UltraLite®
M-Business Anywhere Programming

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Contents

About This Manual

Subject

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.

M-Business Anywhere is the iAnywhere platform for developing and deploying mobile web-based applications. The previous name for the product was AvantGo M-Business Server.

Audience

This manual is intended for application developers who want to take advantage of the performance, resource efficiency, robustness, and security of an UltraLite relational database for data storage and synchronization.

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*].

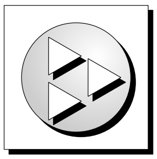
♦ **Environment variables** The documentation refers to setting environment variables. On Windows, environment variables are referred to using the syntax *%envvar%*. On Unix, Linux, and Mac OS X, environment variables are referred to using the syntax *$envvar* or *${envvar}*.

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

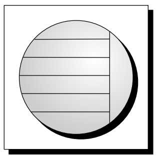
Graphic icons

The following icons are used in this documentation.

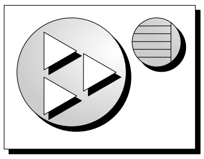
♦ A client application.



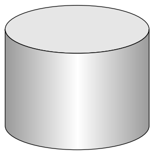
♦ A database server, such as SQL Anywhere.



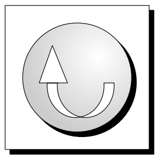
♦ An UltraLite application.



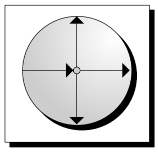
♦ A database. In some high-level diagrams, the icon may be used to represent both the database and the database server that manages it.



- 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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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.

CHAPTER 1

Introduction to UltraLite for M-Business Anywhere

Contents

UltraLite for M-Business Anywhere features

UltraLite for M-Business Anywhere is a relational data management system for mobile devices. It has the performance, resource efficiency, robustness, and security required by business applications. UltraLite also provides synchronization with enterprise data stores.

System requirements and supported platforms

Development platforms

To develop applications using UltraLite for M-Business Anywhere, you require the following:

♦ M-Business Anywhere is the new name for AvantGo M-Business Server. This software requires M-Business Server 5.3 or later, and the corresponding M-Business Anywhere client.

Target platforms

UltraLite for M-Business Anywhere supports the following target platforms:

♦ Windows CE 3.0 and higher, with Pocket PC on the ARM processor, including Windows Mobile 5.0.

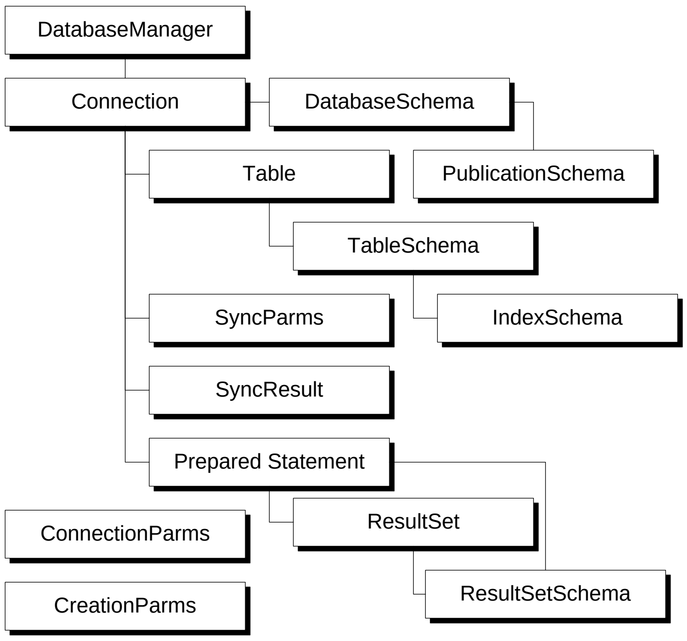
♦ Palm OS version 5.0 and higher.

♦ Windows, starting with M-Business Anywhere 5.5.

For more information about deployment, see the UltraLite Deployment Option for SQL Anywhere table in SQL Anywhere Supported Platforms and Engineering Support Status.

UltraLite for M-Business Anywhere architecture

The UltraLite programming interface exposes a set of objects for data manipulation using an UltraLite database. The following figure describes the object hierarchy.



The following list describes some of the more commonly-used high-level objects.

- **DatabaseManager** manages connections to UltraLite databases.

  See " DatabaseManager class" on page 70.

- **ConnectionParms** holds a set of connection parameters.

  See " ConnectionParms class" on page 66.

- **CreationParms** holds a set of database creation parameters.

  See " CreationParms class" on page 68.

- **Connection** represents a database connection, and governs transactions.

  See " Connection class" on page 58.

- **PreparedStatement, ResultSet, and ResultSetSchema** manage database requests and their results using SQL.

  See:

    - “ PreparedStatement class” on page 81
    - “ ResultSet class” on page 91
    - “ ResultSetSchema class” on page 107

- **Table** manages data using a table-based API.

  See “ ULTable class” on page 146.

- **SyncParms and SyncResult** manage synchronization through the MobiLink server.

  For more information about synchronization with MobiLink, see “UltraLite Clients” [*MobiLink - Client Administration*].

CHAPTER 2

Understanding UltraLite for M-Business Anywhere Development

Contents

UltraLite for M-Business Anywhere Quick Start

The following procedures describe how to run the supplied CustDB and Simple sample applications.

Before you start, ensure that you have M-Business Anywhere 6.0 or later installed and running, and that you have administrative privileges on the server. You must also have a supported handheld device.

♦ To install and run M-Business Anywhere samples

1. Copy the UltraLite for M-Business Anywhere sample files to your installation directory for deployment.

   a. Open a command prompt and change directory to the *samples-dir \UltraLiteForMBusinessAnywhere\CustDB* subdirectory of your SQL Anywhere installation.

   b. Run the following command:

   ```
   build.bat deploy-dir
   ```

   where *deploy-dir* is the directory where the CustDB and UltraLite files are to be deployed. For example, you may choose *C:\tutorial\mba*

   The batch file copies the required files to the location you specify. To see what files are being copied, examine the file *samples-dir\UltraLiteForMBusinessAnywhere\CustDB\build.bat* using a text editor.

2. Create a virtual directory in your web server that points to the directory *deploy-dir* specified in step 1. The following instructions are for Microsoft IIS:

   a. Open the IIS management tool.

   b. Right-click your web site and choose New ► Virtual Directory. Name this virtual directory **CustDB** and specify your deployment directory *deploy-dir* as the content directory. Leave the other settings at their default values.

   c. Right-click the new virtual directory and choose Properties. In the HTTP Headers tab, click File Types and register the following file extensions as the type application/octet-stream:

   - For Windows and Windows CE: cab, dll
   - For Palm OS: pdb, prc
   - udb

   d. Make a note of the URL that accesses the file *main.htm* in this virtual directory. In a default installation this would be *http://localhost/CustDB/main.htm*.

3. Add users to M-Business Anywhere.

   There are three ways to add new users to M-Business Anywhere: by creating new user profiles, by allowing users to self-register, and by importing a CSV file. These instructions describe how to create a new user profile. For more information, see the M-Business Anywhere documentation.

   a. Log in to M-Business Anywhere as an administrator.

The default administrator account settings are a user ID of **Admin** and an empty password.

b. In the left panel, click Users.

c. Click Create User. The Create User page appears.

d. Type a unique user name in the User Name field.

e. Type the same password in the Password and the Confirm Password fields.

f. Click Save to add the user.

4. Deploy the M-Business Anywhere Client to a handheld device or PC.

   a. Click the Download Client Software Only link on the M-Business Anywhere login page. Run the installation to install the client.

   b. On the handheld device or PC, configure M-Business Connect to synchronize with the M-Business Anywhere server.

      Enter the user ID and password of the new M-Business user account you created.

   c. Synchronize to the M-Business Anywhere server.

      If you have connection problems at this stage, specify the host using an IP number rather than a host name (to avoid name resolution issues with some versions of ActiveSync).

   For more information, see your M-Business Anywhere documentation.

5. Add a group to M-Business Anywhere.

   The group will be used to test UltraLite for M-Business Anywhere.

   a. From a web browser, connect to M-Business Anywhere.

      The default URL is *http://localhost* or *http://localhost:8091*.

   b. Log in using the administrator account.

   c. Click the Groups option in the left navigation panel, and click Create Group.

   d. Name your group **UltraLite Samples**.

6. Configure the M-Business Anywhere channel settings.

   a. Add the user you created in step 3 to the group UltraLite Samples using the Users option in the left panel under Edit Group.

   b. Use the group's "Channels" option in the left navigation panel to create the following channel:

Setting	**Value**
Channel Name	CustDB
Location	*http://localhost/CustDB/main.htm* or the URL from step 2.

Setting	Value
Size	1000
Link depth	3
Allow binary distribution	Yes (checked)
Hidden	No (unchecked)

After setting the Location value, click View to confirm that you have entered the value correctly.

7. Synchronize your client.

   The initial synchronization downloads the UltraLite for M-Business Anywhere files onto your handheld device.

♦ To verify your setup

1. Check that the required files are present.

   - On Windows CE, after you have synchronized the device, check that the following files are in the *\Program Files\AvantGo\Pods* folder:

     - *ulpod10.dll*
     - *custdb.udb*

     If any of these files is missing, you may have to manually copy them over to the device.

   - On Palm OS, after you have synchronized your device, check Palm OS App Info for the presence of the following:

     - ulpod
     - custdb

     If any of these are missing, you may have to use the Palm install utility to install the UltraLite for M-Business Anywhere runtime *.prc* and sample schemas *.pdb* files to the device.

   - On Windows desktops, after you have synchronized your device, check that the following files are in the *AvantGo\Pods* subdirectory of your *AvantGo Connect* folder:

     - *ulpod10.dll*
     - *custdb.udb*

     If any of these files are missing, you may have to manually copy them over to the device.

2. Launch M-Business Client.

   On your handheld device or PC, check that the About screen displays the UltraLite for M-Business Anywhere version number. This confirms that UltraLite for M-Business Anywhere is successfully installed.

3. Run the CustDB sample application.

   a. Start the MobiLink server on your desktop.

      From the Start menu, choose Programs ▶ SQL Anywhere 10 ▶ MobiLink ▶ Mobilink Server Sample.

   b. Start the CustDB application on your M-Business Client.

      The CustDB application is a link on your M-Business home page.

   c. Enter your user ID.

      The default value is **50**.

   d. Synchronize.

      Either answer Yes to the prompt "Do you have a network connection now?" or, in the CustDB application, click Synchronize. This synchronizes data with MobiLink, and is a separate operation from synchronizing with M-Business Anywhere.

      You should now see data in the CustDB fields. You can now explore the CustDB application.

   See “Exploring the CustDB Sample for MobiLink” [*MobiLink - Getting Started*].

HotSync with multiple databases

Each UltraLite database on a Palm OS device must have a distinct creator ID to work properly with HotSync. In addition, an application with that creator ID must exist on the Palm OS device.

The HotSync Manager uses each application's creator ID as an identifier to handle synchronization. It hands each properly configured UltraLite application to the MobiLink conduit for synchronization. The conduit searches for and synchronizes a database with the same creator ID as the application.

For more information about configuring the conduit, see “HotSync synchronization overview” [*MobiLink - Client Administration*].

All UltraLite for M-Business Anywhere applications inherit the creator ID of the M-Business client, which is **AvGo**. This inheritance means that only one UltraLite database with creator ID **AvGo** can be synchronized, and that if you assign a distinct creator ID to your database, HotSync will not find it because there is no application with a corresponding creator ID.

This limitation is not an issue for the two sample applications (CustDB and Simple), as they share a common database schema. The only side effect is that when you synchronize the CustDB database, the Simple sample is also synchronized.

For more information about resolving this problem, see “Registering the Palm creator ID” [*UltraLite - C and C++ Programming*].

Connecting to an UltraLite database

UltraLite applications must connect to a database before carrying out operations on the data in it.

Here is the simplest way to establish a connection. Extensions to this technique are given in the following sections.

```
var DatabaseMgr;
var Connection;
DatabaseMgr = CreateObject("iAnywhere.UltraLite.DatabaseManager.CustDB");
Connection = DatabaseMgr.openConnection("dbf=" + DatabaseMgr.directory + "\
\mydb.udb");
```

Using the Connection object

The following properties of the Connection object govern global application behavior.

For more information about the Connection object, see “ Connection class” on page 58.

- **Commit behavior** By default, UltraLite applications are in AutoCommit mode. Each insert, update, or delete statement is committed to the database immediately. Set Connection.AutoCommit to false to build transactions into your application. Turning AutoCommit off and performing commits directly can improve the performance of your application.

  See “ commit method” on page 60.

- **User authentication** You can change the user ID and password for the application from the default values of DBA and sql by using the grantConnectTo and revokeConnectFrom methods.

  See “Authenticating users” on page 28.

- **Synchronization** A set of objects governing synchronization are accessed from the Connection object.

  See “Synchronizing data” on page 29.

- **Tables** UltraLite tables are accessed using the Connection.getTable method.

  See “ getTable method” on page 62.

Maintaining connections and application state across pages

The scope of a JavaScript variable is limited to one web page. Most web applications require multiple pages, and so a mechanism is needed for making some objects persistent across the pages of an application.

UltraLite for M-Business Anywhere provides persistence for the ULTable, ResultSet, and PreparedStatement objects. To make one of these objects persist across pages, supply a **persistent name** as a parameter when creating the object. You can use the persistent name on subsequent pages.

To carry a connection object from page to page, you reopen the connection on each page. One way to do this is to use the reOpen method. Another is to supply an open method on each page, perhaps by including a JavaScript file on each web page to initialize the settings. For examples of how to do this, see the sample files *samples-dir\UltraLiteForMBusinessAnywhere\CustDB\main.htm* and *samples-dir \UltraLiteForMBusinessAnywhere\Simple\main_page.htm*.

The requirement to reopen connections across pages provides a security feature for UltraLite applications. You can use it to require that the user confirm some information, perhaps the password, on moving from page to page.

If an UltraLite object is not needed in another web page, the application should issue a close method on the object to save memory.

See also

- “ reOpenConnection method” on page 72
- “ PreparedStatement class” on page 81
- “ ResultSet class” on page 91
- “ ULTable class” on page 146
- “ PreparedStatement class” on page 81

Persistent names in M-Business Anywhere applications

In HTML, when control transfers to a new page, all handles to allocated JavaScript objects from the old page are lost. For example, in main.html, you have a M-Business Anywhere database connection object:

```
conn = dbMgr.openConnection("...");
```

If you click a link in *main.html* and it takes you to a different page (for example: *insert.html*), you cannot find the object named "conn" in *insert.html*. To get the connection object back, you may have to call dbMgr.openConnection("...") again. However, you do not have to do this since the connection object is still in memory, you have only lost the JavaScript handle to it.

This is why there is a persistName argument in all the M-Business Anywhere API calls to DataManager, Connection, ULTable, PreparedStatement, or ResultSet. For example, when the M-Business Anywhere runtime receives a call from JavaScript for a UltraLite connection object, M-Business Anywhere first checks to see if a connection object exists in memory that has the same persistName. If the runtime can find a matching object, it will return that connection object. Otherwise, M-Business Anywhere goes through the normal procedure to make a new UltraLite database connection and return it.

Using persistent names

There are two types of hierarchy among M-Business Anywhere objects. They both start with DatabaseManager and Connection:

- DatabaseManager -> Connection -> Table (for table API)
- DatabaseManager -> Connection -> PreparedStatement -> ResultSet (for Dynamic SQL API)

To retrieve any of these M-Business Anywhere objects with a persistent name, you have to retrieve the top-level object with a persistent name, and then all the upper level M-Business Anywhere objects along the hierarchy tree until the one you want.

For example, if you want to retrieve an existing ULTable object from insert.html, you need to give a persistent name to dbMgr, conn, and table objects in *main.html*, and then use persistent names in *insert.html* to get all of them back:

Code segment for *main.html*:

```
var dbMgr = CreateObject( "iAnywhere.UltraLite.DatabaseManager.simple" );
// "simple" is the persistent name here. A real database manager object is
allocated

var conn = dbMgr.openConnection( "CON=simple_con;..." );
// "simple_con" is the persistent name here. A real database connection is
made.

var custTable = conn.getTable( "ULCustomer", "simpleCustTable" );
// a real table is allocated
```

Code segment for *insert.html*:

```
var dbMgr = CreateObject( "iAnywhere.UltraLite.DatabaseManager.simple" );
// "simple" is the persistent name here.
// The allocated database manager object from main.html is returned
```

```
var conn = dbMgr.openConnection( "CON=simple_con;..." );
// "simple_con" is the persistent name here.
// The existing connection object from memory is returned.

var custTable = conn.getTable( "ULCustomer", "simpleCustTable" );
// the existing table object is returned.

var newTable = conn.getTable( "ULOrder", "simpleOrderTable" );
// since there is no order table from main.html,
// it does not exist in memory. A real order table object is allocated.
```

Using persistent names correctly

Put the commonly used code in a JavaScript file. Since most HTML pages of an M-Business Anywhere application need to refer to DatabaseManager, Connection, and some major ULTable objects, it is convenient to put the code that creates them (or retrieves them with a persistent name) in a common JavaScript file, and include this file at the top of HTML pages that use them. Both M-Business Anywhere "simple" and "CustDB" sample programs demonstrate how to do this.

Close the object if you do not plan to use the object from another page. If the M-Business Anywhere application only has one HTML page, then there is no need to have persistent names. The persistent name argument can be set to NULL. On the other hand, if each HTML page has many opened PreparedStatement and ResultSet objects, then the developer needs to balance between the convenience of having them in memory to retrieve them easily with a persistent name from another html page, and wasted memory usage because these objects are always around. For example, suppose you have 5 PreparedStatement objects and 10 ResultSet objects created in *main.html*. They are occupying a significant amount of memory. When the application jumps to *insert.html*, if you only need to refer to some of these objects with a persistent name, then the objects that are not needed anymore are wasting memory. If you try to create new PreparedStatement and ResultSet objects in *insert.html*, you may run out of memory. The solution is to explicitly close those PreparedStatment object or ResultSet object at the end of *main.html* if you are sure you do not need them from *insert.html*.

The state of each M-Business Anywhere object is preserved when it is retrieved with a persistent name. If you have a persistent ULTable object from page 1, when you call openTable method from page 2 using the same persistent name, you get the exact ULtable object back with the same state as the one from page 1. If the cursor is on the nth row of the table when you leave page 1, the cursor will be still on the nth row when you get it back in page 2. It will not be "before first row".

Be careful using the persistent name on ResultSet. When there are place holders on the PreparedStatment, you need to be very careful about whether you want to give a persistent name to the ResultSet. For example, in *main.html* you have the following code:

```
var OrderStmt = Connection.prepareStatement(
"SELECT order_id, disc, quant FROM ULOrder WHERE order_id = ?",
"order_query_stmt" );

OrderStmt.setInt(1, 5000);

var OrderResultSet = OrderStmt.executeQuery( "order_query_result" );
```

Then from *insert.html*, you want the same ResultSet object, you must do the following:

```
var OrderStmt = Connection.prepareStatement(
"SELECT order_id, disc, quant FROM ULOrder WHERE order_id = ?",
"order_query_stmt" );

//OrderStmt.setInt(1, 5000); // no need to do this since both the OrderStmt
and
OrderResultSet are retrieve from "cache" without any SQL statement being
actually executed

var OrderResultSet = OrderStmt.executeQuery( "order_query_result" );
```

This OrderResultSet object contains the same result as the "order_id" set to 5000.

However, consider a different situation. You want the same PreparedStatement because you want to do the same query on the Order Table. But you want to query with an order ID other than 5000. In this case, you can assign a persistent name to the PreparedStatement, but you don't need a persistent name on the ResultSet. Since the order id is different this time, the result set will be different from the previous one. In *main.html*, you still do the following:

```
var OrderStmt = Connection.prepareStatement(
"SELECT order_id, disc, quant FROM ULOrder WHERE order_id = ?",
"order_query_stmt" ); // with persistent name

OrderStmt.setInt(1, 5000);

var OrderResultSet = OrderStmt.executeQuery( null ); // notice here, no
persistent name
```

In *insert.html*, you do the following to get a new ResultSet:

```
var OrderStmt = Connection.prepareStatement(
"SELECT order_id, disc, quant FROM ULOrder WHERE order_id = ?",
"order_query_stmt" ); // get the prepared statement from memory with
persistent name

OrderStmt.setInt(1, 6000); // set a different place holder value

var OrderResultSet = OrderStmt.executeQuery( null ); // a real query is
executed
here!
```

In the example above, since the place holder value is different, or some other operation is performed on the Order table that you expect the returned result set will be different, you do not use persistent name on the ResultSet when calling executeQuery.

Database encryption and obfuscation

You can encrypt or obfuscate your UltraLite database using UltraLite for M-Business Anywhere.

For more information about database encryption, see "UltraLite security considerations" [*UltraLite - Database Management and Reference*].

Encryption

UltraLite databases may be unencrypted or may employ either encryption or obfuscation. If you want the database to be encrypted or obfuscated that choice must be made when the database is created.

Encryption of an UltraLite database uses extremely strong industry-standard techniques to encrypt the data in the database. The encryption is based on a key phrase that is specified when the database is created. This key phrase must also be supplied when a connection is made to the database.

If an UltraLite database is encrypted, all connections to that database must specify the correct encryption key or the connection attempt fails.

For more information about the EncryptionKey property, see " ConnectionParms class" on page 66 and " changeEncryptionKey method" on page 59.

