming*]

Stream Type synchronization parameter

Set the MobiLink network protocol to use for synchronization.

Syntax

The syntax varies depending on the API you use. You can also set this parameter with ulsync.

Remarks

This parameter is required. It has no default value.

Most network protocols require protocol options to identify the MobiLink server address and other behavior. These options are supplied in the Stream Parameters parameter. See "Stream Parameters synchronization parameter" on page 387.

When the network protocol requires an option, pass that option using the Stream Parameters parameter; otherwise, set the Stream Parameters parameter to null.

The following stream types are available, but not all are available on all target platforms:

Network protocol	Description
HTTP	Synchronize over HTTP.
HTTPS	Synchronize over HTTPS. The HTTPS protocol uses TLS as its underlying security layer. It operates over TCP/IP.
TCP/IP	Synchronize over TCP/IP.
TLS	Synchronize over TCP/IP with transport-layer security security (TLS). TLS secures client/server communications using digital certificates and public-key cryptography.

For a list of supported platforms, see the UltraLite table in SQL Anywhere 10.0.1 Components by Platform.

See also

- "Certificate creation utility [createcert]" [*SQL Anywhere Server - Database Administration*]
- "Certificate viewer utility [viewcert]" [*SQL Anywhere Server - Database Administration*]
- "Transport-Layer Security" [*SQL Anywhere Server - Database Administration*]
- "UltraLite Synchronization utility (ulsync)" [*UltraLite - Database Management and Reference*]
- "Network protocol options for UltraLite synchronization streams" on page 394
- UltraLite for C/C++: "stream variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"Stream property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Example

For UltraLite for C/C++ applications, set the parameter as follows:

```
Connection conn;
auto ul_synch_info_a info;
...
conn.InitSynchInfo( &info );
info.stream = "http";
```

Stream Parameters synchronization parameter

Sets options to configure the network protocol.

Syntax

The syntax varies depending on the API you use. You can also set this parameter with ulsync.

Default

Null

Allowed values

String

Remarks

This parameter is optional.

A semicolon separated list of network protocol options. Each option is of the form *keyword=value*, where the allowed sets of keywords depends on the network protocol.

See also

- "UltraLite Synchronization utility (ulsync)" [*UltraLite - Database Management and Reference*]
- "Network protocol options for UltraLite synchronization streams" on page 394
- UltraLite for C/C++: "stream_parms variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"StreamParms property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Example

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.stream_parms= UL_TEXT( "host=myserver;port=2439" );
```

Sync Result synchronization parameter

Reports the status of a synchronization.

Syntax

The syntax varies depending on the API you use.

Remarks

The parameter is set by UltraLite, and so is read-only.

The C/C++ interface receive this information in separate parameters as part of a ul_sync_info struct. Otherwise, this information is defined as a compound parameter containing a variety of information in separate fields:

- **Authentication Status** Reports success or failure of authentication. See "Authentication Status synchronization parameter" on page 371.
- **Ignored Rows** Reports the number of ignored rows. See "Ignored Rows synchronization parameter" on page 376.

- **Stream Error information** The Stream Error information includes a Stream Error Code, Stream Error Context, Stream Error ID, and Stream Error System. See "Stream Error synchronization parameter" on page 385.
- **Upload OK** Reports the success or failure of the upload phase. See "Upload OK synchronization parameter" on page 390.

See also

- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET: "ULSyncParms class" [*UltraLite - .NET Programming*]
- UltraLite C/C++: "ul_synch_info_a struct" [*UltraLite - C and C++ Programming*]
- UltraLite for M-Business Anywhere: " SyncParms class" [*UltraLite - M-Business Anywhere Programming*]
- UltraLite for embedded SQL: "ULGetSynchResult function" [*UltraLite - C and C++ Programming*]

Table Order synchronization parameter

Set the table order required for priority synchronization, if the UltraLite default table ordering is not suitable for your deployment.

Syntax

The syntax varies depending on the API you use. You can also set this parameter with ulsync.

Default

Null or empty to order tables based on foreign keys relationships.

Allowed values

A comma separated list of table names that lists all tables to be uploaded.

Remarks

Typically, the default is acceptable when the foreign keys on your consolidated database match the UltraLite remote and there are no foreign key cycles.

Quote tables names with either single or double quotes. For example, "Customer,Sales" and 'Customer,Sales' are both supported in UltraLite. With ulsync, you must separate table names with semicolons (;).

If you include tables that are not included in the synchronization, they are ignored.

The order of tables on the download is the same as those you define for upload.

You only need to explicitly set the table order, if your UltraLite tables:

- Are part of foreign key cycles. You must then list all tables that are part of a cycle.
- Have different foreign key relationships in the consolidated database.

Note
The table order you define, must ensure referential integrity. Any tables that you do not list are appropriately sorted based of the foreign keys defined in the remote database.

See also

- "UltraLite Synchronization utility (ulsync)" [*UltraLite - Database Management and Reference*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET: "TableOrder property" [*UltraLite - .NET Programming*]
- UltraLite C/C++: "table_order variable" [*UltraLite - C and C++ Programming*]
- UltraLite for M-Business Anywhere: " SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Examples

ulsync can set this parameter as an extended synchronization parameter as follows:

```
ulsync -c DBF=myuldb.udb -k http -e
"Username=remoteA;Version=2;TableOrder='Customer;Sales'"
```

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.table_order = UL_TEXT( "Customer,Sales" );
```

Upload OK synchronization parameter

Reports the status of data uploaded to the MobiLink server.

Syntax

The syntax varies depending on the API you use.

Remarks

The parameter is set by UltraLite, and so is read-only.

After synchronization, the parameter holds **true** if the upload was successful, and **false** otherwise. You can check this parameter if there was a synchronization error, to know whether data was successfully uploaded before the error occurred.

See also

- UltraLite C/C++: "upload_ok variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncResult class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"UploadOK property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" SyncResult class" [*UltraLite - M-Business Anywhere Programming*]

Example

UltraLite for C/C++ applications can access the parameter as follows:


```
ul_synch_info_a info;
// ...
returncode = info.upload_ok;
```

Upload Only synchronization parameter

Indicates that there should be no downloads in the current synchronization, which can save communication time, especially over slow communication links.

Syntax

The syntax varies depending on the API you use. You can also set this parameter with ulsync.

Default

False

Allowed values

Boolean

Conflicts with

Download Only, Ping, and Resume Partial Download

Remarks

When set to true, the client waits for the upload acknowledgment from the MobiLink server, after which it terminates the synchronization session successfully.

See also

- "Designing synchronization in UltraLite" on page 345
- "Download Only synchronization parameter" on page 374
- "UltraLite Synchronization utility (ulsync)" [*UltraLite - Database Management and Reference*]
- UltraLite C/C++: "upload_only variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"UploadOnly property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Examples

ulsync can set this parameter as an extended synchronization parameter as follows:

```
ulsync -c DBF=myuldb.udb -k http -e "Username=remoteA;Version=2;UploadOnly =
True"
```

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.upload_only = ul_true;
```


User Data synchronization parameter

Make application-specific information available to the synchronization observer.

Applies to

C/C++ and MobileVB applications only. Other components, such as UltraLite.NET, do not require a separate parameter to handle user data and so have no User Data parameter.

Syntax

The syntax varies depending on the API you use.

Remarks

When implementing the synchronization observer callback function or event handler, you can make application-specific information available by providing information using the User Data parameter.

See also

- "Observer synchronization parameter" on page 378
- UltraLite C/C++: "user_data variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULConnection class" [*UltraLite - AppForge Programming*]

User Name synchronization parameter

A string that the MobiLink server uses for authentication purposes.

Syntax

The syntax varies depending on the API you use. You can also set this parameter with ulsync.

Remarks

The parameter has no default value, and must be explicitly set.

This MobiLink user name and password are separate from any database user ID and password, and serves to only identify and authenticate the application to the MobiLink server. See "Password synchronization parameter" on page 379.

For a user to be part of a synchronization system, you must register the user name with the MobiLink server. The user name is stored in the name column of the ml_user MobiLink system table in the consolidated database.

The user name does not have to be unique when a remote ID is used. See "Remote IDs" on page 14.

See also

- "MobiLink Users" on page 9
- "UltraLite user authentication" on page 10
- "UltraLite Synchronization utility (ulsync)" [*UltraLite - Database Management and Reference*]
- UltraLite C/C++: "user_name variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"UserName property" [*UltraLite - .NET Programming*]

- UltraLite for M-Business Anywhere:" SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Examples

ulsync can set this parameter as an extended synchronization parameter as follows:

```
ulsync -c DBF=myuldb.udb -k http -e "Username=remoteA;Version=2"
```

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.user_name= UL_TEXT( "mluser" );
```

Version synchronization parameter

Allows an UltraLite application to choose from a set of synchronization scripts.

Syntax

The syntax varies depending on the API you use. You can also set this parameter with ulsync.

Allowed values

String

Remarks

This parameter is required.

Each synchronization script in the consolidated database is marked with a version string. For example, there may be two different **download_cursor** scripts, identified by different version strings.

See also

- "Script versions" [*MobiLink - Server Administration*]
- "UltraLite Synchronization utility (ulsync)" [*UltraLite - Database Management and Reference*]
- UltraLite C/C++: "version variable" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSyncParms class" [*UltraLite - AppForge Programming*]
- UltraLite.NET:"Version property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere:" SyncParms class" [*UltraLite - M-Business Anywhere Programming*]

Examples

ulsync can set this parameter as an extended synchronization parameter as follows:

```
ulsync -c DBF=myuldb.udb -k http -e "Username=remoteA;Version=2;
```

UltraLite for C/C++ applications can set the parameter as follows:

```
ul_synch_info_a info;
// ...
info.version = UL_TEXT( "default" );
```


Network protocol options for UltraLite synchronization streams

You must set the network protocol in your application. Each UltraLite database that synchronizes with a MobiLink server does so over a network protocol. Available network protocols include TCP/IP, HTTP, HTTPS, and TLS. Support is also provided for HotSync synchronization on the Palm OS and for ActiveSync notification on Windows CE. For a list of which protocols support a specific set of options, see "MobiLink Client Network Protocol Options" on page 31.

Separately licensed component required
ECC encryption and FIPS-certified encryption require a separate license. All strong encryption technologies are subject to export regulations.
See "Separately licensed components" [*SQL Anywhere 10 - Introduction*].

To configure UltraLite to use TLS, see "Configuring UltraLite clients to use transport-layer security" [*SQL Anywhere Server - Database Administration*].

For the network protocol you set, you can choose from a set of corresponding protocol *options* to ensure that the UltraLite application can locate and properly communicate with the MobiLink server. The network protocol options provide information such as addressing information (host and port) and protocol-specific information. Refer to the table below to determine which options you can use for the stream type you are using.

Setting the synchronization stream and options

You can provide the information needed to locate the MobiLink server in your application by setting the Stream Parameters parameter. See "Stream Parameters synchronization parameter" on page 387.

However, if you are using HotSync, and if you did not specify a Stream Parameter value, or even if you specified the value as NULL, you can enter the required parameters from the HotSync Manager. See "Setting protocol options for MobiLink synchronization" on page 362.

For information about including stream parameters in your UltraLite synchronization call, see:

- UltraLite for C/C++: "Adding HotSync synchronization to Palm applications" [*UltraLite - C and C++ Programming*]
- UltraLite for AppForge: "ULSQLCode enumeration" [*UltraLite - AppForge Programming*]
- UltraLite for UltraLite.NET: "StreamParms property" [*UltraLite - .NET Programming*]
- UltraLite for M-Business Anywhere: " setStreamParms method" [*UltraLite - M-Business Anywhere Programming*]

zlib compression note
zlib compression is not supported on Palm OS or Symbian OS.

See also

- "MobiLink Client Network Protocol Options" on page 31

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