Obfuscation

Obfuscation is a very weak form of encryption that simply masks the data in the database to discourage casual observation of the contents of the database by file or disk viewer programs. To obfuscate the database, set the creationParms.obfuscate boolean value to true. For example:

```
var create_parms = dbMgr.createCreationParms();
create_parms.obfuscate = true;
```

Example

You can change the encryption key by specifying a new encryption key on the Connection object. Before calling the changeEncryptionKey method, the application must make a connection to the encrypted database using the existing encryption key. In the following example code, "apricot" is the new encryption key.

```
conn.changeEncryptionKey("apricot")
```

Working with data using SQL

UltraLite applications can access table data using SQL or the Table API. This section describes data access using SQL.

For information about the Table API, see "Working with data using the table API" on page 20.

This section explains how to perform the following tasks using SQL.

- ♦ Inserting, deleting, and updating rows.
- ♦ Executing a query.
- ♦ Scrolling through the rows of a result set.

This section does not describe the SQL language itself. For more information about SQL features, see SQL Anywhere Server - SQL Reference [*SQL Anywhere Server - SQL Reference*].

Data manipulation: INSERT, UPDATE and DELETE

With UltraLite, you can perform SQL Data Manipulation Language operations and DDL operations. These operations are performed using the ExecuteStatement method, a member of the PreparedStatement class.

For more information the PreparedStatement class, see " PreparedStatement class" on page 81.

Parameter markers in prepared statements
UltraLite handles variable values using the ? parameter marker. For any INSERT, UPDATE or DELETE, each ? is referenced according to its ordinal position in the prepared statement. For example, the first ? is referred to as 1, and the second as 2.

♦ To insert a row

1. Declare a PreparedStatement object.

```
var PrepStmt;
```

2. Assign an INSERT statement to your prepared statement object. In the following, TableName and ColumnName are the names of a table and column.

```
PrepStmt = conn.prepareStatement(
    "INSERT into TableName(ColumnName) values (?)", null );
```

   The null parameter indicates that the statement has no persistent name.

3. Assign parameter values to the statement.

```
var NewValue;
NewValue = "Bob";
PrepStmt.setStringParameter(1, NewValue);
```

4. Execute the statement.

```
PrepStmt.executeStatement( null );
```

♦ To update a row

1. Declare a PreparedStatement object.

   ```
   var PrepStmt;
   ```

2. Assign an UPDATE statement to your prepared statement object. In the following, TableName and ColumnName are the names of a table and column.

   ```
   PrepStmt = conn.prepareStatement(
     "UPDATE TableName SET ColumnName = ? WHERE ID = ?", null);
   ```

   The null parameter indicates that the statement has no persistent name.

3. Assign parameter values to the statement using methods appropriate for the data type.

   ```
   var NewValue;
   NewValue = "Bob";
   PrepStmt.setStringParameter(1, NewValue);
   PrepStmt.setIntParameter(2, 6);
   ```

4. Execute the statement

   ```
   PrepStmt.executeStatement( );
   ```

♦ To delete a row

1. Declare a PreparedStatement object.

   ```
   var PrepStmt;
   ```

2. Assign a DELETE statement to your prepared statement object.

   ```
   PrepStmt = conn.prepareStatement(
       "DELETE FROM customer WHERE ID = ?", null );
   ```

   The null parameter indicates that the statement has no persistent name.

3. Assign parameter values for the statement.

   ```
   var IDValue;
   IDValue = 6;
   PrepStmt.setIntParameter( 1, IDValue );
   ```

4. Execute the statement.

   ```
   PrepStmt.executeStatement( );
   ```

Data retrieval: SELECT

When you execute a SELECT statement, the PreparedStatement.executeQuery method returns a ResultSet object. The ResultSet class contains methods for navigating within a result set and methods to update data using the ResultSet.

For more information about ResultSet objects, see “ ResultSet class” on page 91.

Example

In the following code, the results of a query are accessed as a ResultSet. When first assigned, the ResultSet is positioned before the first row. The ResultSet.moveFirst method is then called to navigate to the first record in the result set.

```
var MyResultSet;
var PrepStmt;
PrepStmt = conn.prepareStatement("SELECT ID, Name FROM customer", null );
MyResultSet = PrepStmt.executeQuery( null );
MyResultSet.moveFirst();
```

Example

The following code demonstrates how to obtain column values for the current row. The example uses character data; similar methods are available for other data types.

The getString method uses the following syntax: MyResultSetName.getString(*Index*) where *Index* is the ordinal position of the column name in your SELECT statement.

```
if ( MyResultSet.getRowCount() == 0 ) {
} else {
  alert( MyResultSet.getString(1) );
  alert( MyResultSet.getString(2) );
  MyResultSet.moveRelative(0);
}
```

For more information about navigating a result set, see “Navigation with SQL” on page 19.

The following procedure uses a SELECT statement to retrieve information from the database. The results of the query are assigned to a ResultSet object.

♦ To perform a select statement

1. Declare a PreparedStatement object.

   ```
   var OrderStmt;
   ```

2. Assign a prepared statement to your PreparedStatement object.

   ```
   OrderStmt = Connection.prepareStatement(
      "SELECT order_id, disc, quant, notes, status, c.cust_id,
      cust_name, p.prod_id, prod_name, price
     FROM ULOrder o, ULCustomer c, ULProduct p
     WHERE o.cust_id = c.cust_id
     AND o.prod_id = p.prod_id
     ORDER BY der_id", "order_query_stmt" );
   ```

   The second parameter is a persistent name that provides cross-page JavaScript object persistence.

3. Execute the query.

   ```
   OrderResultSet = OrderStmt.executeQuery( "order_query" );
   ```

For more information on how to use queries, see the CustDB sample code in *samples-dir \UltraLiteForMBusinessAnywhere\CustDB\custdb.js*.

Navigation with SQL

UltraLite for M-Business Anywhere provides you with a number of methods to navigate a result set to perform a wide range of navigation tasks.

The following methods of the ResultSet object allow you to navigate your result set:

- **moveAfterLast** moves to a position after the last row.
- **moveBeforeFirst** moves to a position before the first row.
- **moveFirst** moves to the first row.
- **moveLast** moves to the last row.
- **moveNext** moves to the next row.
- **movePrevious** moves to the previous row.
- **moveRelative** moves a certain number of rows relative to the current row. Positive index values move forward in the result set, negative index values move backward in the result set, and zero does not move the cursor. Zero is useful if you want to repopulate a row buffer.

Example

The following code fragment demonstrates how to use the moveFirst method to navigate within a result set.

```
PrepStmt = conn.prepareStatement(
    "SELECT ID, Name FROM customer", null );
MyResultSet = PrepStmt.executeQuery( null );
MyResultSet.moveFirst();
```

The same technique is used for all of the move methods.

For more information about these navigational methods, see “ ResultSet class” on page 91.

The ResultSetSchema object

The ResultSet.schema property allows you to retrieve information about the columns in the query.

The following example demonstrates how to use ResultSetSchema to capture schema information.

```
var i;
var MySchema = rs.schema ;
for ( i = 1; i <= MySchema.columnCount; i++) {
  colname = MySchema.getColumnName(i);
  coltype = MySchema.getColumnSQLType(colname).toString();
  alert ( colname + " " + coltype );
}
```

Working with data using the table API

UltraLite applications can access table data using SQL or the Table API. This section describes data access using the Table API.

For information about SQL, see "Working with data using SQL" on page 16.

This section explains how to perform the following tasks using the Table API.

- ♦ Scrolling through the rows of a table.
- ♦ Accessing the values of the current row.
- ♦ Using find and lookup methods to locate rows in a table.
- ♦ Inserting, deleting, and updating rows.

Navigation with the Table API

UltraLite for M-Business Anywhere provides you with a number of methods to navigate a table to perform a wide range of navigation tasks.

The following methods of the ULTable object allow you to navigate your result set:

- ♦ **moveAfterLast** moves to a position after the last row.
- ♦ **moveBeforeFirst** moves to a position before the first row.
- ♦ **moveFirst** moves to the first row.
- ♦ **moveLast** moves to the last row.
- ♦ **moveNext** moves to the next row.
- ♦ **movePrevious** moves to the previous row.
- ♦ **moveRelative** moves a certain number of rows relative to the current row. Positive index values move forward in the table, negative index values move backward in the table, and zero does not move the cursor. Zero is useful if you want to repopulate a row buffer.

Example

The following code opens the customer table and scrolls through its rows. It then displays an alert with the last name of each customer.

```
var tCustomer;
tCustomer = conn.getTable( "customer", null );
tCustomer.open();
tCustomer.moveBeforeFirst();
While (tCustomer.moveNext()) {
  alert( tCustomer.getString(3) );
}
```

Specifying an index

You expose the rows of the table to the application when you open the table object. By default, the rows are exposed in order by primary key value, but you can specify an index to access the rows in a particular order.

Example

The following code moves to the first row of the customer table as ordered by the ix_name index.

```
tCustomer = conn.getTable("customer", null );
tCustomer.openWithIndex("ix_name");
tCustomer.moveFirst();
```

Accessing the values of the current row

At any time, a ULTable object is positioned at one of the following places.

- Before the first row of the table.
- On a row of the table.
- After the last row of the table.

If the ULTable object is positioned on a row, you can use one of the ULTable get methods to get the value of each column for the current row.

Example

The following code fragment retrieves the value of three columns from the tCustomer ULTable object, and displays them in text boxes.

```
var colID, colFirstName, colLastName;
colID = tCustomer.schema.getColumnID( "id" );
colFirstName = tCustomer.schema.getColumnID( "fname" );
colLastName = tCustomer.schema.getColumnID( "lname" );
alert( tCustomer.getInt( colID ) );
alert( tCustomer.getString( colFirstName ) );
alert( tCustomer.getString( colLastName ) );
```

You can also use methods of ULTable to set values.

```
tCustomer.setString( colLastName, "Kaminski" );
```

By assigning values to these properties you do not alter the value of the data in the database.

You can assign values to the properties even if you are before the first row or after the last row of the table. You cannot, however, get values from the column. For example, the following code fragment generates an error.

```
tCustomer.moveBeforeFirst();
id = tCustomer.getInt( colID );
```

Searching rows with find and lookup

UltraLite has several modes of operation for working with data. Two of these modes, the find and lookup modes, are used for searching. The ULTable object has methods corresponding to these modes for locating particular rows in a table.

Note
The columns searched using Find and Lookup methods must be in the index used to open the table.

- **Find methods** move to the first row that exactly matches a specified search value, under the sort order specified when the ULTable object was opened.

  For more information about find methods, see " ULTable class" on page 146.

- **Lookup methods** move to the first row that matches or is greater than a specified search value, under the sort order specified when the ULTable object was opened.

  For more information about lookup methods, see " ULTable class" on page 146.

♦ To search for a row

1. Enter find or lookup mode.

   Call the FindBegin or LookupBegin method. For example, the following code fragment calls ULTable.findBegin.

   ```
   tCustomer.findBegin();
   ```

2. Set the search values.

   You do this by setting values in the current row. Setting these values affects the buffer, not the database. For example, the following code fragment sets the last name column in the buffer to Kaminski.

   ```
   tCustomer.setString(3, "Kaminski" );
   ```

   For multi-column indexes, a value for the first column is required, but you can omit the other columns.

3. Search for the row.

   Use the appropriate method to carry out the search. For example, the following instruction looks for the first row that exactly matches the specified value in the current index.

   ```
   tCustomer.findFirst();
   ```

Inserting, updating, and deleting rows

UltraLite exposes the rows in a table to your application one at a time. The ULTable object has a current position, which may be on a row, before the first row, or after the last row of the table.

When your application changes location, UltraLite makes a copy of the row in a buffer. Any operations to get or set values affect only the copy of data in this buffer. They do not affect the data in the database.

Example

The following statement changes the value of the first column in the buffer to 3.

```
tCustomer.setInt( 1 , 3 );
```

Using UltraLite modes

The UltraLite mode determines the purpose for which the values in the buffer will be used. UltraLite has the following four modes of operation, in addition to a default mode.

- ♦ **Insert mode** The data in the buffer is added to the table as a new row when the ULTable.insert method is called.
- ♦ **Update mode** The data in the buffer replaces the current row when the ULTable.update method is called.
- ♦ **Find mode** Used to locate a row whose value exactly matches the data in the buffer when one of the ULTable.find methods is called.
- ♦ **Lookup mode** Used to locate a row whose value matches or is greater than the data in the buffer when one of the ULTable.lookup methods is called.

♦ To update a row

1. Move to the row you want to update.

   You can move to a row by scrolling through the table or by searching using Find and Lookup methods.

2. Enter Update mode.

   For example, the following instruction enters Update mode on the table tCustomer.

   ```
   tCustomer.updateBegin();
   ```

3. Set the new values for the row to be updated.

   For example, the following instruction sets the new value to Elizabeth.

   ```
   tCustomer.setString( 2, "Elizabeth" );
   ```

4. Execute the Update.

   ```
   tCustomer.update();
   ```

After the update operation, the current row is the row that was just updated. If you changed the value of a column in the index specified when the ULTable object was opened, the current position is undefined.

By default, UltraLite operates in AutoCommit mode, so that the update is immediately applied to the row in permanent storage. If you have disabled AutoCommit mode, the update is not applied until you execute a commit operation. For more information about AutoCommit mode, see “Managing transactions” on page 25.

Caution
Do not update the primary key of a row: delete the row and add a new row instead.

Inserting rows

The steps to insert a row are similar to those for updating rows, except that there is no need to locate any particular row in the table before carrying out the insert operation. Rows are automatically sorted by the index specified when opening the table.

♦ To insert a row

1. Enter Insert mode.

   For example, the following instruction enters Insert mode on the table CustomerTable.

   ```
   tCustomer.insertBegin();
   ```

2. Set the values for the new row.

   If you do not set a value for one of the columns, and that column has a default, the default value is used. If the column has no default, NULL is used. If the column does not allow NULL, the following defaults are used:

   ♦ For numeric columns, zero.

   ♦ For character columns, an empty string.

   To set a value to NULL explicitly, use the setNull method.

   ```
   colID = tCustomer.schema.getColumnID( "id" );
   colFirstName = tCustomer.schema.getColumnID( "fname" );
   colLastName = tCustomer.schema.getColumnID( "lname" );
   tCustomer.setInt( colID, 42 );
   tCustomer.setString( colFirstName, "Mitch" );
   tCustomer.setString( colLastName, "McLeod" );
   ```

3. Execute the insertion.

   The inserted row is permanently saved to the database when a Commit is carried out. In AutoCommit mode, a Commit is carried out as part of the Insert method.

   ```
   tCustomer.insert();
   ```

Deleting rows

There is no delete mode corresponding to the insert or update modes.

The following procedure deletes a row.

♦ To delete a row

1. Move to the row you want to delete.

2. Execute the delete:

   ```
   tCustomer.deleteRow();
   ```

Working with BLOB data

You can fetch BLOB data for columns declared BINARY or LONG BINARY using the GetByteChunk method.

See “ getStringChunk method” on page 155.

Managing transactions

UltraLite provides transaction processing to ensure the integrity of the data in your database. A transaction is a logical unit of work. Either the entire transaction is executed, or none of the statements in the transaction are executed.

By default, UltraLite operates in AutoCommit mode. In AutoCommit mode, each insert, update, or delete is executed as a separate transaction. Once the operation is completed, the change is made to the database.

If you set the Connection.AutoCommit property to false, you can use multi-statement transactions. For example, if your application transfers money between two accounts, the deduction from the source account and the addition to the destination account constitute a single transaction.

If AutoCommit is false, you must execute a Connection.commit statement to complete a transaction and make changes to your database permanent, or you may execute a Connection.rollback statement to cancel all the operations of a transaction. Turning AutoCommit off improves performance.

Note
Synchronization causes a Commit even if you have AutoCommit set to False.

Accessing schema information

Each Connection, ULTable, and ResultSet object contains a schema property. These schema objects provide information about the tables, columns, indexes, and publications in a database.

- **DatabaseSchema** The number and names of the tables in the database, as well as global properties such as the format of dates and times.

  To obtain a DatabaseSchema object, access the Connection.databaseSchema property.

- **TableSchema** The number and names of columns in the table, as well as the Indexes collections for the table.

  To obtain a TableSchema object, access the ULTable.schema property.

- **IndexSchema** Information about the column, or columns, in the index. As an index has no data directly associated with it, there is no separate Index object, only a IndexSchema object.

  The IndexSchema objects are accessed using the TableSchema.getIndex method.

- **PublicationSchema** The numbers and names of tables and columns contained in a publication. Publications are also comprised of schema only, so there is a PublicationSchema object but no Publication object.

  The PublicationSchema objects are accessible using the DatabaseSchema.getPublicationSchema method.

- **ResultSetSchema** The number and names of the columns in a result set.

  The ResultSetSchema objects are accessible using the PreparedStatement.getResultSetSchema method or the ResultSet.schema property.

Handling errors

In normal operation, UltraLite for M-Business Anywhere can throw errors that are intended to be caught and handled in the script environment. See “ SQLError class” on page 111.

Errors are expressed as SQLCODE values, negative numbers indicating the particular kind of error.

UltraLite for M-Business Anywhere throws errors only from the DatabaseManager and Connection objects. The following methods of DatabaseManager can throw errors.

- createDatabase
- dropDatabase
- openConnection

All other errors and exceptions within UltraLite for M-Business Anywhere are routed through the Connection object.

You can access error numbers from DatabaseManager and Connection objects. See:

- “ Connection class” on page 58
- “ DatabaseManager class” on page 70

Authenticating users

New users have to be added from an existing connection. As all UltraLite databases are created with a default user ID and password of DBA and sql, respectively, you must first connect as this initial user.

You cannot change a user ID: you add a user and delete an existing user. A maximum of four user IDs are permitted for each UltraLite database.

For more information about granting or revoking connection authority, see “ grantConnectTo method” on page 62 and “ revokeConnectFrom method” on page 63.

♦ To add a user or change the password for an existing user

1. Connect to the database as an existing user.
2. Grant the user connection authority with the desired password.

```
conn.grantConnectTo("Robert", "newPassword");
```

♦ To delete an existing user

1. Connect to the database as an existing user.
2. Revoke the user's connection authority as follows.

```
conn.revokeConnectFrom("Robert");
```

Synchronizing data

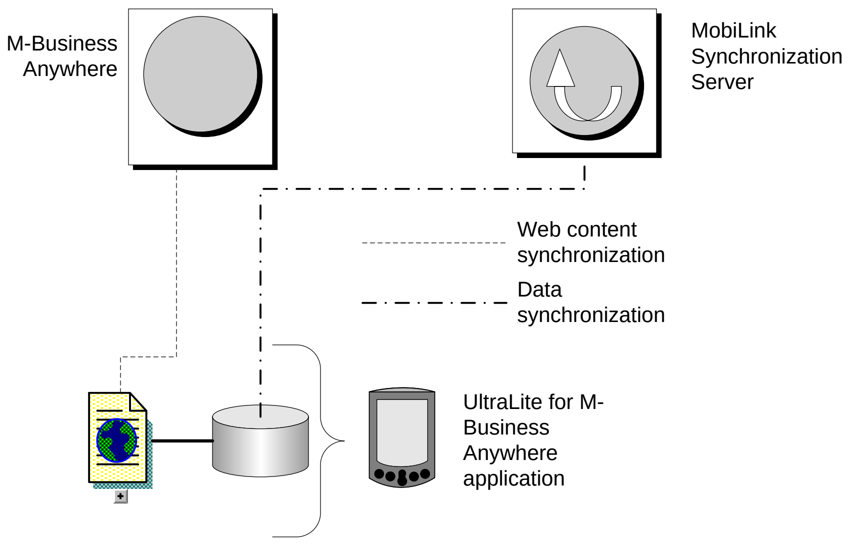
UltraLite for M-Business Anywhere applications typically involve two kinds of synchronization:

- **Web content synchronization** Web content, including HTML pages that define the application itself, is synchronized through M-Business Anywhere.
- **Data synchronization** The UltraLite database is synchronized with a MobiLink server.

Although these two kinds of synchronization are distinct, you can initiate them together in a technique called **one-button synchronization**. One-button synchronization is the recommended model for most applications, but as there may be cases where it is necessary to keep synchronization of data and web content entirely separate, that technique is discussed below.

One-button synchronization

One-button synchronization is a technique for initiating web content synchronization (using M-Business Anywhere) and UltraLite data synchronization (using MobiLink) in a single operation. It is available on Windows CE and Windows only. The architecture of one-button synchronization is as follows:


M-Business Anywhere
MobiLink Synchronization Server
Web content synchronization
Data synchronization
UltraLite for M-Business Anywhere application

The sequence of events in one button synchronization is as follows:

1. The user synchronizes their web application, perhaps by placing it in the cradle.
2. The M-Business Client synchronizes the web content.
3. The MBConnect component of M-Business Client calls the *ulconnect.exe* application.
4. *ulconnect.exe* initiates synchronization of the UltraLite database.
5. Data is synchronized with MobiLink.

To implement one-button synchronization you must carry out the following steps:

1. In your application, set the synchronization parameters for MobiLink synchronization.

   If you are synchronizing through M-Business Anywhere you can use the SyncParms.setMBAServer method to set the host and port synchronization parameters. See " setMBAServer method" on page 126.

   Otherwise, use the standard methods to set synchronization parameters. See " SyncParms class" on page 121.

2. Save the synchronization parameters so that they can be read by *ulconnect.exe*.

   Call the Connection.saveSyncParms method to save the synchronization parameters. See " saveSyncParms method" on page 64.

Synchronizing data

For most users it is useful to use one-button synchronization, which initiates both data synchronization and web content synchronization. For more information, see "One-button synchronization" on page 29.

This section is for those users who want to synchronize data separately from web content synchronization.

Synchronization requires the MobiLink server and appropriate licensing. You can find a working example of synchronization in the CustDB sample application.

UltraLite for M-Business Anywhere supports TCP/IP, HTTP, HTTPS, and HotSync synchronization. Synchronization is initiated by the UltraLite application. In all cases, you use methods and properties of the Connection object to control 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*].

♦ To synchronize over TCP/IP or HTTP

1. Prepare the synchronization information.

   Assign values to the required properties of the Connection.syncParms object.

   For more information about the properties and the values that you should set, see "UltraLite Clients" [*MobiLink - Client Administration*].

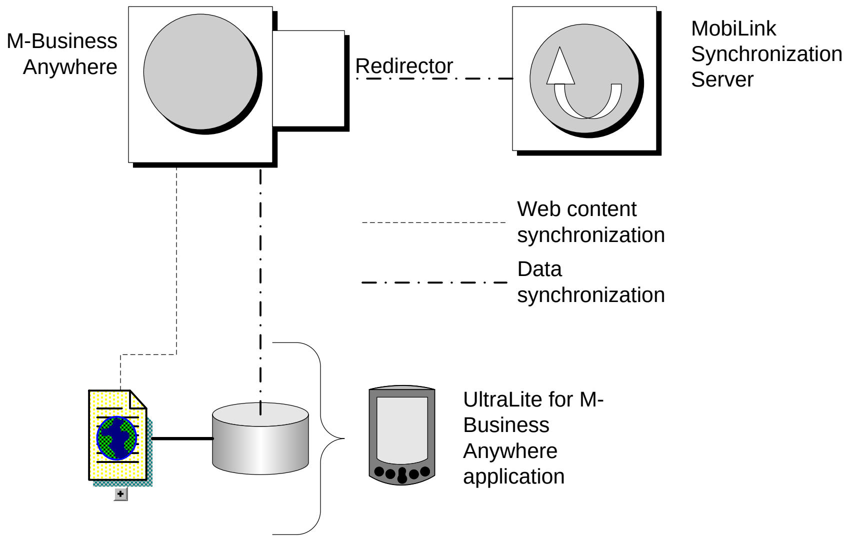
2. Synchronize.

   Call the Connection.synchronize method.

Synchronizing data via M-Business Anywhere

Whether you use one-button synchronization or separate data synchronization, you can use a MobiLink Redirector to configure your M-Business Anywhere server to route data to and from a MobiLink server. For synchronization from outside the firewall, this reduces the number of ports that need to be externally accessible.

The following diagram illustrates the architecture for the case of one-button synchronization.


M-Business Anywhere
Redirector
MobiLink Synchronization Server
Web content synchronization
Data synchronization
UltraLite for M-Business Anywhere application

♦ To synchronize data via M-Business Anywhere

1. At the server side, set up a MobiLink Redirector to route data between M-Business Anywhere and your MobiLink server. See "M-Business Anywhere Redirector" [*MobiLink - Server Administration*].

2. In your client, set synchronization parameters so that UltraLite synchronization is directed to the host and port number of M-Business Anywhere. You can use the SyncParms.setMBAServer method to carry out this task. See " setMBAServer method" on page 126.

3. From a client application, initiate synchronization using either one-button synchronization or separate data synchronization. See:

   - "One-button synchronization" on page 29
   - "Synchronizing data" on page 30

Deploying UltraLite for M-Business Anywhere applications

When you have completed your application or when you want to test your application, you need to deploy it to a device. This section outlines the steps needed to deploy an UltraLite application to a device.

Deploying applications to Windows CE and Windows desktops

You must carry out the following steps to deploy an UltraLite application to a Windows CE device:

♦ Deploy your application and UltraLite component. See "UltraLite for M-Business Anywhere Quick Start" on page 6.

♦ Deploy an initial copy of the UltraLite database. See "UltraLite for M-Business Anywhere Quick Start" on page 6.

  In many situations it is sufficient to deploy an UltraLite database. You can use synchronization to load an initial copy of the data.

  You must place the database so that it can be located by the application. The Database On CE connection parameter defines the location for Windows CE. The Database on Desktop connection parameter defines the location for Windows. See:

  ♦ "UltraLite CE_FILE connection parameter" [*UltraLite - Database Management and Reference*]
  ♦ "UltraLite DBF connection parameter" [*UltraLite - Database Management and Reference*].

Deploying applications that use one-button synchronization

One-button synchronization requires a set of files, including: *ulconnect.exe*,*ulconnect.udb*,*ulpod10.dll*, and *ulrt10.dll*. For Windows CE, these files are located in file ulpod.cab in the directory *install-dir\ultralite \UltraLiteForMBusinessAnywhere\ce\arm\*. When you deploy the cab file to a Windows CE device, it installs its contents in the proper locations automatically. For Windows, the required files must be deployed manually from the directory *install-dir\ultralite\UltraLiteForMBusinessAnywhere\win32\386\*.

Deploying applications to Palm OS

You must carry out the following steps to deploy an UltraLite application to a Palm OS device:

♦ Deploy your application and UltraLite component. See "UltraLite for M-Business Anywhere Quick Start" on page 6.

♦ Deploy an initial copy of the UltraLite database. See "UltraLite for M-Business Anywhere Quick Start" on page 6.

  In many situations it is sufficient to deploy an appropriately initialized UltraLite database file only. You can then use synchronization to load an initial copy of the data.

You can create *.pdb* files for deployment to Palm OS from any of the UltraLite utilities, including ulxml and ulinit.

You must supply a database using the correct creator ID, so that it can be located by your application. The Database On Palm connection parameter uses the creator ID to find the database. See "UltraLite PALM_FILE connection parameter" [*UltraLite - Database Management and Reference*].

- Deploy the MobiLink synchronization conduit for HotSync.

  This step is required only if the application is synchronizing using HotSync. See "HotSync on Palm OS" [*MobiLink - Client Administration*].

CHAPTER 3

Tutorial: A Sample Application for M-Business Anywhere

Contents

Introduction to M-Business Anywhere development tutorial

This tutorial describes how to build a cross-platform UltraLite application. At the end of the tutorial you will have an application and small database that synchronizes with a central consolidated database.

Timing

The tutorial takes about 30 minutes if you copy and paste the code. If you enter the code yourself, it takes significantly longer.

Prerequisites

This tutorial assumes that you have M-Business Anywhere installed on your computer and that your machine has a web server that you can use to deliver files.

You must also have access to an M-Business Client to test and run the application.

The tutorial assumes a basic familiarity with JavaScript programming language and M-Business Anywhere application development.

The tutorial also assumes that you know how to create an UltraLite database using either UltraLite in Sybase Central, or the ulcreate UltraLite utility.

See also

- “Creating an UltraLite database from Sybase Central” [*UltraLite - Database Management and Reference*]
- “Creating and Configuring UltraLite Databases” [*UltraLite - Database Management and Reference*]

Lesson 1: Create project architecture

The first lesson describes how to set up the project architecture and creating an UltraLite database for the tutorial.

♦ **To create project architecture and empty UltraLite database**

1. Create a directory for this tutorial.

   This tutorial assumes the directory is *c:\Tutorial\mbus*. If you create a directory with a different name, use that directory throughout the tutorial.

   Create the following subdirectories for platform-specific files:

   - *c:\Tutorial\mbus\PALM_OS*
   - *c:\Tutorial\mbus\WIN32_OS*
   - *c:\Tutorial\mbus\WINCE_OS*
   - *c:\Tutorial\mbus\WINCE_OS\arm*

2. Configure your web server:

   a. Map a virtual directory named tutorial on your web server to *c:\Tutorial\mbus*. The URL to access this directory will be *http://localhost/tutorial*.

      For Microsoft IIS, you can make these changes from the management tool.

      For Apache, make a symbolic link named *tutorial* from your document root to the *c:\Tutorial \mbus* directory, or copy the tutorial files into your Apache document root.

   b. Ensure that your web server delivers the following files with MIME type application/octet-stream:

      - *.cab*
      - *.dll*
      - *.prc*
      - *.pdb*
      - *.udb*

      For Microsoft IIS, you can make these changes from the management tool. Go to the virtual directory properties and make the changes under HTTP Headers and File Types.

      For Apache, edit the file *mime.types* in your *conf* directory.

3. Create a database using UltraLite in Sybase Central.

   For more information about creating a database, see "Creating an UltraLite database from Sybase Central" [*UltraLite - Database Management and Reference*].

   - **Table name** Customer
   - **Columns in Customer**

Column Name	Data Type (Size)	Column allows NULL values?	Default value
ID	integer	No	autoincrement
FName	char(15)	No	None
LName	char(20)	No	None
City	char(20)	Yes	None
Phone	char(12)	Yes	555-1234

It is usually better to use global autoincrement or UUID values for primary keys in a synchronizing environment. The autoincrement default is used here to keep the tutorial shorter.

- **Primary key** Ascending ID

4. Save the database.

   If you are developing an application for Windows or Windows CE, choose File ► Save and choose *tutcustomer.udb* in the *WINCE_OS* or the *WIN32_OS* subdirectory of your tutorial directory as the file name.

   If you are developing an application for Palm OS:

   a. From the File menu, choose Export Schema for Palm.

   b. Enter Syb3 as the creator ID.

   c. Save the file as *tutcustomer.pdb* in the *PALM_OS* subdirectory of your tutorial directory.

A note on Palm creator IDs
The creator ID is assigned to you by Palm. You can use Syb3 as your creator ID when you make sample applications. However, when you create a commercial application, you should use your own creator ID.

If you are developing a cross-platform application, save the database file in all the above locations.

Lesson 2: Create the application files

The following procedure uses the form to create a user interface. This example uses text boxes for input and output.

♦ Create the application files

1. Create the file *c:\Tutorial\mbus\main.html*.

   This file will be the main file of the application. Later in the tutorial, you will add content to the file. For now, you just set it up to include a platform-specific file *ul_deps.html*. Add the following content to the file:

   ```
   <html>
   <body>
   <a href="AG_DEVICEOS/ul_deps.html"></a>
   </body>
   </html>
   ```

2. Create the platform-specific files.

   Each of these files references the appropriate UltraLite runtime library and database file. Create a file *ul_deps.html* in each of the operating system subdirectories of your tutorial directory, as follows:

   ```
   <!-- PALM_OS\ul_deps.html -->
   <html>
     <a href="ulpod10.prc"></a>
     <a href="tutCustomer.pdb"></a>
   </html>

   <!-- WINCE_OS\ul_deps.html -->
   <html>
     <a href="AG_DEVICEPROCESSOR/ulpod10.dll"></a>
     <a href="tutCustomer.udb"></a>
   </html>

   <!-- WIN32_OS\ul_deps.html -->
   <html>
     <a href="ulpod10.dll"></a>
     <a href="tutCustomer.udb"></a>
   </html>
   ```

3. Copy the UltraLite runtime files to the tutorial directory.

   The *ul_deps.html* files require that the UltraLite runtime library and database be in the proper location relative to the tutorial directory. The database file is already in place from earlier in the tutorial. You must now copy the UltraLite runtime library into place.

   - For the Palm OS, copy *ulpod10.prc* from *install-dir\ultralite\UltraLiteForMBusinessAnywhere\palm\68k* to *c:\Tutorial\mbus\PALM_OS\*.
   - For Windows CE, copy *ulpod10.dll* from *install-dir\ultralite\UltraLiteForMBusinessAnywhere\ce\arm* to *c:\Tutorial\mbus\WINCE_OS\arm\*.
   - For Windows desktops, copy *ulpod10.dll* from *install-dir\ultralite\UltraLiteForMBusinessAnywhere\win32\386* to *c:\Tutorial\mbus\WIN32_OS\*.

All application files are now in place.

Lesson 3: Set up the M-Business Anywhere Server and Client

In this lesson you create an M-Business Anywhere user, group, and channel for your application. This information is for M-Business Anywhere 6.0.

♦ **Configure M-Business Anywhere**

1. Open the M-Business Anywhere administration console and login as the admin user.

   The default user ID is **Admin**, with an empty password.

2. Create a new user:

   Later in this tutorial, you will use the user name and password you create in this step to synchronize from an M-Business client. If you already have an M-Business client set up for this server, you may want to use a user name that already exists.

   a. Click the Users menu option in the left navigation panel and then click the Create User link. The Create New User page appears.

   b. Enter a User Name and enter the same password in the Password and Confirm Password fields. The other fields are optional. Click Create.

3. Create a group and a channel:

   a. Click the Groups heading and click New Group.

   b. Name the new group **UltraLite Samples** and click Create and Edit.

   c. Under the Web tab, click New Group Channel.

   d. Use the following settings for the channel. Make sure to substitute the correct URL for your web server:

      ♦ **Title** UltraLite Tutorial

      ♦ **Location** *http://localhost:8091/tutorial/main.html*.

        The location is the URL of the tutorial *main.html* page, as served by your web server.

      ♦ **Channel Size Limit** 1000 KB

      ♦ **Link Depth** 3

      ♦ **Allow Binary Distribution** Yes (checked).

      ♦ **Hidden** No (unchecked)

4. Add the user to the group:

   a. Click the Users heading and find the user you created in step 2.

   b. Click the User Name to show the user's properties.

c. Click Add/Remove Groups.

d. Check the _**UltraLite Samples**_ group and click Update to add the user to this group.

The user, group, and channel are now set up on M-Business Anywhere. The next step is to synchronize the content of this channel to an M-Business client. You can do this from whichever platform you want to use.

The next procedure assumes that you have an M-Business client installed. It is recommended that you click Tools ► Options and set the client options to Show JavaScript Errors. This setting allows easier debugging of any errors in your application.

♦ **Synchronize the channel for your device**

- Synchronize your M-Business client with the UltraLite channel on the M-Business Anywhere Server.

  At this stage there is no content for your application, so the page appears blank.

Lesson 4: Add startup code to your application

In this lesson you add startup code to your application that connects to an UltraLite database. This requires adding HTML to the main page, and adding JavaScript logic to control the application.

♦ Add content to your application

1. Add content to *main.html*.

   Add the following form to your application's main page, *c:\Tutorial\mbus\main.html*, immediately after the <a> tag:

```
<form name="custForm">
<input type="text" name="fname" size="15"><br>
<input type="text" name="lname" size="20"><br>
<input type="text" name="city" size="20"><br>
<input type="text" name="phone" size="12"><br>
<input type="text" name="custid" size="10"><br>
<br><br>


<table>
    <tr>
  <td><input type="button"
       value="Insert" onclick="ClickInsert();">
  </td>
  <td><input type="button"
       value="Update" onclick="ClickUpdate();">
  </td>
  <td>
              <input type="button"
      value="Delete" onclick="ClickDelete();">
  </td>
    </tr>

 <tr>
  <td>
    <input type="button"
     value="Next" onclick="ClickNext();">
  </td>
  <td>
    <input type="button"
     value="Prev" onclick="ClickPrev();">
  </td>
  <td></td>
    </tr>

 <tr>
   <td colspan=3>
          <input type="button"
     value="Synchronize" onclick="ClickSync();">
   </td>
    </tr>
</table>
</form>
```

2. Create a JavaScript file *c:\Tutorial\mbus\tutorial.js* that provides application logic.

3. Add content to the JavaScript file:

   Add the following code to the top of the file to declare the required UltraLite objects:

```
var DatabaseMgr;
var Connection;
var CustomerTable;
```

Add connection code:

```
function Connect()
{
  DatabaseMgr = CreateObject
( "iAnywhere.Data.UltraLite.DatabaseManager.Tutorial" );
  if( DatabaseMgr == null ) {
    alert( "Error, make sure POD is on device" );
    return;
  }

  var connParms = DatabaseMgr.createConnectionParms();
  var dir = DatabaseMgr.directory;

  connParms.schemaOnPalm = "tutCustomer";
  connParms.databaseOnPalm = "Syb3";

  connParms.databaseOnCE = dir + "\\tutCustomer.udb";
  connParms.databaseOnDesktop = dir + "\\tutCustomer.udb";

  connParms.userID = "DBA";
  connParms.password = "sql";

  try {
    // try to connect to an existing database
    Connection = DatabaseMgr.openConnection( connParms.ToString() );
    alert("Connected to an existing database");
  } catch( ex ) {
    if( DatabaseMgr.sqlCode !=
DatabaseMgr.SQLError.SQLE_ULTRALITE_DATABASE_NOT_FOUND ) {
      alert( ex.getMessage() );
      return;
    } else {
      try {
        // the database does not exist, create one
        Connection = DatabaseMgr.createDatabase( connParms.ToString() );
        alert("Created a new database");
      } catch( ex2 ) {
        alert( ex2.getMessage() );
        return;
      }
    }
  }
}
```

4. Use the onload event handler to connect to the database when the application is started:

   a. Import *tutorial.js* into *main.html* by adding the following line immediately before the <body> tag:

   ```
   <script src="tutorial.js"></script>
   ```

   b. Edit *main.html* and change the <body> tag to the following:

   ```
   <body onload="Connect();">
   ```

5. Test your application.

Synchronize your M-Business Client and start the application. A message box appears when your application creates the UltraLite database. Once this is working properly, you can continue to the next lesson.

Lesson 5: Add inserts to your application

This lesson shows how to fill out your application with data manipulation and navigation logic.

♦ Open the table

1. Write code to initialize the CustomerTable that represents the Customer table in your database.

   Add the following code to the end of the Connect function in *tutorial.js*:

   ```
   try {
     CustomerTable = Connection.getTable( "customer", null );
     CustomerTable.open();
   } catch( ex3 ) {
     alert("Error: " + ex3.getMessage() );
   }
   ```

2. Add variables to move data between the database and the web form.

   Add the following declarations to the top of *tutorial.js*, before the Connect function.

   ```
   var Cust_FName = "";
   var Cust_LName = "";
   var Cust_City = "";
   var Cust_Phone = "";
   var Cust_Id = "";
   ```

3. Create procedures to fetch and display customer data.

   Add the following function to *tutorial.js*, immediately after the Connect function. It fetches the current row of the customer and also ensures that NULL columns display as empty strings:

   ```
   function FetchCurrentRow()
   {
     var id;
     if( CustomerTable.getRowCount() == 0 ) {
       Cust_FName = "";
       Cust_LName = "";
       Cust_City = "";
       Cust_Phone = "";
       Cust_Id = "";
     } else {
       id = CustomerTable.schema.getColumnID("FName");
       Cust_FName = CustomerTable.getString(id);
       id = CustomerTable.schema.getColumnID("LName");
       Cust_LName = CustomerTable.getString(id);
       id = CustomerTable.schema.getColumnID("city");
       if( CustomerTable.isNull(id) ) {
         Cust_City = "";
       } else {
         Cust_City = CustomerTable.getString(id);
       }
       id = CustomerTable.schema.getColumnID("phone");
       if( CustomerTable.isNull(id) ) {
         Cust_Phone = "";
       } else {
         Cust_Phone = CustomerTable.getString(id);
       }

       id = CustomerTable.schema.getColumnID("id");
       Cust_Id = CustomerTable.getString(id);
   ```

```
    }
  }
```

Add the following JavaScript to *main.html*, immediately before the closing </body> tag. DisplayCurrentRow takes the values from the database and displays them in the web form. FetchForm takes the current values in the web form and makes them available to the database code.

```
<script>
function DisplayCurrentRow()
{
  FetchCurrentRow();
  document.custForm.fname.value = Cust_FName;
  document.custForm.lname.value = Cust_LName;
  document.custForm.city.value = Cust_City;
  document.custForm.phone.value = Cust_Phone;
  document.custForm.custid.value = Cust_Id;
}

function FetchForm()
{
  Cust_FName = document.custForm.fname.value;
  Cust_LName = document.custForm.lname.value;
  Cust_City = document.custForm.city.value;
  Cust_Phone = document.custForm.phone.value;
}
</script>
```

4. Call DisplayCurrentRow when the application is loaded.

   Modify the body tag at the top of *main.html* as follows:

```
<body onload="Connect(); DisplayCurrentRow();">
```

Although there is no data in your database and no rows are displayed, this is a good place to synchronize M-Business Client to ensure that you have not introduced bugs.

♦ Add code to insert rows

- Write code to implement the Insert button.

  In the following procedure, the call to InsertBegin puts the application into insert mode and sets all values in the current row to their defaults. For example, the ID column receives the next autoincrement value. The column values are set and the new row is inserted.

  Add the following function to *tutorial.js*, immediately after FetchCurrentRow:

```
function Insert()
{
  var id;

  try {
    CustomerTable.insertBegin();
    id = CustomerTable.schema.getColumnID("FName");
    CustomerTable.setString(id, Cust_FName);
    id = CustomerTable.schema.getColumnID("LName");
    CustomerTable.setString(id, Cust_LName);
    id = CustomerTable.schema.getColumnID("city");
    if( Cust_City.length > 0 ) {
      CustomerTable.setString(id, Cust_City);
    }
```

```
        id = CustomerTable.schema.getColumnID("phone");
        if( Cust_Phone.length > 0 ) {
          CustomerTable.setString(id, Cust_Phone);
        }
        CustomerTable.insert();
        CustomerTable.moveLast();
      } catch( ex ) {
        alert( "Insert error: " + ex.getMessage() );
      }
    }
```

Add the following function to *main.html*, immediately after the FetchForm function:

```
function ClickInsert()
{
  FetchForm();
  Insert();
  DisplayCurrentRow();
}
```

You can now test your application.

♦ Test your application

1. Synchronize your M-Business Client.
2. Run the application.

   After an initial message box, the form is displayed.
3. Insert two rows into the table:

   a. Enter a first name of Jane in the first text box and a last name of Doe in the second text box. Click Insert.

      A row is added to the table with these values. The application moves to the last row of the table and displays the row. The label displays the automatically incremented value of the ID column that UltraLite assigned to the row.

   b. Enter a first name of John in the first text box and a last name of Smith in the second. Click Insert.

The next step is to add navigation buttons

Lesson 6: Add navigation to your application

This lesson describes code for scrolling forward and backward through the rows of a result set.

♦ Add navigation code to your application

1. Add the MoveNext function to *tutorial.js*, immediately after the Insert function:

```
function MoveNext()
{
  if( ! CustomerTable.moveNext() ) {
    CustomerTable.moveLast();
  }
}
```

2. Add the MovePrev function to *tutorial.js*, immediately after the MoveNext function:

```
function MovePrev()
{
  if( ! CustomerTable.movePrevious() ) {
    CustomerTable.moveFirst();
  }
}
```

3. Add the following procedures to *main.html*:

```
function ClickNext()
{
  MoveNext();
  DisplayCurrentRow();
}

function ClickPrev()
{
  MovePrev();
  DisplayCurrentRow();
}
```

4. Synchronize your application and test the navigation buttons.

   When the form is first displayed, the controls are empty as the current position is before the first row. After the form is displayed, click Next and Previous to move through the rows of the table.

Lesson 7: Add updates and deletes to your application

This lesson describes code for updating and deleting rows.

♦ Add update and delete functions to your application

1. Add the Update function to *tutorial.js*:

```
function Update()
{
  var id;
  try {
    CustomerTable.updateBegin();

    id = CustomerTable.schema.getColumnID("fname");
    CustomerTable.setString(id, Cust_FName);
    id = CustomerTable.schema.getColumnID("lname");
    CustomerTable.setString(id, Cust_LName);
    id = CustomerTable.schema.getColumnID("city");
    if( Cust_City.length > 0 ) {
      CustomerTable.setString(id, Cust_City);
    } else {
      CustomerTable.setNull(id);
    }
    id = CustomerTable.schema.getColumnID("phone");
    if( Cust_Phone.length > 0 ) {
      CustomerTable.setString(id, Cust_Phone);
    } else {
      CustomerTable.setNull(id);
    }
    CustomerTable.update();
  } catch( ex ) {
    alert( "Update error: " + ex.getMessage() );
  }
}
```

2. Add the Delete function to *tutorial.js*:

```
function Delete()
{
  if( CustomerTable.getRowCount() == 0 ) {
    return;
  }
  CustomerTable.deleteRow();
  CustomerTable.moveRelative(0);
}
```

3. Add the following functions to *main.html*:

```
function ClickUpdate()
{
  FetchForm();
  Update();
  DisplayCurrentRow();
}

function ClickDelete()
{
  Delete();
  DisplayCurrentRow();
}
```

4. Synchronize your M-Business Client and run the application.

Lesson 8: Add synchronization to your application

The following procedure implements synchronization.

♦ Add a synchronization function to your application

1. Add the Synchronize function to *tutorial.js*:

   The synchronization parameters are stored in the SyncParms object. For example, the SyncParms.userName property specifies the user name for which MobiLink searches. The SyncParms.sendColumnNames property specifies that the column names are sent to MobiLink so it can generate upload and download scripts.

   This function uses a TCP/IP synchronization stream and the default network communication options (stream parameters). These default options assume that you are synchronizing from either a Windows CE client connected to the computer running the MobiLink server via ActiveSync, or from a 32-bit Windows desktop client running on the same computer as MobiLink. If this is not the case, change the synchronization stream type and set the network communication options to the appropriate values. See:

   - “ setStream method” on page 130
   - “ setStreamParms method” on page 130

   ```
   function Synchronize()
   {
     var SyncParms = Connection.syncParms;

     SyncParms.setUserName("user-name");
     SyncParms.setStream(SyncParms.STREAM_TYPE_TCPIP);
     SyncParms.setVersion("ul_default");
     SyncParms.setSendColumnNames(true);

     try {
       Connection.synchronize();
     } catch( ex ) {
       alert( "Sync error: " + ex.getMessage() );
     }
   }
   ```

2. Add the following function to *main.html*:

   ```
   function ClickSync()
   {
     window.showBusy = true;
     Synchronize();
     window.showBusy = false;
     DisplayCurrentRow();
   }
   ```

3. Synchronize your M-Business Client.

   This synchronization downloads the latest version of the application. It does not synchronize your database.

The final step in this tutorial is to synchronize your UltraLite database. The SQL Anywhere sample database has a Customer table with columns matching those in the **Customer** table in your UltraLite database. The following procedure synchronizes your database with the SQL Anywhere sample database.

♦ To synchronize your application

1. From a command prompt, start the MobiLink server by running the following command.

   ```
   mlsrv10 -c "dsn=SQL Anywhere 10 Demo" -v+ -zu+
   ```

   The -zu+ option provides automatic addition of user scripts. For more information about this option, see "MobiLink Server Options" [*MobiLink - Server Administration*].

2. In M-Business Client, click Delete repeatedly to delete all the rows in your table.

   Any rows in the table would be uploaded to the Customer table in the SQL Anywhere sample database.

3. Synchronize your application.

   Click Synchronize. The MobiLink server window displays the synchronization progress.

4. When the synchronization is complete, click Next and Previous to move through the rows of the table.

This completes the tutorial.

CHAPTER 4

UltraLite for M-Business Anywhere API Reference

Contents

Data types in UltraLite for M-Business Anywhere

JavaScript has only one numeric data type and only one Date data type.

The prototypes in this API Reference include a variety of other data types in the method and property descriptions. These types are internal M-Business Anywhere data types. Distinct numeric data types such as UInt32 (unsigned 32-bit integer) are reported here to give an idea of the size and precision of data that may be supplied. Distinct data types related to date and time (Date, Time, Timestamp) are reported so that you can write code to extract the required information from the supplied data if necessary.

AuthStatusCode class

Enumerates the status codes that may be reported during MobiLink user authentication.

This object can be obtained from DatabaseManager as follows:

```
var authStatus = dbMgr.AuthStatusCode;
```

Properties

The following constants are properties of AuthStatusCode

Constant	Value	Description
UNKNOWN	0	Authorization status is unknown, possibly because the connection has not yet performed a synchronization.
VALID	1	User ID and password were valid at time of synchronization.
VALID_BUT_EXPIRES_SOON	2	User ID and password were valid at time of synchronization but will expire soon.
EXPIRED	3	User ID or password has expired; authorization failed.
INVALID	4	Bad user ID or password; authorization failed.
IN_USE	5	User ID is already in use; authorization failed.

toString method

Generates the string name of the authorization status code constant.

Syntax

String **toString()**;

Returns

The name of the code or **unknown** if not a recognized code.

Connection class

Represents a connection to an UltraLite database.

Connections are instantiated using one of the following methods:

- DatabaseManager.openConnection
- DatabaseManager.createDatabase

You must open a connection before carrying out any other operation, and you must close the connection after you have finished all operations on the connection and before your application terminates.

You must close all tables opened on a connection before closing the connection.

When a JavaScript Error is thrown because of a failed UltraLite database operation, the SQL error code is set on the sqlCode field of the Connection object.

Properties

Prototype	Description
Boolean autoCommit	Controls whether a commit is performed after each statement (insert, update or delete). If **autoCommit** is false, a commit or rollback is performed only when the user invokes the **commit()** or **rollback()** method. By default, a database commit is performed after each successful statement. If the commit fails, you have the option to execute additional SQL statements and perform the commit again, or execute a rollback statement.
String openParms (read-only)	Gets the connection parameters string as a semicolon-separated list of name=value pairs. See "UltraLite Connection String Parameters Reference" [*UltraLite - Database Management and Reference*].
DatabaseSchema databaseSchema (read-only)	Gets the database schema. This property is valid only while its connection is open.
Boolean skipMBASync (read-write)	Controls whether the database should be synchronized during one-button synchronization (false) or whether it should be skipped (true). Default is false. See "One-button synchronization" on page 29.

Prototype	**Description**
Int32 sqlCode (read-only)	Gets the SQL Code of the last operation on this connection. The SQL Code is the standard SQL Anywhere code and is reset by any subsequent UltraLite database operation on this connection.
SyncParms syncParms (read-only)	Gets synchronization settings for this connection. See "Synchronization parameters for UltraLite" [*MobiLink - Client Administration*].
SyncResult syncResult (read-only)	Gets the results of the most recent synchronization for this connection. See "Synchronization parameters for UltraLite" [*MobiLink - Client Administration*].
INVALID_DATABASE_ID (read-only)	A constant indicating an invalid database.

changeEncryptionKey method

Changes the database encryption key to the specified new key.

Syntax

changeEncryptionKey(String *newKey***)**

Parameters

- ♦ **newKey** The new encryption key for the database.

Remarks

If the encryption key is lost, it is not possible to open the database.

close method

Closes this connection.

Syntax

close()

Remarks

Once a connection is closed, it cannot be reopened. To reopen a connection, a new connection object must be created and opened.

It is an error to use any object (a table or schema for example) associated with a closed connection.

In JavaScript, the closed connection object is not set to NULL automatically after it is closed. It is recommended that you explicitly set the connection object to NULL after closing the connection.

commit method

Commits outstanding changes to the database.

Syntax

commit()

countUploadRow method

Returns the number of rows to be uploaded when the next synchronization takes place.

Syntax

UInt32 **countUploadRow(** UInt32 *mask*, UInt32 *threshold***)**

Parameters

- **mask** Set of publications to check.

  See PublicationSchema class.

- **threshold** Value that determines the maximum number of rows to count, and so limits the amount of time taken by the call. A value of 0 corresponds to the maximum limit. A value of 1 determines if any rows need to be synchronized. **threshold** must be in range **[0,0x0ffffffff]**.

getDatabaseID method

Gets the current Database ID value, as set by setDatabaseID().

Syntax

UInt32 **getDatabaseID( )**

Remarks

If the value has not been set, the constant Connection.INVALID_DATABASE_ID is returned.

getGlobalAutoIncrementUsage method

Returns the percentage of available global autoincrement values that have been used.

Syntax

UInt16 **getGlobalAutoIncrementUsage( )**

Remarks

If the percentage approaches 100, your application should set a new value for the global database ID using the **setDatabaseID**.

getLastDownloadTime method

Returns the timestamp of the most recent download.

Syntax

Date **getLastDownloadTime(** UInt32 *mask* **)**

Parameters

- **mask** A set of publications to check.

Remarks

The parameter mask must reference a single publication or be the special constant PublicationSchema.SYNC_ALL_DB for the time of the last download of the full database.

See also

- “ PublicationSchema class” on page 90

getLastIdentity method

Returns the most recent identity value used.

Syntax

UInt64 **getLastIdentity()**

Remarks

This function is equivalent to the following SQL statement:

```
SELECT @@identity
```

The function is particularly useful in the context of global autoincrement columns. 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.

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 so as to avoid this situation.

getNewUUID method

Returns a new UUID value.

Syntax

UUID **getNewUUID()**

getTable method

Creates and returns a reference to the requested table in the database.

Syntax

Table **getTable(**String *name*, String *persistName* **)**

Parameters

- ♦ **name** Name of the table to fetch.
- ♦ **persistName** The name for cross-page JavaScript object persistence. Set to null if no persistence is required (for example, if the application has only a single HTML page).

grantConnectTo method

Grants access to an UltraLite database for a user ID with a specified password.

Syntax

grantConnectTo(String *uid*, String *pwd***)**

Parameters

- ♦ **uid** User ID to grant access to. The maximum length is 16 characters.
- ♦ **pwd** The password for the user ID.

Remarks

If an existing user ID is specified, this function updates the password for the user. UltraLite supports a maximum of 4 users.

isOpen method

Returns true if the connection is open, false otherwise.

Syntax

Boolean **isOpen()**;

prepareStatement method

Pre-compiles and stores into a PreparedStatement object a SQL statement with or without IN parameters.

Syntax

PreparedStatement **prepareStatement(**String *sql*, String *persistName***)**

Parameters

- ♦ **sql** A SQL statement that may contain one or more '?' IN parameter placeholder.

- **persistName** The name for cross-page JavaScript object persistence. Set to null if no persistence is required (for example, if the application has only a single HTML page).

Remarks

This object can be used to efficiently execute the SQL statement multiple times.

resetLastDownloadTime method

Resets the time of the most recent download.

Syntax

resetLastDownloadTime(UInt32 *mask***)**

Parameters

- **mask** Set of publications to reset.

revokeConnectFrom method

Revokes access to an UltraLite database for a specified user ID.

Syntax

revokeConnectFrom(String *uid* **)**

Parameters

- **uid** User ID to be excluded from database access. The maximum length is 16 characters.

rollback method

Rolls back outstanding changes to the database.

Syntax

rollback( )

rollbackPartialDownload method

Rolls back the changes from a failed synchronization.

Syntax

rollbackPartialDownload( )

Remarks

When a communication error occurs during the download phase of synchronization, UltraLite can apply the downloaded changes, so that the synchronization can be resumed from the place it was interrupted. If the download changes are not needed (the user or application does not want to resume the download at this point), RollbackPartialDownload rolls back the failed download transaction.

saveSyncParms method

Saves the synchronization parameters for use by HotSync or for use during one-button synchronization.

Syntax

saveSyncParms( )

Remarks

Do not confuse the saveSyncParms method with the Connection.SyncParms property. The SyncParms property is used to define the synchronization parameters for this connection. The setSyncParms method just saves these parameters so that HotSync can use them.

See also

- "One-button synchronization" on page 29

setDatabaseID method

Sets the database ID value to be used for global autoincrement columns.

Syntax

setDatabaseID(UInt32 *value* **)**

Parameters

- **value** Database ID value. **value** must be in range **[0,0x0fffffff]**.

startSynchronizationDelete method

Marks for synchronization all subsequent deletes made by this connection.

Syntax

startSynchronizationDelete( )

Remarks

Once this function is called, all delete operations are again synchronized.

stopSynchronizationDelete method

Prevents delete operations from being synchronized.

Syntax

stopSynchronizationDelete( )

Remarks

This is useful for deleting old information from an UltraLite database to save space, while not deleting this information on the consolidated database.

synchronize method

Synchronizes the database using the current SyncParms object.

Syntax

synchronize( )

Remarks

A detailed result status is reported in this connection's SyncResult object. The synchronization is carried out using the synchronization properties defined in the Connection.SyncParms object for this connection.

synchronizeWithParm method

Synchronizes the database using the specified SyncParms object.

Syntax

synchronizeWithParm(SyncParms *parms***)**

Parameters

- **parms** The SyncParms object to use for this synchronization.

Remarks

This method makes it possible to share synchronization parameters among connections.

A detailed result status is reported in this connection's SyncResult object.

ConnectionParms class

Specifies parameters for opening a connection to an UltraLite database.

Databases are created with a single authenticated user, DBA, whose initial password is sql. By default, connections are opened using the user ID DBA and password sql. To disable the default user, use Connection.revokeConnectFrom. To add a user or change a user's password, use Connection.grantConnectTo.

Currently, only one connection can be opened at any time. Only one database may be active at a given time. Attempts to open a connection to a different database while other connections are open result in an error.

Properties

The properties of the class are listed here.

Prototype	Description
String additionalParms (read-write)	Additional parameters specified as **name**=*value* pairs separated with semicolons.
String cacheSize (read-write)	The size of the cache. CacheSize values are specified in bytes. Use the suffix k or K for kilobytes and use the suffix m or M for megabytes. The default cache size is sixteen pages. Given a default page size of 4 KB, the default cache size is 64 KB. See “UltraLite CACHE_SIZE connection parameter” [*UltraLite - Database Management and Reference*].
String connectionName (read-write)	A name for the connection. The connection name is used to share a single connection across multiple web pages. See “UltraLite CON connection parameter” [*UltraLite - Database Management and Reference*], and “Maintaining connections and application state across pages” on page 11.
String creatorIdOnPalm	The UltraLite database creator ID on the Palm device.
String databaseOnCE (read-write)	The file name of the database on Windows CE. See “UltraLite CE_FILE connection parameter” [*UltraLite - Database Management and Reference*].
String databaseOnDesktop (read-write)	The file name of the database deployed to Windows. See “UltraLite DBF connection parameter” [*UltraLite - Database Management and Reference*].
String databaseOnPalm (read-write)	The file name of the UltraLite database on Palm. See “UltraLite PALM_FILE connection parameter” [*UltraLite - Database Management and Reference*].

Prototype	Description
String databaseOnSymbian (read-write)	The file name of the UltraLite database on Symbian. See "UltraLite SYMBIAN_FILE connection parameter" [*UltraLite - Database Management and Reference*].
String encryptionKey (read-write)	A key for encrypting the database. OpenConnection must use the same key as specified during database creation. Suggestions for keys are: 1. Select an arbitrary, lengthy string 2. Select strings with a variety of numbers, letters and special characters, to decrease the chances of key penetration. See "UltraLite DBKEY connection parameter" [*UltraLite - Database Management and Reference*].
String password (read-write)	The password for an authenticated user. Databases are initially created with one authenticated user (DBA) with password *sql*. Passwords are case-insensitive if the database is case-insensitive and case-sensitive if the database is case-sensitive. The default value is *sql*. See "UltraLite PWD connection parameter" [*UltraLite - Database Management and Reference*].
String userID (read-write)	The authenticated user for the database. Databases are initially created with one authenticated user DBA. The UserID is case-insensitive. The default value is *DBA*. See "UltraLite UID connection parameter" [*UltraLite - Database Management and Reference*].

toString method

Generates the string name of the authorization status code constant.

Syntax

String **toString()**;

Returns

The name of the code or **unknown** if not a recognized code.

CreationParms class

Defines parameters that may be specified when creating an UltraLite database.

Some UltraLite database options must be set at the time the database is created. The following parameters can be supplied when creating the database using the createDatabase method. See “ createDatabase method” on page 70.

Properties

The properties of the class are listed here. For more information about the corresponding descriptions, see “Choosing creation-time database properties for UltraLite” [*UltraLite - Database Management and Reference*]

Prototype	Description
Boolean caseSensitive	Sets the case-sensitivity of string comparisons in the UltraLite database.
UInt32 checksumLevel	Sets the level of checksum validation in the database. Default is 0.
String dateFormat	Sets the default string format in which dates are retrieved from the database.
String dateOrder	Controls the interpretation of date ordering of months, days, and years.
UInt32 maxHashSize	Set the maximum number of bytes that are used to hash the UltraLite indexes. Default is 0.
UInt32 nearestCentury	Controls the interpretation of two-digit years in string-to-date conversions.
Boolean obfuscate	Controls whether or not to obfuscate data in the database. Obfuscation is a form of simple encryption.
UInt32 pageSize	Defines the database page size. Valid values are: 1024, 2048, 4096, 8192, 16384. Default is 4096.
UInt32 precision	Specifies the maximum number of digits in the result of any decimal arithmetic.
UInt32 scale	Specifies the minimum number of digits after the decimal point when an arithmetic result is truncated to the maximum precision.
String timeFormat	Sets the format for times retrieved from the database.

Prototype	Description
String timestampFormat	Determines how the timestamp is formatted in UltraLite.
String timestampIncrement	Determines how the timestamp is truncated in UltraLite.
Boolean utf8Encoding	Encodes data using the UTF-8 format, 8-bit multibyte encoding for Unicode.

DatabaseManager class

Manages connections to an UltraLite database.

You must open a connection before carrying out any other operation, and you must close the connection after you have finished all operations on the connection, and before your application terminates. You must close all tables opened on a connection before closing the connection.

Properties

The properties of the class are listed here.

Property	Description
AuthStatusCode **AuthStatusCode** (read-only)	Gets the AuthStatusCode object associated with the most recent synchronization.
String **directory** (read-only)	The directory in which M-Business Anywhere is running. On Palm OS, this property is NULL.
UInt32 **runtimeType** (read-only)	The runtime type: either the UltraLite runtime (stand alone) library or the UltraLite database engine. The value is an enum, and is one of the following: ♦ DatabaseManager.UL_STANDALONE ♦ DatabaseManager.UL_ENGINE_CLIENT
Int32 **sqlCode** (read-only)	Gets the SQL Code value associated with the most recent operation.
SQLError **SQLError** (read-only)	Gets the SQLError object.
SQLType **SQLType** (read-only)	Gets the SQLType object.
PODSUInt32 **UL_STANDALONE** (read only)	A constant indicating that the runtime type is the UltraLite runtime library.
PODSUInt32 **UL_ENGINE_CLIENT** (read-only)	A constant indicating that the runtime type is the UltraLite database engine.

createDatabase method

Creates a database and opens a connection to the database as specified by **access_parms**.

Syntax

Connection **createDatabase(**
String *access_parms* ,

PODSArray *coll_bytes*,
String *create_parms*
)

Parameters

- **access_parms** Parameters for connecting to the database. access_parms is used to specify connection parameters (including the database file name and location) and to open the connection.

  See "Connecting to an UltraLite Database" [*UltraLite - Database Management and Reference*].

- **coll_bytes** A byte array defining a database collation to use for the database to be created. A number of source files are supplied with UltraLite as JavaScript source files (.js) in *install-dir\src\ulcollations\* with file names of the form **Collation_XXXXX.js** where XXXXX represents the collation name. For example, *coll_1250LATIN2.js*.

  The .js file must be included in the main html file before the database logic. The byte array variable is defined in the .js file.

- **create_parms** Parameters for creating the database. Parameter keywords are case-insensitive, and most values are case-sensitive. create_parms is used to specify certain parameters that may be specified only at database creation.

  See "Choosing creation-time database properties for UltraLite" [*UltraLite - Database Management and Reference*].

Returns

No return value.

Remarks

If the database already exists, a SQLE_DATABASE_NOT_CREATED exception is thrown.

Only one database may be active at a given time. Attempts to open a connection to a database result in an error if there are connections open to a different database.

dropDatabase method

Deletes the specified database.

Syntax

dropDatabase(String *parms***)**

Parameters

- **parms** Parameters for identifying a database.

Remarks

parms is a semicolon-separated list of keyword=value pairs (**"param1=value1;param2=value2"**). Parameter keywords are case-insensitive, and most values are case-sensitive.

You cannot drop a database that has open connections.

getDatabaseOptions method

Syntax

Connection **openConnection(** String *parms***)**

openConnection method

Opens a connection to the database specified by **parms**.

Syntax

Connection **openConnection(** String *parms***)**

Parameters

- ♦ **parms** A String holding the parameters for opening a connection as a set of keyword=value pairs. Parameter keywords are case-insensitive, and most values are case-sensitive.

Returns

An opened connection.

Remarks

If the database does not exist, an error is thrown. You can check Connection.sqlCode within the error catching code to identify the cause of the error.

Only one database may be active at a given time. Attempts to open a connection to different database while other connections are open result in an error.

reOpenConnection method

Returns an opened Connection object.

Syntax

Connection **reOpenConnection(** String *connectionName* **)**

Parameters

- ♦ **connectionName** The name of the connection to be reopened, as specified in the ConnectionParms.connectionName property.

Returns

The method is used to maintain connections across multiple web pages.

DatabaseSchema class

Represents the schema of an UltraLite database. A **DatabaseSchema** object is attached to a connection and is only valid while that connection is open.

Constants

Constant	Description
SYNC_ALL_DB	Synchronize all tables in the database.
SYNC_ALL_PUBS	Synchronize all publications in the database.

The members of the class are listed here.

getCollationName method

Returns a string identifying the character set and sort order used in this database.

Syntax

String **getCollationName()**

getDatabaseProperty method

Returns the value of the specified database property.

Syntax

String **getDatabaseProperty(**String *name***)**

Parameters

- **name**   Name of the database property.

Remarks

Recognized properties are:

- **"date_format"**   The date format used for string conversions by the database.
- **"date_order"**   The date order used for string conversions by the database.
- **"nearest_century"**   The nearest century used for string conversions by the database.
- **"precision"**   The floating-point precision used for string conversions by the database.
- **"scale"**   The minimum number of digits after the decimal point when an arithmetic result is truncated to the maximum precision during string conversions by the database.

- **"time_format"** The time format used for string conversions by the database.
- **"timestamp_format"** The timestamp format used for string conversions by the database.
- **"timestamp_increment"** The minimum difference between two unique timestamps, in nanoseconds (1,000,000th of a second).

getDateFormat method

Returns the date format used for string conversions.

Syntax

String **getDateFormat()**

getDateOrder method

Returns the date order used for string conversions.

Syntax

String **getDateOrder()**

getNearestCentury method

Returns the nearest century used for string conversions.

Syntax

String **getNearestCentury()**

getPrecision method

Returns the floating-point precision used for string conversions.

Syntax

String **getPrecision( )**

getPublicationCount method

Returns the number of publications in the database.

Syntax

UInt16 **getPublicationCount( )**

Remarks

Publication IDs range from 1 to **getPublicationCount()**, inclusively. Publication IDs are not publication masks.

Note: Publication IDs, masks, and count may change during a schema upgrade. To correctly identify a publication, access it by name or refresh the cached IDs, masks, and counts after a schema upgrade.

getPublicationName method

Returns the name of the publication identified by the specified publication ID.

Syntax

String **getPublicationName(** UInt16 *pubID* **)**

Parameters

- ♦ **pubID** ID of the publication. **pubID** must be in range **[1,getPublicationCount]()**.

Remarks

Publication IDs are not publication masks.

Note: Publication IDs, masks, and count may change during a schema upgrade. To correctly identify a publication, access it by name or refresh the cached IDs, masks, and counts after a schema upgrade.

getPublicationSchema method

Returns the publication schema corresponding to the named publication.

Syntax

PublicationSchema **getPublicationSchema(** String *name* **)**

Parameters

- ♦ **name** Name of the publication.

getSignature method

Returns the signature of this database.

Syntax

String **getSignature( )**

getTableCount method

Returns the number of tables in the database.

Syntax

UInt16 **getTableCount( )**

Returns

The number of tables, or 0 if the connection is not open.

Remarks

Table IDs range from 1 to **getTableCount()**, inclusively.

getTableCountInPublications method

Returns the number of tables included in the specified publication mask.

Syntax

UInt16 **getTableCountInPublications(** UInt32 *mask* **)**

Parameters

- ♦ **mask** Set of publications to check.

Remarks

The count does not include tables whose names end in _nosync.

getTableName method

Returns the name of the table identified by the specified table ID.

Syntax

String **getTableName(** UInt16 *tableID***)**

Parameters

- ♦ **tableID** ID of the table. **tableID** must be in range **[1,getTableCount()]**.

Remarks

Note: Table IDs may change during a schema upgrade. To correctly identify a table, access it by name or refresh the cached IDs after a schema upgrade.

getTimeFormat method

Returns the time format used for string conversions.

Syntax

String **getTimeFormat()**

getTimestampFormat method

Returns the timestamp format used for string conversions.

Syntax

String **getTimestampFormat()**

isCaseSensitive method

Returns true if the database is case sensitive, false otherwise.

Syntax

Boolean **isCaseSensitive()**

isOpen method

Returns true if the database schema is open, false otherwise.

Syntax

Boolean **isOpen()**

IndexSchema class

Represents the schema of an UltraLite table index.

This object cannot be directly instantiated. Index schemas are created using the TableSchema.getPrimaryKey, TableSchema.getIndex and TableSchema.getOptimalIndex methods.

getColumnCount method

Returns the number of columns in this index.

Syntax

UInt16 **getColumnCount( )**

Remarks

Column IDs in indexes range from 1 to getColumnCount(), inclusively.

getColumnName method

Returns the name of the *colIDInIndex* column in this index.

Syntax

String **getColumnName(**UInt16 *colIDInIndex* **)**

Parameters

- **colIDInIndex** ID in this index of the column. colIDInIndex must be in range [1, getColumnCount()].

getName method

Returns the name of this index.

Syntax

String **getName()**

getReferencedIndexName method

Returns the name of the referenced primary index if this index is a foreign key.

Syntax

String **getReferencedIndexName()**

getReferencedTableName method

Returns the name of the referenced primary table if index is a foreign key.

Syntax

String **getReferencedTableName()**

isColumnDescending method

Returns true if column is used in descending order, false if column is used in ascending order.

Syntax

Boolean **isColumnDescending(**String *name***)**

Parameters

♦ **name** Name of the column.

isForeignKey method

Returns true if index is the foreign key, false if index is not the foreign key.

Syntax

Boolean **isForeignKey()**

Remarks

Columns in a foreign key may reference a non-null unique index of another table.

isForeignKeyCheckOnCommit method

Returns true if referential integrity is checked on commits, false if it is checked on inserts and updates.

Syntax

Boolean **isForeignKeyCheckOnCommit()**

isForeignKeyNullable method

Returns true if this foreign key is nullable, false if this foreign key is not nullable.

Syntax

Boolean **isForeignKeyNullable()**

isPrimaryKey method

Returns true if index is the primary key, false if index is not the primary key.

Syntax

Boolean **isPrimaryKey()**

Remarks

Columns in the primary key may not be null.

isUniqueIndex method

Returns true if the index is unique, false otherwise.

Syntax

Boolean **isUniqueIndex()**

Remarks

Columns in a unique index may be null.

isUniqueKey method

Returns true if index is unique key, false if index is not unique key.

Syntax

Boolean **isUniqueKey()**

Remarks

Columns in a unique key may not be null.

PreparedStatement class

Represents a pre-compiled SQL statement with or without IN parameters. Created at runtime using Connection.prepareStatement.

This object can then be used to efficiently execute this statements multiple times.

When a prepared statement is closed, all ResultSet and ResultSetSchema objects associated with it are also closed. For resource management reasons, it is preferred that you explicitly close prepared statements when you are done with them.

AppendBytesParameter method

Appends the specified subset of the specified array of bytes to the new value for the specified SQLType.LONGBINARY column.

Syntax

AppendBytesParameter(
 UInt16 *parameterID*,
 Array *value*,
 UInt32 *srcOffset*,
 UInt32 *count*
)

Parameters

- **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.
- **value** The value to append to the current new value for the parameter.
- **srcOffset** Start position in the source array.
- **count** The number of bytes to be copied.

Remarks

The bytes at position srcOffset (starting from 0) through `srcOffset+count-1` of the array **value** are appended to the value for the specified parameter. When inserting, **insertBegin** initializes the new value to the parameter's default value.

If any of the following is true, an Error with code SQLError.SQLE_INVALID_PARAMETER is thrown and the destination is not modified:

- The **value** argument is null.
- The **srcOffset** argument is negative.
- The **count** argument is negative.
- **srcOffset+count** is greater than **value.length**, the length of the source array.

AppendStringChunkParameter method

Appends the String to the new value for the specified SQLType.LONGVARCHAR.

Syntax

AppendStringChunkParameter(
  UInt16 *parameterID*,
  String *value*,
)

Parameters

- **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.
- **value** The value to append to the current new value for the parameter.

Example

The following statement appends one hundred instances of the string **XYZ** to the first parameter:

```
for ( i = 0; i < 100; i++ ){
  stmt.AppendStringChunkParameter( 1, "XYZ" );
}
```

close method

Close the prepared statement.

Syntax

close( )

Remarks

When a prepared statement is closed, all ResultSet and ResultSetSchema objects associated with it are also closed.

It is recommended that you set the preparedStatement object to null immediately after you close it.

executeQuery method

Executes a SQL SELECT statement and returns the result set.

Syntax

ResultSet **executeQuery(** String *persistName* **)**

Parameter

- **persistName** The name for cross-page JavaScript object persistence. Set to null if no persistence is required (for example, if the application has only a single HTML page).

Returns

The result set of the query, as a set of rows.

executeStatement method

Executes a statement that does not return a result set, such as a SQL INSERT, DELETE or UPDATE statement.

Syntax

Int32 **executeStatement( )**

Returns

The number of rows affected by the statement.

Remarks

If Connection.autoCommit is true, the statement commits only if one or more rows is affected by the statement.

getPlan method

Returns a string describing the access plan UltraLite will use to execute a query.

Syntax

String **getPlan( )**

Remarks

This method is intended primarily for use during development.

See also

- ♦ "Query access plans in UltraLite" [*UltraLite - Database Management and Reference*].

getResultSetSchema method

Returns the schema describing the result set of this query statement.

Syntax

ResultSetSchema **getResultSetSchema()**

hasResultSet method

Returns true if a result set is generated when this statement is executed, false if no result set is generated.

Syntax

Boolean **hasResultSet( )**

isOpen method

Returns true if the prepared statement is open, false otherwise.

Syntax

Boolean **isOpen( )**

setBooleanParameter method

Sets the value for the specified parameter using a Boolean.

Syntax

setBooleanParameter(UInt16 *parameterID*, Boolean *value* **)**

Parameters

- ♦ **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.
- ♦ **value** The new value for the parameter.

Example

The following statement sets a value for the first parameter:

```
stmt.setBooleanParameter(1, false);
```

setBytesParameter method

Sets the value for the specified parameter using an array of bytes.

Syntax

setBytesParameter(UInt16 *parameterID*, Array *value* **)**

Parameters

- ♦ **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.
- ♦ **value** The new value for the parameter.

Remarks

Suitable for columns of type SQLType.BINARY or SQLType.LONGBINARY only.

Example

The following statement sets a value for the first parameter:

```
var blob = new Array( 3 );
blob[ 0 ] = 78;
blob[ 1 ] = 0;
blob[ 2 ] = 68;
stmt.setBytesParameter( 1, blob );
```

setDateParameter method

Sets the value for the specified SQLType.DATE type parameter using a date.

Syntax

setDateParameter(UInt16 *parameterID*, Date *value* **)**

Parameters

- ♦ **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.
- ♦ **value** The new value for the parameter.

Remarks

Only the year, month, and day fields of the Date object are relevant.

Example

The following statement sets a value for the first parameter to 2004/09/27:

```
stmt.setDateParameter(
    1, new Date( 2004,9,27,0,0,0,0 )
);
```

setDoubleParameter method

Sets the value for the specified parameter using a **double**.

Syntax

setDoubleParameter(UInt16 *parameterID*, Double *value* **)**

Parameters

- ♦ **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.
- ♦ **value** The new value for the parameter.

Example

The following statement sets a value for the first parameter:

```
stmt.setDoubleParameter( 1, Number.MAX_VALUE );
```

setFloatParameter method

Sets the value for the specified SQLType.REAL parameter.

Syntax

setFloatParameter(UInt16 *parameterID*, Float *value* **)**

Parameters

- ♦ **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.
- ♦ **value** The new value for the parameter.

Example

The following statement sets a floating-point value for the first parameter:

```
stmt.setFloatParameter( 1,
    (2 - Math.pow(2,-23)) * Math.pow(2,127)
);
```

setIntParameter method

Sets the value for the specified parameter using a UInt16.

Syntax

setUInt16Parameter(UInt16 *parameterID*, UInt16 *value* **)**

Parameters

- ♦ **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.
- ♦ **value** The new value for the parameter.

Example

The following statement sets the value for the first parameter to **2147483647**:

```
stmt.setIntParameter( 1, 2147483647 );
```

setLongParameter method

Sets the value for the specified parameter.

Syntax

setLongParameter(UInt16 *parameterID*, Int64 *value* **)**

Parameters

- **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.
- **value** The new value for the parameter.

Example

The following statement sets the value for the first parameter to **9223372036854770000**:

```
stmt.setLongParameter( 1, 9223372036854770000 );
```

setNullParameter method

Sets the specified parameter to the SQL NULL value.

Syntax

setNullParameter(UInt16 *parameterID* **)**

Parameters

- **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.

setShortParameter method

Sets the value for the specified parameter.

Syntax

setUInt16Parameter(UInt16 *parameterID*, UInt16 *value* **)**

Parameters

- **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.
- **value** The new value for the parameter.

Example

The following statement sets the value for the first parameter to **32767**:

```
stmt.setShortParameter( 1, 32767 );
```

setStringParameter method

Sets the value for the specified parameter.

Syntax

setStringParameter(UInt16 *parameterID*, String *value* **)**

Parameters

- ♦ **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.
- ♦ **value** The new value for the parameter.

Example

The following statement sets the value for the first parameter to **ABC**:

```
stmt.setStringParameter( 1, "ABC" );
```

setTimeParameter method

Sets the value for the specified SQLType.TIME type parameter using a date.

Syntax

setTimeParameter(UInt16 *parameterID*, Date *value* **)**

Parameters

- ♦ **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.
- ♦ **value** The new value for the parameter.

Remarks

Only the hour, minute, and second fields of the Date object are relevant.

Example

The following statement sets a value for the first parameter to 18:02:13:0000:

```
stmt.setTimeParameter(
    1, new Date( 1966,4,1,18,2,13,0 )
);
```

setTimestampParameter method

Sets the value for the specified parameter using a **Timestamp**.

Syntax

setTimestampParameter(UInt16 *parameterID*, Date *value* **)**

Parameters

- ♦ **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.
- ♦ **value** The new value for the parameter.

Example

The following statement sets a value for the first parameter to 1966/04/01 18:02:13:0000:

```
stmt.setTimestampParameter(
    1, new Date( 1966,4,1,18,2,13,0 )
);
```

setULongParameter method

Sets the value for the specified parameter using a Double treated as an unsigned value.

Syntax

setULongParameter(UInt16 *parameterID*, UInt64 *value* **)**

Parameters

- **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.
- **value** The new value for the parameter. Uses a Double to represent the value of an unsigned 64-bit integer.

Remarks

See class Unsigned64.

Example

The following statement sets the value for the first parameter:

```
stmt.setLongParameter( 1, 9223372036854770000 * 4096 );
```

setUUIDParameter method

Sets the value for the specified parameter using a **UUID**.

Syntax

setUUIDParameter(UInt16 *parameterID*, UUID *value***)**

Parameters

- **parameterID** The ID number of the parameter. The first parameter in the result set has an ID value of one.
- **value** The new value for the parameter.

PublicationSchema class

Represents the schema of an UltraLite publication.

This class cannot be directly instantiated. Publication schemas are created using the DatabaseSchema.getPublicationSchema method.

UltraLite methods requiring a publication mask actually require a set of publications to check. A set is formed by or'ing the publication masks of individual publications. For example:

```
pub1.getMask() | pub2.getMask()
```

Two special mask values are provided by DatabaseSchema object. SYNC_ALL_DB corresponds to the entire database. SYNC_ALL_PUBS corresponds to all publications.

Publication masks may change during a schema upgrade. To correctly identify a publication, access it by name or refresh the cached masks after a schema upgrade.

getMask method

Returns the publication mask of this publication.

Syntax

UInt32 **getMask()**

Remarks

Note: Publication IDs, masks, and count may change during a schema upgrade. To correctly identify a publication, access it by name or refresh the cached masks, and counts after a schema upgrade.

getName method

Returns the name of this publication.

Syntax

String **getName()**

ResultSet class

Represents a result set in an UltraLite database. Created at runtime using PreparedStatement.executeQuery.

Properties

The properties of the class are listed here.

Property	Description
ResultSetSchema schema (read-only)	The schema of this result set. This property is only valid while its prepared statement is open.
NULL_TIMESTAMP_VAL	A constant indicating that a timestamp value is NULL.

appendBytes method

Appends the specified subset of the specified array of bytes to the new value for the specified SQLType.LONGBINARY column.

Syntax

appendBytes(
  UInt16 *columnID*,
  Array *value*,
  UInt32 *srcOffset*,
  UInt32 *count*
)

Parameters

- ♦ **columnID** The ID number of the column. The first column in the table has an ID value of one.
- ♦ **value** The new value for the column.
- ♦ **srcOffset** The value to append to the current new value for the column.
- ♦ **count** The number of bytes to be copied.

Remarks

The bytes at position srcOffset (starting from 0) through **srcOffset+count-1** of the array **value** are appended to the value for the specified column. When inserting, insertBegin initializes the new value to the column's default value. The data in the row is not actually changed until you execute an **insert**, and that change is not permanent until it is committed.

If any of the following is true, an Error with code SQLCode.SQLE_INVALID_PARAMETER is thrown and the destination is not modified:

- ♦ The **value** argument is null.

- The **srcOffset** argument is negative.
- The **count** argument is negative.
- **srcOffset+count** is greater than **value.length**, the length of the source array.

For other errors, a **SQLException** with the appropriate error code is thrown.

appendStringChunk method

Appends the specified string to the new value for the specified SQLType.LONGVARCHAR column.

Syntax

appendStringChunk(
 UInt16 *columnID*,
 String *value*
)

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Example

The following statements append one hundred instances of the string **XYZ** to the value in the first column:

```
for ( i = 0; i < 100; i++ ){
  t.AppendStringChunk( 1, "XYZ" );
}
```

close method

Frees all resources associated with this object.

Syntax

close()

deleteRow method

Deletes the current row.

Syntax

deleteRow( )

Remarks

Each deleteRow must be preceded by a call to updateBegin.

getBoolean method

Returns the value for the specified column as a Boolean.

Syntax

Boolean **getBoolean(** UInt16 *index* **)**

Parameters

- **index** The ID number of the column. The first column in the result set has an ID of one.

getBytes method

Returns the value for the specified column as an array of bytes.

Syntax

Array **getBytes(** UInt16 *index* **)**

Parameters

- **index** The ID number of the column. The first column in the result set has an ID of one.

Remarks

Only valid for columns of type SQLType.BINARY or SQLType.LONGBINARY.

getBytesSection method

Copies a subset of the contents of a specified SQLType.LONGBINARY or SQLType.BINARY column, beginning at a specified source offset, to a specified offset of the destination byte array.

Syntax

```
UInt32 getBytesSection(
  UInt16 index,
  UInt32 srcOffset,
  Array  dst,
  UInt32 dstOffset,
  UInt32 count
)
```

Parameters

index The 1-based ordinal of the column containing the binary data.

srcOffset The zero-relative offset into the source array of bytes. The source offset must be greater than or equal to 0, otherwise a SQLE_INVALID_PARAMETER error is raised. A buffer bigger than 64K is also permissible.

dst A destination array of bytes.

dstOffset The zero-relative offset into the destination array of bytes. The destination offset must be greater than or equal to 0, otherwise a SQLE_INVALID_PARAMETER error is raised. A buffer bigger than 64K is also permissible.

count The number of bytes to move. The count must be greater than or equal to 0.

Returns

The number of bytes read.

Remarks

The bytes at position `srcOffset` (starting from 0) through `srcOffset+count-1` of the source array are copied into positions dstOffset through dstOffset+count-1, respectively, of the destination array. If the end of the source value is encountered before the specified number of bytes are copied, the remainder of the destination array is left unchanged.

If any of the following is true, an error is thrown, SQLError code is set to SQLE_INVALID_PARAMETER, and the destination is not modified:

- The dst argument is null.
- The srcOffset argument is negative.
- The dstOffset argument is negative.
- The count argument is negative.
- dstOffset + count is greater than dst.length (the length of the destination array).

Errors set

SQLE_CONVERSION_ERROR This error occurs if the column data type is not BINARY or LONG BINARY.

SQLE_INVALID_PARAMETER This error occurs if the column data type is BINARY and the offset is not 0 or 1, or, the data length is less than 0.

This error also occurs if the column data type is LONG BINARY and the offset is less than 1.

getDate method

Returns the value as a Date.

Syntax

Date **getDate(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getDouble method

Returns the value as a Double.

Syntax

Double **getDouble(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getFloat method

Returns the value for the specified column.

Syntax

Float **getFloat(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getInt method

Returns the value for the specified column.

Syntax

UInt32 **getInt(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getLong method

Returns the value for the specified column.

Syntax

Int64 **getLong(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getRowCount method

Returns the number of rows in the result set.

Syntax

UInt32 **getRowCount( )**

getShort method

Returns the value as an Int16.

Syntax

Int16 **getShort(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getString method

Returns the value as a String.

Syntax

String **getString(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getStringChunk method

Copies a subset of the value for the specified SQLType.LONGVARCHAR column, starting at the specified offset, to the String object.

Syntax

String **getStringChunk(**
  UInt16 *index***,**
  UInt32 *srcOffset***,**
  UInt32 *count*
)

Parameters

- **index** The 1-based ordinal in the result set to get
- **srcOffset** The o-based start position in the string value.
- **count** The number of characters to be copied.

Returns

The string, with specified characters copied.

getTime method

Returns the value as a Date.

Syntax

Date **getTime(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getTimestamp method

Returns the value as a Date.

Syntax

Date **getTimestamp(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getULong method

Returns the value as an unsigned 64-bit integer.

Syntax

UInt64 **getULong(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getUUID method

Returns the value of the column as a UUID.

Syntax

UUID **getUUID(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

Remarks

The column must be of type SQLType.BINARY with length 16.

isBOF method

Returns **true** if the current row position is before first row, **false** otherwise.

Syntax

Boolean **isBOF( )**

isEOF method

Returns **true** if the current row position is after the last row, **false** otherwise.

Syntax

Boolean **isEOF( )**

isNull method

Returns **true** if the value is null, **false** otherwise.

Syntax

Boolean **isNull(** Uint16 *index* **)**

Parameters

index	The column index value.

isOpen method

Returns **true** if the ResultSet is open, **false** otherwise.

Syntax

Boolean **isOpen( )**

moveAfterLast method

Moves to a position after the last row of the ULResultSet.

Syntax

moveAfterLast( )

moveBeforeFirst method

Moves to a position before the first row.

Syntax

moveBeforeFirst( )

moveFirst method

Moves to the first row.

Syntax

Boolean **moveFirst( )**

Returns

True if successful.

False if unsuccessful. The method fails, for example, if there are no rows.

moveLast method

Moves to the last row.

Syntax

Boolean **moveLast( )**

Returns

True if successful.

False if unsuccessful. The method fails, for example, if there are no rows.

moveNext method

Moves to the next row.

Syntax

Boolean **moveNext( )**

Returns

True if successful.

False if unsuccessful. The method fails, for example, if there are no rows.

movePrevious method

Moves to the previous row.

Syntax

Boolean **movePrevious( )**

Returns

true if successful.

false if unsuccessful. The method fails, for example, if there are no rows.

moveRelative method

Moves a certain number of rows relative to the current row.

Syntax

Boolean **moveRelative(** Int32 *index* **)**

Parameters

index The number of rows to move. The value can be positive, negative, or zero.

Returns

true if successful.

false if unsuccessful. The method fails, for example, if there are no rows.

Remarks

Relative to the current position of the cursor in the result set, positive index values move forward in the result set, negative index values move backward in the result set and zero does not move the cursor.

setBoolean method

Sets the value for the specified column using a **boolean**.

Syntax

setBoolean(short *columnID*, boolean *value***)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an **update**, and that change is not permanent until it is committed.

setBytes method

Sets the value for the specified column using an array of **byte**s.

Syntax

setBytes(UInt16 *columnID*, Array *value* **)**

Parameters

- ♦ **columnID** The ID number of the column. The first column in the table has an ID value of one.
- ♦ **value** The new value for the column.

Remarks

Suitable for columns of type **SQLType.BINARY** or **SQLType.LONGBINARY** only. The data in the row is not actually changed until you execute an **update**, and that change is not permanent until it is committed.

setDate method

Sets the value for the specified column using a **Date**.

Syntax

setDate(UInt16 *columnID*, Date *value***)**

Parameters

- ♦ **columnID** The ID number of the column. The first column in the table has an ID value of one.
- ♦ **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an update, and that change is not permanent until it is committed.

setDateTime method

Sets the value for the specified column using a **Date**.

Syntax

setDateTime(UInt16 *columnID*, Date *value***)**

Parameters

- ♦ **columnID** The ID number of the column. The first column in the table has an ID value of one.
- ♦ **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an update, and that change is not permanent until it is committed.

setDouble method

Sets the value for the specified column using a **double**.

Syntax

setDouble(UInt16 *columnID*, Double *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an update, and that change is not permanent until it is committed.

setFloat method

Sets the value for the specified column using a **float**.

Syntax

setFloat(UInt16 *columnID*, Float *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an update, and that change is not permanent until it is committed.

setInt method

Sets the value for the specified column using an Integer.

Syntax

setInt(UInt16 *columnID*, Int32 *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an update, and that change is not permanent until it is committed.

setLong method

Sets the value for the specified column using an Int64.

Syntax

setLong(UInt16 *columnID*, Int64 *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an update, and that change is not permanent until it is committed.

setNull method

Sets a column to the SQL NULL.

Syntax

setNull(UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

Remarks

The data is not actually changed until you execute an update, and that change is not permanent until it is committed.

setShort method

Sets the value for the specified column using a UInt16.

Syntax

setShort(UInt16 *columnID*, Int16 *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an update, and that change is not permanent until it is committed.

setString method

Sets the value for the specified column using a String.

Syntax

setString(UInt16 *columnID*, String *value* **)**

Parameters

- ♦ **columnID** The ID number of the column. The first column in the table has an ID value of one.
- ♦ **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an update, and that change is not permanent until it is committed.

setTime method

Sets the value for the specified column using a Date.

Syntax

setTime(UInt16 *columnID*, Date *value* **)**

Parameters

- ♦ **columnID** The ID number of the column. The first column in the table has an ID value of one.
- ♦ **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an update, and that change is not permanent until it is committed.

setTimestamp method

Sets the value for the specified column using a Date.

Syntax

setTimestamp(UInt16 *columnID*, Date *value* **)**

Parameters

- ♦ **columnID** The ID number of the column. The first column in the table has an ID value of one.
- ♦ **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an update, and that change is not permanent until it is committed.

setULong method

Sets the value for the specified column using a 64-bit integer treated as an unsigned value.

Syntax

setULong(UInt16 *columnID*, UInt64 *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an update, and that change is not permanent until it is committed.

setUUID method

Sets the value for the specified column using a UUID.

Syntax

setUUID(UInt16 *columnID*, UUID *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an update, and that change is not permanent until it is committed. Only valid for columns of type SQLType.BINARY and length 16.

See also

- "Using UUIDs" [*MobiLink - Server Administration*]

update method

Updates the current row with the current column values (specified using the set methods).

Syntax

update()

Remarks

Each update must be preceded by a call to updateBegin.

updateBegin method

Prepares to update the current row in this result set.

Syntax

updateBegin()

Remarks

Column values are modified by calling the appropriate set*Type* method or methods.

The data is not actually changed until you execute the update, and that change is not permanent until it is committed.

ResultSetSchema class

Represents the schema of an UltraLite result set.

getColumnCount method

Returns the number of columns in this cursor.

Syntax

UInt16 **getColumnCount()**;

Remarks

Column IDs range from 1 to getColumnCount inclusively.

Column IDs and count may change during a schema upgrade. To correctly identify a column, access it by name or refresh the cached IDs and counts after a schema upgrade.

getColumnID method

Returns the column ID of the named column.

Syntax

UInt16 **getColumnID(**String *name***)**

Parameters

- **name** The name of the column.

Remarks

Column IDs range from 1 to getColumnCount(), inclusively.

Column IDs and count may change during a schema upgrade. To correctly identify a column, access it by name or refresh the cached IDs and counts after a schema upgrade.

getColumnName method

Returns the name of column identified by the specified column ID.

Syntax

String **getColumnName(**UInt16 *columnID***)**

Parameters

- **columnID** ID of the column. **columnID** must be in the range **[1,getColumnCount()]**.

Remarks

Column IDs and count may change during a schema upgrade. To correctly identify a column, access it by name or refresh the cached IDs and counts after a schema upgrade.

getColumnPrecision method

Returns the precision of the named column.

Syntax

Int32 **getColumnPrecision(**String *name***)**

Parameters

- ♦ **name** The name of the column.

Remarks

The column must be of type SQLType.NUMERIC.

getColumnPrecisionByColID method

Returns the precision of the column.

Syntax

Int32 **getColumnPrecisionByColID(** UInt16 *columnID* **)**

Parameters

- ♦ **columnID** The ID number of the column. The first column in the result set has an ID value of one.

Remarks

The column must be of type SQLType.NUMERIC.

getColumnScale method

Returns the scale of the column.

Syntax

Int32 **getColumnScale(**String *name***)**

Parameters

- ♦ **name** The name of the column.

Remarks

The column must be of type SQLType.NUMERIC.

getColumnScaleByColID method

Returns the scale of the column.

Syntax

Int32 **getColumnScaleByColID(** UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the result set has an ID value of one.

Remarks

The column must be of type SQLType.NUMERIC.

getColumnSize method

Returns the size of the named column.

Syntax

UInt32 **getColumnSize(**String *name***)**

Parameters

- **name** The name of the column.

Remarks

The column must be of type SQLType.NUMERIC.

getColumnSizeByColID method

Returns the size of the column.

Syntax

UInt32 **getColumnSizeByColID(** UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the result set has an ID value of one.

Remarks

The column must be of type SQLType.NUMERIC.

getColumnSQLType method

Returns the SQL data type of the named column.

Syntax

UInt16 **getColumnSQLType(**String *name***)**

Parameters

- ♦ **name** The name of the column.

getColumnSQLTypeByColID method

Returns the SQLType of the column, in a SQLType enumerated integer.

Syntax

UInt16 **getColumnSQLTypeByColID(** UInt16 *columnID* **)**

Parameters

- ♦ **columnID** The ID number of the column. The first column in the result set has an ID value of one.

isOpen method

Returns **true** if the result set is open, **false** otherwise.

Syntax

Boolean **isOpen()**;

SQLError class

Enumerates the SQL codes that may be reported by UltraLite for M-Business Anywhere. This class provides static constants and cannot be directly instantiated.

members	Description
SQLE_AGGREGATES_NOT_ALLOWED	See "Invalid use of an aggregate function" [*SQL Anywhere 10 - Error Messages*].
SQLE_ALIAS_NOT_UNIQUE	See "Alias '%1' is not unique" [*SQL Anywhere 10 - Error Messages*].
SQLE_ALIAS_NOT_YET_DEFINED	See "Definition for alias '%1' must appear before its first reference" [*SQL Anywhere 10 - Error Messages*].
SQLE_AMBIGUOUS_INDEX_NAME	See "Index name '%1' is ambiguous" [*SQL Anywhere 10 - Error Messages*].
SQLE_BAD_ENCRYPTION_KEY	See "Incorrect or missing encryption key" [*SQL Anywhere 10 - Error Messages*].
SQLE_BAD_PARAM_INDEX	See "Input parameter index out of range" [*SQL Anywhere 10 - Error Messages*].
SQLE_CANNOT_ACCESS_FILESYSTEM	See "Unable to access the filesystem on the device" [*SQL Anywhere 10 - Error Messages*].
SQLE_CANNOT_CHANGE_USER_NAME	See "Cannot change synchronization user_name when status of the last upload is unknown" [*SQL Anywhere 10 - Error Messages*].
SQLE_CANNOT_CONVERT	See "Invalid data conversion" [*SQL Anywhere 10 - Error Messages*].
SQLE_CANNOT_EXECUTE_STMT	See "Statement cannot be executed" [*SQL Anywhere 10 - Error Messages*].
SQLE_CANNOT_MODIFY	See "Cannot modify column '%1' in table '%2'" [*SQL Anywhere 10 - Error Messages*].
SQLE_CLIENT_OUT_OF_MEMORY	See "Client out of memory" [*SQL Anywhere 10 - Error Messages*].
SQLE_COLUMN_AMBIGUOUS	See "Column '%1' found in more than one table -- need a correlation name" [*SQL Anywhere 10 - Error Messages*].
SQLE_COLUMN_CANNOT_BE_NULL	See "Column '%1' in table '%2' cannot be NULL" [*SQL Anywhere 10 - Error Messages*].
SQLE_COLUMN_IN_INDEX	See "Cannot alter a column in an index" [*SQL Anywhere 10 - Error Messages*].
SQLE_COLUMN_NOT_FOUND	See "Column '%1' not found" [*SQL Anywhere 10 - Error Messages*].

members	Description
SQLE_COLUMN_NOT_INDEXED	See "Column '%1' not part of any indexes in its containing table" [*SQL Anywhere 10 - Error Messages*].
SQLE_COLUMN_NOT_STREAMABLE	See "The operation failed because column '%1"s type does not support streaming" [*SQL Anywhere 10 - Error Messages*].
SQLE_COMMUNICATIONS_ERROR	See "Communication error" [*SQL Anywhere 10 - Error Messages*].
SQLE_CONNECTION_ALREADY_EXISTS	See "This connection already exists" [*SQL Anywhere 10 - Error Messages*].
SQLE_CONNECTION_NOT_FOUND	See "Connection not found" [*SQL Anywhere 10 - Error Messages*].
SQLE_CONNECTION_RESTORED	See "UltraLite connection was restored" [*SQL Anywhere 10 - Error Messages*].
SQLE_CONSTRAINT_NOT_FOUND	See "Constraint '%1' not found" [*SQL Anywhere 10 - Error Messages*].
SQLE_CONVERSION_ERROR	See "Cannot convert %1 to a %2" [*SQL Anywhere 10 - Error Messages*].
SQLE_COULD_NOT_FIND_FUNCTION	See "Could not find '%1' in dynamic library '%2'" [*SQL Anywhere 10 - Error Messages*].
SQLE_COULD_NOT_LOAD_LIBRARY	See "Could not load dynamic library '%1'" [*SQL Anywhere 10 - Error Messages*].
SQLE_CURSOR_ALREADY_OPEN	See "Cursor already open" [*SQL Anywhere 10 - Error Messages*].
SQLE_CURSOR_NOT_OPEN	See "Cursor not open" [*SQL Anywhere 10 - Error Messages*].
SQLE_CURSOR_RESTORED	See "UltraLite cursor (or result set or table) was restored" [*SQL Anywhere 10 - Error Messages*].
SQLE_CURSOROP_NOT_ALLOWED	See "Illegal cursor operation attempt" [*SQL Anywhere 10 - Error Messages*].
SQLE_DATABASE_ERROR	See "Internal database error %1 -- transaction rolled back" [*SQL Anywhere 10 - Error Messages*].
SQLE_DATABASE_NAME_REQUIRED	See "Database name required to start server" [*SQL Anywhere 10 - Error Messages*].
SQLE_DATABASE_NOT_CREATED	See "Database creation failed: %1" [*SQL Anywhere 10 - Error Messages*].
SQLE_DATATYPE_NOT_ALLOWED	See "Expression has unsupported data type" [*SQL Anywhere 10 - Error Messages*].

members	Description
SQLE_DBSPACE_FULL	See “A dbspace has reached its maximum file size” [*SQL Anywhere 10 - Error Messages*].
SQLE_DESCRIBE_NONSE-LECT	See “Can only describe a SELECT statement” [*SQL Anywhere 10 - Error Messages*].
SQLE_DIV_ZERO_ERROR	See “Division by zero” [*SQL Anywhere 10 - Error Messages*].
SQLE_DOWNLOAD_CON-FLICT	See “Download failed because of conflicts with existing rows” [*SQL Anywhere 10 - Error Messages*].
SQLE_DOWNLOAD_RESTA RT_FAILED	See “Unable to retry download because upload is not finished” [*SQL Anywhere 10 - Error Messages*].
SQLE_DROP_DATABASE_F AILED	See “An attempt to delete database '%1' failed” [*SQL Anywhere 10 - Error Messages*].
SQLE_DUPLICATE_CURSOR _NAME	See “The cursor name '%1' already exists” [*SQL Anywhere 10 - Error Messages*].
SQLE_DUPLICATE_FOREIG N_KEY	See “Foreign key '%1' for table '%2' duplicates an existing foreign key” [*SQL Anywhere 10 - Error Messages*].
SQLE_DUPLICATE_OPTION	See “Option '%1' specified more than once” [*SQL Anywhere 10 - Error Messages*].
SQLE_DYNAMIC_MEMORY _EXHAUSTED	See “Dynamic memory exhausted” [*SQL Anywhere 10 - Error Messages*].
SQLE_ENCRYPTION_INITIA LIZATION_FAILED	See “Could not initialize the encryption DLL: '%1'” [*SQL Anywhere 10 - Error Messages*].
SQLE_ENGINE_ALREADY_ RUNNING	See “Database server already running” [*SQL Anywhere 10 - Error Messages*].
SQLE_ENGINE_NOT_MUL-TIUSER	See “Database server not running in multi-user mode” [*SQL Anywhere 10 - Error Messages*]
SQLE_ERROR	See “Run time SQL error -- %1” [*SQL Anywhere 10 - Error Messages*].
SQLE_ERROR_CALLING_FU NCTION	See “Could not allocate resources to call external function” [*SQL Anywhere 10 - Error Messages*].
SQLE_ERROR_IN_ASSIGN-MENT	See “Error in assignment” [*SQL Anywhere 10 - Error Messages*].
SQLE_EXPRESSION_ERROR	See “Invalid expression near '%1'” [*SQL Anywhere 10 - Error Messages*].
SQLE_FEATURE_NOT_EN-ABLED	See “The method you attempted to invoke was not enabled for your application” [*SQL Anywhere 10 - Error Messages*].

members	Description
SQLE_FILE_BAD_DB	See “Unable to start specified database: '%1' is not a valid database file” [*SQL Anywhere 10 - Error Messages*].
SQLE_FILE_IN_USE	See “Specified database file already in use” [*SQL Anywhere 10 - Error Messages*].
SQLE_FILE_NOT_DB	See “Unable to start specified database: '%1' is not a database” [*SQL Anywhere 10 - Error Messages*].
SQLE_FILE_VOLUME_NOT_ FOUND	See “Specified file system volume not found for database '%1'” [*SQL Anywhere 10 - Error Messages*].
SQLE_FILE_WRONG_VER- SION	See “Unable to start specified database: '%1' was created by a different version of the software” [*SQL Anywhere 10 - Error Messages*].
SQLE_FOREIGN_KEY_NAM E_NOT_FOUND	See “Foreign key name '%1' not found” [*SQL Anywhere 10 - Error Messages*].
SQLE_IDENTIFIER_TOO_LO NG	See “Identifier '%1' too long” [*SQL Anywhere 10 - Error Messages*].
SQLE_INCORRECT_VOLUM E_ID	See “Incorrect volume ID for '%1'” [*SQL Anywhere 10 - Error Mes- sages*].
SQLE_INDEX_NAME_NOT_ UNIQUE	See “Index name '%1' not unique” [*SQL Anywhere 10 - Error Mes- sages*].
SQLE_INDEX_NOT_FOUND	See “Cannot find index named '%1'” [*SQL Anywhere 10 - Error Mes- sages*].
SQLE_INDEX_NOT_UNIQUE	See “Index '%1' for table '%2' would not be unique” [*SQL Anywhere 10 - Error Messages*].
SQLE_INTERRUPTED	See “Statement interrupted by user” [*SQL Anywhere 10 - Error Mes- sages*].
SQLE_INVALID_CONSTRAI NT_REF	See “Invalid reference to or operation on constraint '%1'” [*SQL Any- where 10 - Error Messages*].
SQLE_INVALID_DESCRIPTO R_INDEX	See “Invalid descriptor index” [*SQL Anywhere 10 - Error Mes- sages*].
SQLE_INVALID_DESCRIPTO R_NAME	See “Invalid SQL descriptor name” [*SQL Anywhere 10 - Error Mes- sages*].
SQLE_INVALID_DISTINCT_ AGGREGATE	See “Grouped query contains more than one distinct aggregate func- tion” [*SQL Anywhere 10 - Error Messages*].
SQLE_INVALID_FOREIGN_ KEY	See “No primary key value for foreign key '%1' in table '%2'” [*SQL Anywhere 10 - Error Messages*].
SQLE_INVALID_FOREIGN_ KEY_DEF	See “Column '%1' in foreign key has a different definition than pri- mary key” [*SQL Anywhere 10 - Error Messages*].

members	Description
SQLE_INVALID_GROUP_SE-LECT	See "Function or column reference to '%1' must also appear in a GROUP BY" [*SQL Anywhere 10 - Error Messages*].
SQLE_INVALID_LOGON	See "Invalid user ID or password" [*SQL Anywhere 10 - Error Mes-sages*].
SQLE_INVALID_OPTION_SE TTING	See "Invalid setting for option '%1'" [*SQL Anywhere 10 - Error Mes-sages*].
SQLE_INVALID_OPTION_V ALUE	See "'%1' is an invalid value for '%2'" [*SQL Anywhere 10 - Error Messages*].
SQLE_INVALID_ORDER	See "Invalid ORDER BY specification" [*SQL Anywhere 10 - Error Messages*].
SQLE_INVALID_PARAME-TER	See "Invalid parameter" [*SQL Anywhere 10 - Error Messages*].
SQLE_INVALID_PARSE_PA-RAMETER	See "Parse error: %1" [*SQL Anywhere 10 - Error Messages*].
SQLE_INVALID_PUBLICATI ON_MASK	See "The specified publication mask is invalid" [*SQL Anywhere 10 - Error Messages*].
SQLE_INVALID_SQL_IDEN-TIFIER	See "Invalid SQL identifier" [*SQL Anywhere 10 - Error Messages*].
SQLE_INVALID_UNION	See "Select lists in UNION, INTERSECT, or EXCEPT do not match in length" [*SQL Anywhere 10 - Error Messages*].
SQLE_KEYLESS_ENCRYP-TION	See "Unable to perform requested operation since this database uses keyless encryption" [*SQL Anywhere 10 - Error Messages*].
SQLE_LOCKED	See "User '%1' has the row in '%2' locked" [*SQL Anywhere 10 - Error Messages*].
SQLE_MEMORY_ERROR	See "Memory error -- transaction rolled back" [*SQL Anywhere 10 - Error Messages*].
SQLE_NAME_NOT_UNIQUE	See "Item '%1' already exists" [*SQL Anywhere 10 - Error Mes-sages*].
SQLE_NO_COLUMN_NAME	See "Derived table '%1' has no name for column %2" [*SQL Anywhere 10 - Error Messages*].
SQLE_NO_CURRENT_ROW	See "No current row of cursor" [*SQL Anywhere 10 - Error Mes-sages*].
SQLE_NO_INDICATOR	See "No indicator variable provided for NULL result" [*SQL Any-where 10 - Error Messages*].
SQLE_NO_MATCHING_SEL ECT_ITEM	See "The select list for the derived table '%1' has no expression to match '%2'" [*SQL Anywhere 10 - Error Messages*].

members	Description
SQLE_NO_PRIMARY_KEY	See “Table '%1' has no primary key” [*SQL Anywhere 10 - Error Messages*].
SQLE_NOERROR	SQLE_NOERROR(0) - This code indicates that there was no error or warning.
SQLE_NON_UPDATEABLE_COLUMN	See “Cannot update an expression” [*SQL Anywhere 10 - Error Messages*].
SQLE_NON_UPDATEABLE_CURSOR	See “FOR UPDATE has been incorrectly specified for a READ ONLY cursor” [*SQL Anywhere 10 - Error Messages*].
SQLE_NOT_IMPLEMENTED	See “Feature '%1' not implemented” [*SQL Anywhere 10 - Error Messages*].
SQLE_NOT_SUPPORTED_IN_ULTRALITE	See “Feature not available with UltraLite” [*SQL Anywhere 10 - Error Messages*].
SQLE_NOTFOUND	See “Row not found” [*SQL Anywhere 10 - Error Messages*].
SQLE_ONLY_ONE_TABLE	See “INSERT/DELETE on cursor can modify only one table” [*SQL Anywhere 10 - Error Messages*].
SQLE_OVERFLOW_ERROR	See “Value %1 out of range for destination” [*SQL Anywhere 10 - Error Messages*].
SQLE_PAGE_SIZE_INVALID	See “Invalid database page size” [*SQL Anywhere 10 - Error Messages*].
SQLE_PARTIAL_DOWNLOAD_NOT_FOUND	See “No partial download was found” [*SQL Anywhere 10 - Error Messages*].
SQLE_PERMISSION_DENIED	See “Permission denied: %1” [*SQL Anywhere 10 - Error Messages*].
SQLE_PRIMARY_KEY_NOT_UNIQUE	See “Primary key for table '%1' is not unique” [*SQL Anywhere 10 - Error Messages*].
SQLE_PRIMARY_KEY_TWICE	See “Table cannot have two primary keys” [*SQL Anywhere 10 - Error Messages*].
SQLE_PRIMARY_KEY_VALUE_REF	See “Primary key for row in table '%1' is referenced by foreign key '%2' in table '%3'” [*SQL Anywhere 10 - Error Messages*].
SQLE_PUBLICATION_NOT_FOUND	See “Publication '%1' not found” [*SQL Anywhere 10 - Error Messages*].
SQLE_PUBLICATION_PREDICATE_IGNORED	See “Publication predicates were not evaluated” [*SQL Anywhere 10 - Error Messages*].
SQLE_RESOURCE_GOVERNOR_EXCEEDED	See “Resource governor for '%1' exceeded” [*SQL Anywhere 10 - Error Messages*].

members	Description
SQLE_ROW_DELETED_TO_MAINTAIN_REFERENTIAL_INTEGRITY	See "Row was dropped from table %1 to maintain referential integrity" [*SQL Anywhere 10 - Error Messages*].
SQLE_SCHEMA_UPGRADE_NOT_ALLOWED	See "A schema upgrade is not currently allowed" [*SQL Anywhere 10 - Error Messages*].
SQLE_SERVER_SYNCHRONIZATION_ERROR	See "Synchronization failed due to an error on the server: %1" [*SQL Anywhere 10 - Error Messages*].
SQLE_START_STOP_DATABASE_DENIED	See "Request to start/stop database denied" [*SQL Anywhere 10 - Error Messages*].
SQLE_STATEMENT_ERROR	See "SQL statement error" [*SQL Anywhere 10 - Error Messages*].
SQLE_STRING_RIGHT_TRUNCATION	See "Right truncation of string data" [*SQL Anywhere 10 - Error Messages*].
SQLE_SUBQUERY_SELECT_LIST	See "Subquery allowed only one select list item" [*SQL Anywhere 10 - Error Messages*].
SQLE_SYNC_INFO_INVALID	See "Information for synchronization is incomplete or invalid, check '%1'" [*SQL Anywhere 10 - Error Messages*].
SQLE_SYNC_INFO_REQUIRED	See "Information for synchronization was not provided" [*SQL Anywhere 10 - Error Messages*].
SQLE_SYNC_NOT_REENTRANT	See "Synchronization process was unable to re-enter synchronization" [*SQL Anywhere 10 - Error Messages*].
SQLE_SYNC_STATUS_UNKNOWN	See "The status of the last synchronization upload is unknown" [*SQL Anywhere 10 - Error Messages*].
SQLE_SYNTAX_ERROR	See "Syntax error near '%1' %2" [*SQL Anywhere 10 - Error Messages*].
SQLE_TABLE_ALREADY_INCLUDED	See "Table '%1' is already included" [*SQL Anywhere 10 - Error Messages*].
SQLE_TABLE_IN_USE	See "Table in use" [*SQL Anywhere 10 - Error Messages*].
SQLE_TABLE_NOT_FOUND	See "Table '%1' not found" [*SQL Anywhere 10 - Error Messages*].
SQLE_TOO_MANY_BLOB_REFS	See "Too many references to a BLOB" [*SQL Anywhere 10 - Error Messages*].
SQLE_TOO_MANY_CONNECTIONS	See "Database server connection limit exceeded" [*SQL Anywhere 10 - Error Messages*].
SQLE_TOO_MANY_PUBLICATIONS	See "Too many publications specified in publication mask" [*SQL Anywhere 10 - Error Messages*].

members	Description
SQLE_TOO_MANY_TEMP_TABLES	See "Too many temporary tables in connection" [*SQL Anywhere 10 - Error Messages*].
SQLE_TOO_MANY_USERS	See "Too many users in database" [*SQL Anywhere 10 - Error Messages*].
SQLE_ULTRALITE_DATABASE_NOT_FOUND	See "The database '%1' was not found" [*SQL Anywhere 10 - Error Messages*].
SQLE_ULTRALITE_OBJ_CLOSED	See "Invalid operation on a closed object" [*SQL Anywhere 10 - Error Messages*].
SQLE_ULTRALITE_WRITE_ACCESS_DENIED	See "Write access was denied" [*SQL Anywhere 10 - Error Messages*].
SQLE_UNABLE_TO_CONNECT	See "Database cannot be started -- %1" [*SQL Anywhere 10 - Error Messages*].
SQLE_UNABLE_TO_START_DATABASE	See "Unable to start specified database: %1" [*SQL Anywhere 10 - Error Messages*].
SQLE_UNABLE_TO_START_DATABASE_VER_NEWER	See "Unable to start specified database: Server must be upgraded to start database %1" [*SQL Anywhere 10 - Error Messages*].
SQLE_UNCOMMITTED_TRANSACTIONS	See "You cannot synchronize or upgrade with uncommitted transactions" [*SQL Anywhere 10 - Error Messages*].
SQLE_UNKNOWN_FUNC	See "Unknown function '%1'" [*SQL Anywhere 10 - Error Messages*].
SQLE_UNKNOWN_OPTION	See "'%1' is an unknown option" [*SQL Anywhere 10 - Error Messages*].
SQLE_UNKNOWN_USERID	See "User ID '%1' does not exist" [*SQL Anywhere 10 - Error Messages*].
SQLE_UNRECOGNIZED_OPTION	See "The option '%1' is not recognized" [*SQL Anywhere 10 - Error Messages*].
SQLE_UPLOAD_FAILED_AT_SERVER	See "Synchronization server failed to commit the upload" [*SQL Anywhere 10 - Error Messages*].
SQLE_VALUE_IS_NULL	See "Cannot return NULL result as requested data type" [*SQL Anywhere 10 - Error Messages*].
SQLE_VARIABLE_INVALID	See "Invalid host variable" [*SQL Anywhere 10 - Error Messages*].
SQLE_WRONG_NUM_OF_INSERT_COLS	See "Wrong number of values for INSERT" [*SQL Anywhere 10 - Error Messages*].
SQLE_WRONG_PARAMETER_COUNT	See "Wrong number of parameters to function '%1'" [*SQL Anywhere 10 - Error Messages*].

SQLType class

This enumeration lists as constants the available UltraLite SQL database types used as table column types.

Constant	UltraLite Database Type
BAD_INDEX	
S_LONG	INT
U_LONG	UNSIGNED INT
S_SHORT	SMALLINT
U_SHORT	UNSIGNED SMALLINT
S_BIG	BIGINT
U_BIG	UNSIGNED BIGINT
TINY	TYNY INT
BIT	BIT
TIMESTAMP	TIMESTAMP
DATE	DATE
TIME	TIMESTAMP
DOUBLE	DOUBLE
REAL	REAL
NUMERIC	NUMERIC
BINARY	BINARY
CHAR	CHAR or VARCHAR
LONGVARCHAR	LONG VARCHAR
LONGBINARY	LONG BINARY
MAX_INDEX	

toString method

Returns the string name of the specified SQL column type constant or BAD_SQL_TYPE if not a recognized type.

Syntax

String **toString(**UInt16 *code***)**

Parameters

- **code** The SQL column type constant.

SyncParms class

Represents synchronization parameters that define how to synchronize an UltraLite database. Each connection has its own SyncParms instance.

Constants

Constant	Value	Description
STREAM_TYPE_TCPIP	0	TCP/IP stream
STREAM_TYPE_HTTP	1	HTTP stream
STREAM_TYPE_HTTPS	2	HTTPS synchronization
STREAM_TYPE_TLS	3	TLS synchronization
STREAM_TYPE_HOTSYNC	4	For HotSync synchronization

getAuthenticationParms method

Returns parameters provided to a custom user authentication script or null if no parameters are specified.

Syntax

Array **getAuthenticationParms()**

getCheckpointStore method

Returns true if the client performs extra checkpoints, false if the client only performs required checkpoints.

Syntax

Boolean **getCheckpointStore()**

getDisableConcurrency method

Returns true if concurrent synchronization is disabled, false if concurrent synchronization is enabled.

Syntax

Boolean **getDisableConcurrency()**

getDownloadOnly method

Returns true if uploads are disabled, false if uploads are enabled.

Syntax

Boolean **getDownloadOnly()**

getKeepPartialDownload method

Returns true if partial downloads are to be kept, false if partial downloads should be rolled back.

Syntax

Boolean getKeepPartialDownload**()**

getNewPassword method

Returns the new password that is associated with the MobiLink user after the next synchronization.

Syntax

String **getNewPassword()**

getPartialDownloadRetained method

Returns true if a download failed because of a communications error and the partial download was retained, false if the download was not interrupted, or if the partial download was rolled back.

Syntax

Boolean **getPartialDownloadRetained( )**

getPassword method

Returns the MobiLink password for the user specified with setUserName.

Syntax

String **getPassword()**;

getPingOnly method

Returns true if client only pings the server, false if client performs a synchronization.

Syntax

Boolean **getPingOnly()**

getPublicationMask method

Returns the publications to be synchronized.

Syntax

UInt32 **getPublicationMask()**;

Remarks

See PublicationSchema class.

getResumePartialDownload method

Returns true if the previous partial download is to be resumed, false if the previous partial download is to be rolled back.

Syntax

Boolean **getResumePartialDownload( )**

getSendColumnNames method

Returns true if client sends column names to the MobiLink server during synchronization, false if client does not send column names.

Syntax

Boolean **getSendColumnNames()**

getSendDownloadAck method

Returns true if client provides a download acknowledgement to the MobiLink server, false if the client does not provide a download acknowledgement.

Syntax

Boolean **getSendDownloadAck()**

getStream method

Returns the type of MobiLink synchronization stream to use for synchronization.

Syntax

UInt16 **getStream()**;

getStreamParms method

Returns a string containing all the network protocol options used for synchronization streams.

Syntax

String **getStreamParms()**;

getUploadOnly method

Returns true if downloads are disabled, false if downloads are enabled

Syntax

Boolean **getUploadOnly()**

getUserName method

Returns the MobiLink user name.

Syntax

String **getUserName()**

getVersion method

Returns the version string that indicates which synchronization scripts are to be used.

Syntax

String **getVersion()**

setAuthenticationParms method

Specifies parameters for a custom user authentication script (MobiLink authenticate_parameters connection event).

Syntax

setAuthenticationParms(Array *value* **)**

Parameters

- **value** An array of strings, each containing an authentication parameter (null array entries result in a synchronization error).

Remarks

Only the first 255 strings are used and each string should be no longer than 128 characters (longer strings are truncated when sent to MobiLink).

setCheckpointStore method

Specifies whether the client should perform extra store checkpoints to control the growth of the database store during synchronization.

Syntax

setCheckpoint16Store(Boolean *value* **)**

Parameters

- **value** Set to true to perform extra checkpoints, or set to false to only perform the required checkpoints.

Remarks

The checkpoint operation adds I/O operations for the application, and so slows synchronization. This option is most useful for large downloads with many updates. Devices with slow flash memory may not want to incur the performance penalty.

setDisableConcurrency method

Specifies whether to disable or enable concurrent access to UltraLite while performing a synchronization.

Syntax

setDisableConcurrency(Boolean *value* **)**;

Parameters

- **value** Set to true to disable concurrent synchronization, or set to false to enable concurrent synchronization.

Remarks

By default, other threads may perform UltraLite operations while a thread is synchronizing. When concurrent synchronization is disabled, other threads block on UltraLite calls until the synchronization has completed.

setDownloadOnly method

Specifies whether to disable or enable uploads when synchronizing.

Syntax

setDownloadOnly(Boolean *value* **)**

Parameters

- **value** Set to true to disable uploads, or set to false to enable uploads.

setKeepPartialDownload method

Specifies whether to disable or enable partial downloads when synchronizing.

Syntax

setKeepPartialDownload(Boolean *value* **)**

Parameters

- **value** Set to true to enable the retention of partial downloads when synchronzing, or set to false to discard partial downloads.

Remarks

UltraLite has the ability to restart downloads that fail because of communication errors. UltraLite processes the download as it is received. If a download is interrupted, then the partial download transaction will remain in the database and can be resumed during the next synchronization.

To indicate that UltraLite should save partial downloads, specify Connection.syncParms.setKeepPartialDownload(true); otherwise the download will be rolled back if an error occurs.

If a partial download was kept, then the output field connection.SyncResult.getPartialDownloadRetained is set to true when the connection.synchronize exits. If getPartialDownloadRetained is set, then you can resume a download. To do this, call connection.synchronize with connection.syncParms.setResumePartialDownload(true). You may still want KeepPartialDownload set to true as well in case another communication error occurs. No upload is done if a download is skipped.

The download you receive during a resumed download will be as old as when the download originally began. If you need the most up to date data, then you can do another download immediately after the special resumed download completes.

When resuming a download, many of the SyncParms fields are not relevant. For example, the PublicationMask field is not used. You will receive the publications that you requested on the initial download. The only fields that need to be set are setResumePartialDownload(boolean) and setUserName (String). The fields setKeepPartialDownload(boolean), setDownloadOnly(boolean), and setDisableConcurrency(boolean) may be set if desired and will function as normal.

If you have a partial download and it is no longer needed, then you can call Connection.rollbackPartialDownload to roll back the failed download transaction. Also if you attempt to synchronize again and do not specify ResumePartialDownload, then the partial download will roll back before the next synchronization begins.

See "How synchronization failure is handled" [*MobiLink - Getting Started*].

setMBAServer method

Provides a quick way to set the synchronization parameters for the MobiLink host and port to those of the M-Business Anywhere server used by the M-Business client.

Syntax

setMBAServer(String *host*, String *port*, String *url_suffix* **)**

Parameters

- **host** The host or IP value of the M-Business Anywhere server. If host is null, UltraLite sets it to the current M-Business Anywhere host.

- **port** The port on which the M-Business Anywhere server is listening. If port is null, UltraLite sets it to the current M-Business Anywhere port value.
- **url_suffix** This corresponds to the url_suffix parameter set in the *sync.conf* file of M-Business Anywhere.

Remarks

Use the MobiLink redirector for M-Business Anywhere to route data to and from the MobiLink server.

If you are using one-button synchronization, you must save the synchronization parameters using Connection.saveSyncParms.

For information about configuring M-Business Server to route HTTP database traffic through the M-Business Anywhere Redirector, see “M-Business Anywhere Redirector” [*MobiLink - Server Administration*].

setMBAServerWithMoreParms method

Provides a quick way to set the synchronization parameters for the MobiLink host and port to those of the M-Business Anywhere server used by the M-Business client.

Syntax

setMBAServerWithMoreParms(String *host*, String *port*, String *url_suffix*, String *additional***)**

Parameters

- **host** The host or IP value of the M-Business Anywhere server. If host is null, UltraLite sets it to the current M-Business Anywhere host.
- **port** The port on which the M-Business Anywhere server is listening. If port is null, UltraLite sets it to the current M-Business Anywhere port value.
- **url_suffix** This corresponds to the url_suffix parameter set in the *sync.conf* file of M-Business Anywhere.
- **additional** This parameter may contain additional stream parameters that are not covered by the preceding parameters (for example, proxy host, proxy port or security-related parameters). If you need to specify host, port or url_suffix information, you may use the setMBAServer method described in the previous section.

Remarks

Use the MobiLink redirector for M-Business Anywhere to route data to and from the MobiLink server.

This method expands on the capabilities provided by setMBAServer by permitting the user to specify other parameters in an additional parameter.

If you are using one-button synchronization, you must save the synchronization parameters using Connection.saveSyncParms.

For information about configuring M-Business Server to route HTTP database traffic through the M-Business Anywhere Redirector, see "M-Business Anywhere Redirector" [*MobiLink - Server Administration*].

setNewPassword method

Sets a new MobiLink password for the user specified with setUserName.

Syntax

setNewPassword(String *value* **)**

Parameters

- **value** New password for MobiLink user.

Remarks

The new password takes effect after the next synchronization.

setPassword method

Sets the MobiLink password for the user specified with setUserName.

Syntax

setPassword(String *value* **)**

Parameters

- **value** The password for MobiLink user.

Remarks

This user name and password are separate from any database user ID and password, and serves to identify and authenticate the application to the MobiLink server.

setPingOnly method

Specifies whether the client should only ping the MobiLink server instead of performing a real synchronization.

Syntax

setPingOnly(Boolean *value* **)**;

Parameters

- **value** Set to true to only ping the MobiLink server, or to false to perform a synchronization.

setPublicationMask method

Specifies the publications to be synchronized.

Syntax

setPublicationMask(UInt16 *mask* **)**

Parameters

♦ **mask** Set of publications to synchronize.

Remarks

See **PublicationSchema** class.

setSendColumnNames method

Specifies whether the client should send column names to the MobiLink server during synchronization.

Syntax

setSendColumnNames(Boolean *value* **)**

Parameters

♦ **value** Set to true to send column names, or set to false not to send column names.

Remarks

This parameter is used for direct row handling.

setSendDownloadAck method

Specifies whether the client should send a download acknowledgement to the MobiLink server during synchronization.

Syntax

setSendDownloadAck(Boolean *value* **)**

Parameters

♦ **value** Set to true to send a download acknowledgement (positive or negative) or set to false to tell the server that no download acknowledgement is sent.

Remarks

The download acknowledgement is sent after the download has been fully applied and committed at the remote (positive acknowledgement) or the download fails (negative acknowledgement).

If the client does send a download acknowledgement, the MobiLink server database worker thread must wait for the client to apply and commit the download. If the client does not sent a download acknowledgement, the MobiLink server is freed up sooner for its next synchronization.

setStream method

Sets the MobiLink synchronization stream to use for synchronization.

Syntax

setStream(UInt16 *value* **)**

Parameters

- ♦ **value** Type of MobiLink synchronization stream to use for synchronization. For a list of valid choices, see "Constants" on page 121.

Remarks

Most synchronization streams require parameters to identify the MobiLink server address and control other behavior. These parameters are supplied with the **setStreamParms()** method.

The default stream type is STREAM_TYPE_TCPIP.

setStreamParms method

Sets the parameters to configure the synchronization stream.

Syntax

setStreamParms(String *value* **)**

Parameters

- ♦ **value** String containing all the network protocol options used for synchronization streams. Options are specified as a semicolon-separated list of name=value pairs (**"param1=value1;param2=value2"**).

Remarks

For information about configuring specific stream types, see "Network protocol options for UltraLite synchronization streams" [*MobiLink - Client Administration*].

setUploadOnly method

Specifies whether to disable or enable downloads when synchronizing.

Syntax

setUploadOnly(Boolean *value* **)**

Parameters

- ♦ **value** Set to true to disable downloads, or set to false to enable downloads.

setUserName method

Sets the user name that uniquely identifies the MobiLink client to the MobiLink server.

Syntax

setUserName(String *value* **)**

Parameters

- ♦ **value** MobiLink user name.

Remarks

MobiLink uses this value to determine the download content, to record the synchronization state, and to recover from interruptions during synchronization. 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.

setVersion method

Specifies which synchronization script version to use.

Syntax

setVersion(String *value* **)**

Parameters

- ♦ **value** Script version string.

Remarks

Each synchronization script in the consolidated database is marked with a version string. For example, there may be two different download_cursor scripts, and each one is identified by different version strings. The version string allows an UltraLite application to choose from a set of synchronization scripts.

SyncResult class

Represents the status of UltraLite for M-Business Anywhere methods the last synchronization. Each connection has its own SyncResult instance.

This class cannot be directly instantiated.

getAuthStatus method

Returns the authorization status code for the last synchronization attempt.

Syntax

UInt16 **getAuthStatus()**

getIgnoredRows method

Returns true if any uploaded rows were ignored during the most recent synchronization, false if no uploaded rows were ignored.

Syntax

Boolean **getIgnoredRows()**

Parameters

♦ **return** True if any uploaded rows were ignored, false if no uploaded rows were not ignored.

getPartialDownloadRetained method

Returns true if a download was interrupted and the partial download was retained, false if the download was not interrupted or the partial download was rolled back.

Syntax

Boolean getPartialDownloadRetained**()**

getStreamErrorCode method

Returns an integer representing the error code reported by the synchronization stream processing.

Syntax

UInt16 **getStreamErrorCode( )**

Parameters

♦ **return** Error code reported by the synchronization stream.

Remarks

See “MobiLink Communication Error Messages” [*SQL Anywhere 10 - Error Messages*].

getStreamErrorContext method

Returns the basic network operation being performed when the stream error occurred.

Syntax

UInt16 **getStreamErrorContext( )**

Remarks

The known contexts are as follows:

Value	Context
0	Unknown
1	Register
2	Unregister
3	Create
4	Destroy
5	Open
6	Close
7	Read
8	Write
9	WriteFlush
10	EndWrite
11	EndRead
12	Yield
13	Softshutdown

getStreamErrorID method

Returns the network layer reporting the error.

Syntax

UInt32 **getStreamErrorID( )**

Remarks

The value is the ID of network layer. The known IDs are as follows:

Value	**Description**
0	TCP/IP stream
3	For HotSync synchronization
7	HTTP stream
8	HTTPS synchronization

getStreamErrorSystem method

Returns the stream error system-specific code.

Syntax

UInt16 **getStreamErrorSystem( )**

Parameters

- **return** A system-specific error code.

getTimestamp method

Returns the timestamp of the most recent synchronization.

Syntax

Date **getTimestamp( )**

getUploadOK method

Returns true if last upload synchronization was successful, false if last upload synchronization was unsuccessful.

Syntax

Boolean **getUploadOK()**

TableSchema class

Represents the schema of an UltraLite table.

getColumnCount method

Returns the 1-based number of columns in this table.

Syntax

UInt16 **getColumnCount( )**

Remarks

Column IDs range from 1 to getColumnCount().

getColumnDefaultValue method

Returns the default value of the named column or null if the default value is **null**.

Syntax

String **getColumnDefaultValue(** String *name* **)**

Parameters

- **name** Name of the column.

getColumnDefaultValueByColID method

Returns the default value of the column or null if the default value is **null**.

Syntax

String **getColumnDefaultValueByColID(** UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

getColumnID method

Returns the 1-based ID of the specified column.

Syntax

UInt16 **getColumnID(** String *name* **)**

Parameters

- **name** Name of the column.

getColumnName method

Returns the name of the specified column.

Syntax

String **getColumnName(** UInt16 *colID* **)**

Parameters

- **colID** The 1-based column ID of the column.

getColumnPartitionSize method

Returns the column's global autoincrement partition size as an unsigned 64-bit number represented by a Double.

Syntax

UInt64 **getColumnPartitionSize(** String *name* **)**

Parameters

- **name** Name of the column.

Remarks

All global autoincrement columns in a given table share the same global autoincrement partition.

getColumnPartitionSizeByColID method

Returns the column's global autoincrement partition size as an unsigned 64-bit number represented by a Double.

Syntax

UInt64 **getColumnPartitionSizeByColID(** UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

Remarks

All global autoincrement columns in a given table share the same global autoincrement partition.

getColumnPrecision method

Returns the precision of the column.

Syntax

Int32 **getColumnPrecision(** String *name* **)**

Parameters

- **name** Name of the column.

Remarks

The column must be of type SQLType.NUMERIC.

getColumnPrecisionByColID method

Returns the precision of the column.

Syntax

Int32 **getColumnPrecisionByColID(** UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

Remarks

The column must be of type SQLType.NUMERIC

getColumnScale method

Returns the scale of the column.

Syntax

Int32 **getColumnScale(** String *name* **)**

Parameters

- **name** Name of the column.

Remarks

The column must be of type SQLType.NUMERIC.

getColumnScaleByColID method

Returns the scale of the column.

Syntax

Int32 **getColumnScaleByColID(** UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

Remarks

The column must be of type SQLType.NUMERIC.

getColumnSize method

Returns the size of the column.

Syntax

UInt32 **getColumnSize(** String *name* **)**

Parameters

- ♦ **name** Name of the column.

Remarks

The column must be of type SQLType.BINARY or SQLType.CHAR.

getColumnSizeByColID method

Returns the size of the column.

Syntax

UInt32 **getColumnSizeByColID(** UInt16 *columnID* **)**

Parameters

- ♦ **columnID** The ID number of the column. The first column in the table has an ID value of one.

Remarks

The column must be of type SQLType.BINARY or SQLType.CHAR.

getColumnSQLType method

Returns the SQLType of the column, in a SQLType enumerated integer.

Syntax

Int16 **getColumnSQLType(** String *name* **)**

Parameters

- ♦ **name** Name of the column.

getColumnSQLTypeByColID method

Returns the SQLType of the column, in a SQLType enumerated integer.

Syntax

Int16 **getColumnSQLTypeByColID(** UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

getIndex method

Returns the index schema of the named index.

Syntax

IndexSchema **getIndex(** String *name* **)**

Parameters

- **name** Name of the index.

getIndexCount method

Returns the number of indexes on this table.

Syntax

UInt16 **getIndexCount( )**

Remarks

Index IDs range from 1 to **getIndexCount()**, inclusively.

Note: Index IDs and count may change during a schema upgrade. To correctly identify an index, access it by name or refresh the cached IDs and counts after a schema upgrade.

getIndexName method

Returns the name of the index identified by the specified index ID.

Syntax

String **getIndexName(** UInt16 *indexID* **)**

Parameters

- **indexID** ID of the index. **indexID** must be in the range **[1,getIndexCount()]**.

Remarks

Note: Index IDs and count may change during a schema upgrade. To correctly identify an index, access it by name or refresh the cached IDs and counts after a schema upgrade.

getName method

Returns the name of this table.

Syntax

String **getName( )**

getOptimalIndex method

Returns the optimal index for searching a table using the named column.

Syntax

IndexSchema **getOptimalIndex(** String *name* **)**

Parameters

- **name** Name of the column.

Remarks

The named column is the first column in the index but the index may have more than one column.

getPrimaryKey method

Returns the index schema of the primary key for this table.

Syntax

IndexSchema **getPrimaryKey( )**

getUploadUnchangedRows method

Returns true if the table is marked to upload all rows, false if the table is not marked to upload all rows.

Syntax

Boolean **getUploadUnchangedRows( )**

Remarks

Tables for which this method returns true always upload unchanged rows, as well as changed rows, when the table is synchronized. These tables are sometimes referred to as "all sync" tables.

isColumnAutoIncrement method

Returns true if the column is autoincrementing, false otherwise.

Syntax

Boolean **isColumnAutoIncrement(** String *name* **)**

Parameters

- **name** Name of the column.

isColumnAutoIncrementByColID method

Returns true if the column is autoincrementing, false otherwise.

Syntax

Boolean **isColumnAutoIncrementByColID(** UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

isColumnCurrentDate method

Returns true if the column defaults to the current date, false otherwise.

Syntax

Boolean **isColumnCurrentDate(** String *name* **)**

Parameters

- **name** Name of the column.

Remarks

The column must be of type SQLType.DATE.

isColumnCurrentDateByColID method

Returns true if the column defaults to the current date, false otherwise.

Syntax

Boolean **isColumnCurrentDateByColID(** UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

Remarks

The column must be of type SQLType.DATE.

isColumnCurrentTime method

Returns true if the column defaults to the current time, false otherwise.

Syntax

Boolean **isColumnCurrentTime(** String *name* **)**

Parameters

- **name** Name of the column.

Remarks

The column must be of type SQLType.TIME.

isColumnCurrentTimeByColID method

Returns true if the column defaults to the current time, false otherwise.

Syntax

Boolean **isColumnCurrentTimeByColID(** UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

Remarks

The column must be of type SQLType.TIME.

isColumnCurrentTimestamp method

Returns true if the column defaults to the current timestamp, false otherwise.

Syntax

Boolean **isColumnCurrentTimestamp(** String *name* **)**

Parameters

- **name** Name of the column.

Remarks

The column must be of type SQLType.TIMESTAMP.

isColumnCurrentTimestampByColID method

Returns true if the column defaults to the current timestamp, false otherwise.

Syntax

Boolean **isColumnCurrentTimestampByColID(** UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

Remarks

The column must be of type SQLType.TIME.

isColumnGlobalAutoIncrement method

Returns true if the column defaults to global autoincrement, false otherwise.

Syntax

Boolean **isColumnGlobalAutoIncrement(** String *name* **)**

Parameters

- **name** Name of the column.
- **return** True if the column is global autoincrementing, false if not global autoincrementing.

isColumnGlobalAutoincrementByColID method

Returns true if the column defaults to global autoincrement, false otherwise.

Syntax

Boolean **isColumnGlobalAutoincrementByColID(** UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

isColumnNewUUID method

Returns true if the column defaults to a new UUID, false otherwise.

Syntax

Boolean **isColumnNewUUID(** String *name* **)**

Parameters

- **name** Name of the column.

isColumnNewUUIDByColID method

Returns true if the column defaults to a new UUID, false otherwise.

Syntax

Boolean **isColumnNewUUIDByColID(** UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

isColumnNullable method

Returns true if the column is nullable, false otherwise.

Syntax

Boolean **isColumnNullable(** String *name* **)**

Parameters

- **name** Name of the column.

isColumnNullableByColID method

Returns true if the column defaults to a new UUID, false otherwise.

Syntax

Boolean **isColumnNullableByColID(** UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

isInPublication method

Returns true if table in publication, false if table not in publication.

Syntax

Boolean **isInPublication(** String *pubName* **)**

Parameters

- **pubName** Name of the publication.

isNeverSynchronized method

Returns true if the table is marked as never synchronized, false if the table is not marked as never synchronized.

Syntax

Boolean **isNeverSynchronized( )**

Remarks

Tables for which this method returns true are never synchronized, even if they are included in a publication. These tables are sometimes referred to as "no sync" tables.

ULTable class

Represents an UltraLite table.

Properties

The properties of the class are listed here.

Property	**Description**
TableSchema schema (read-only)	The schema of this result set. This property is only valid while its prepared statement is open.
NULL_TIMESTAMP_VAL	A constant indicating that a timestamp value is NULL.

AppendBytes method

Appends the specified subset of the specified array of bytes to the new value for the specified SQLType.LONGBINARY column.

Syntax

AppendBytes(
 UInt16 *columnID*,
 Array *value*,
 UInt32 *srcOffset*,
 UInt32 *count*
)

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.
- **srcOffset** The value to append to the current new value for the column.
- **count** The number of bytes to be copied.

Remarks

The bytes at position srcOffset (starting from 0) through **srcOffset+count-1** of the array **value** are appended to the value for the specified column. When inserting, insertBegin initializes the new value to the column's default value. The data in the row is not actually changed until you execute an **insert**, and that change is not permanent until it is committed.

If any of the following is true, an Error with code SQLCode.SQLE_INVALID_PARAMETER is thrown and the destination is not modified:

- The **value** argument is null.

- The **srcOffset** argument is negative.
- The **count** argument is negative.
- **srcOffset+count** is greater than **value.length**, the length of the source array.

For other errors, a **SQLException** with the appropriate error code is thrown.

AppendStringChunk method

Appends the specified string to the new value for the specified SQLType.LONGVARCHAR column.

Syntax

AppendStringChunk(
 UInt16 *columnID*,
 String *value*
)

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Example

The following statements append one hundred instances of the string **XYZ** to the value in the first column:

```
for ( i = 0; i < 100; i++ ){
  t.AppendStringChunk( 1, "XYZ" );
}
```

deleteRow method

Deletes the current row.

Syntax

deleteRow( )

deleteAllRows method

Deletes all rows in the table.

Syntax

deleteAllRows( )

Remarks

In some applications, it can be useful to delete all rows from a table before downloading a new set of data into the table. Rows can be deleted from the UltraLite database without being deleted from the consolidated database using the Connection.startSynchronizationDelete method.

findBegin method

Prepares to perform a new find on this table.

Syntax

findBegin( )

Remarks

The value(s) for which to search are specified by calling the appropriate set*Type* method(s) on the columns in the index with which this table was opened.

findFirst method

Move forward through the table from the beginning, looking for a row that exactly matches a value or full set of values in the current index.

Syntax

Boolean **findFirst( )**

Returns

true if successful, **false** otherwise

Remarks

To specify the value for which to search, set the column value for each column in the index. The cursor is left on the first row that exactly matches the index value. On failure the cursor position is after the last row (isEOF).

Each search must be preceded by a call to the findBegin method.

See also

- “ findBegin method” on page 148
- “ isEOF method” on page 98

findFirstForColumns method

Move forward through the table from the beginning, looking for a row that exactly matches a value or partial set of values in the current index.

Syntax

Boolean **findFirstForColumns(**
  UInt16 *numColumns*
)

Parameters

- **numColumns** For composite indexes, the number of columns to use in the lookup. For example, if you have a three column index, and you want to look up a value that matches based on the first column only, you should set the value for the first column, and then supply a **numColumns** value of **1**.

Returns

true if successful, **false** otherwise

Remarks

To specify the value for which to search for, set the column value for each column in the index. The cursor is left on the first row that exactly matches the index value. On failure the cursor position is after the last row (isEOF).

Each search must be preceded by a call to the findBegin method.

See also

- “ findBegin method” on page 148
- “ isEOF method” on page 98

findLast method

Move backward through the table from the end, looking for a row that exactly matches a value or full set of values in the current index.

Syntax

Boolean **findLast( )**

Returns

true if successful, **false** otherwise.

Remarks

To specify the value for which to search, set the column value for each column in the index. The cursor is left on the first row found that exactly matches the index value. On failure the cursor position is before the first row (isBOF).

Each search must be preceded by a call to the findBegin method.

See also

- “ findBegin method” on page 148
- “ isBOF method” on page 97

findLastForColumns method

Move backward through the table from the end, looking for a row that exactly matches a value or partial set of values in the current index.

Syntax

Boolean **findLastForColumns(** UInt16 *numColumns* **)**

Parameters

- ♦ **numColumns** For composite indexes, the number of columns to use in the lookup. For example, if you have a three column index, and you want to look up a value that matches based on the first column only, you should set the value for the first column, and then supply a **numColumns** value of **1**.

Returns

true if successful, **false** otherwise.

Remarks

To specify the value for which to search, set the column value for each column in the index. The cursor is left on the first row found that exactly matches the index value. On failure the cursor position is before the first row (isBOF).

Each search must be preceded by a call to the findBegin method.

See also

- ♦ " findBegin method" on page 148
- ♦ " isBOF method" on page 97

findNext method

Continues a findFirst search by moving forward through the table from the current position, looking to see if the next row exactly matches a value or full set of values in the current index.

Syntax

Boolean **findNext( )**

Returns

true if successful, **false** otherwise.

Remarks

The cursor is left on the next row if it exactly matches the index value. On failure the cursor position is after the last row (isEOF).

The findNext method behavior is undefined if the column values being searched for are modified during a row update.

findNextForColumns method

Continues a findFirst search by moving forward through the table from the current position, looking to see if the next row exactly matches a value or partial set of values in the current index.

Syntax

Boolean **findNextForColumns(** UInt16 *numColumns***)**

Parameters

- **numColumns** For composite indexes, the number of columns to use in the lookup. For example, if you have a three column index, and you want to look up a value that matches based on the first column only, you should set the value for the first column, and then supply a **numColumns** value of **1**.

Returns

true if successful, **false** otherwise.

Remarks

The cursor is left on the next row if it exactly matches the index value. On failure the cursor position is after the last row (isEOF).

The findNext method behavior is undefined if the column values being searched for are modified during a row update.

findPrevious method

Continues a findLast search by moving backward through the table from the current position, looking to see if the previous row exactly matches a value or full set of values in the current index.

Syntax

Boolean **findPrevious( )**

Returns

true if successful, **false** otherwise.

Remarks

The cursor is left on the previous row if it exactly matches the index value. On failure the cursor position is before the first row (isBOF).

The findPrevious method behavior is undefined if the column values being searched for are modified during a row update.

findPreviousForColumns method

Continues a findLast search by moving backward through the table from the current position, looking to see if the previous row exactly matches a value or partial set of values in the current index.

Syntax

Boolean **findPreviousForColumns(**
  UInt16 *numColumns*
)

Parameters

- **numColumns** For composite indexes, the number of columns to use in the lookup. For example, if you have a three column index, and you want to look up a value that matches based on the first column only, you should set the value for the first column, and then supply a **numColumns** value of **1**.

Returns

true if successful, **false** otherwise.

Remarks

The cursor is left on the previous row if it exactly matches the index value. On failure the cursor position is before the first row (isBOF).

The findPrevious method behavior is undefined if the column values being searched for are modified during a row update.

getBoolean method

Returns the value for the specified column as a Boolean.

Syntax

Boolean **getBoolean(** UInt16 *index* **)**

Parameters

- **index** The ID number of the column. The first column in the result set has an ID of one.

getBytes method

Returns the value for the specified column as an array of bytes.

Syntax

Array **getBytes(** UInt16 *index* **)**

Parameters

- **index** The ID number of the column. The first column in the result set has an ID of one.

Remarks

Only valid for columns of type SQLType.BINARY or SQLType.LONGBINARY.

getBytesSection method

Copies a subset of the contents of the specified SQLType.LONGBINARY column, beginning at the specified offset, to the specified offset of the destination byte array.

Syntax

```
UInt32 getBytesSection(
  UInt16 index
  UInt32 srcOffset,
  Array  dst,
  UInt32 dstOffset,
  UInt32 count
)
```

Parameters

index The 1-based ordinal of the column containing the binary data.

srcOffset The start position in the column value. Zero is the beginning of the value.

dst The destination array.

dstOffset The start position in the destination array.

count The number of bytes to be copied

Returns

The number of bytes read.

Remarks

The bytes at position srcOffset (starting from 0) through srcOffset+count-1 of the source column are copied into positions dstOffset through dstOffset+count-1, respectively, of the destination array. If the end of the value is encountered before count bytes are copied, the remainder of the destination array is left unchanged.

If any of the following is true, an Error is thrown, Connection.sqlCode set to SQLError.SQLE_INVALID_PARAMETER and the destination is not modified:

- The dst argument is null
- The srcOffset argument is negative
- The dstOffset argument is negative
- The count argument is negative
- dstOffset + count is greater than dst.length, the length of the destination array.

getDate method

Returns the value as a Date.

Syntax

Date **getDate(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getDouble method

Returns the value as a Double.

Syntax

Double **getDouble(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getFloat method

Returns the value for the specified column.

Syntax

Float **getFloat(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getInt method

Returns the value for the specified column.

Syntax

Int32 **getInt(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getLong method

Returns the value for the specified column.

Syntax

Int64 **getLong(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getRowCount method

Returns the number of rows in the result set.

Syntax

UInt32 **getRowCount( )**

getShort method

Returns the value as an Int16.

Syntax

Int16 **getShort(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getString method

Returns the value as a String.

Syntax

String **getString(** UInt32 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getStringChunk method

Copies a subset of the value for the specified SQLType.LONGVARCHAR column, starting at the specified offset, to the String object.

Syntax

String **getStringChunk(**
  UInt16 *index*,
  UInt32 *srcOffset*,
  UInt32 *count*
)

Parameters

- **index** The 1-based ordinal in the result set to get

- **srcOffset** The o-based start position in the string value.
- **count** The number of characters to be copied.

Returns

The string, with specified characters copied.

getTime method

Returns the value as a Date.

Syntax

Date **getTime(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getTimestamp method

Returns the value as a Date.

Syntax

Date **getTimestamp(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getULong method

Returns the value as an unsigned 64-bit integer.

Syntax

UInt64 **getULong(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

getUUID method

Returns the value of the column as a UUID.

Syntax

UUID **getUUID(** UInt16 *index* **)**

Parameters

index The 1-based ordinal in the result set to get.

Remarks

The column must be of type SQLType.BINARY with length 16.

insert method

Inserts a new row with the current column values (specified using the set methods).

Syntax

insert()

Remarks

Each insert must be preceded by a call to insertBegin.

insertBegin method

Prepares to insert a new row into this table by setting all current column values to their default values.

Syntax

insertBegin( )

Remarks

Call the appropriate set*Type* method(s) to specify the non-default values that are to be inserted.

The row is not actually inserted and the data in the row is not actually changed until you execute the insert method, and that change is not permanent until it is committed.

lookupBackward method

Move backward through the table from the end, looking for a row that matches or is less than a value or full set of values in the current index.

Syntax

Boolean **lookupBackward( )**

Returns

true if successful, **false** otherwise.

Remarks

To specify the value for which to search, set the column value for each column in the index. The cursor is left on the first row that matches or is less than the index value. On failure (no rows less than the value being looked for) the cursor position is before the first row (isBOF).

Each search must be preceded by a call to the lookupBegin method.

lookupBackwardForColumns method

Move backward through the table from the beginning, looking for a row that matches or is less than a value or partial set of values in the current index.

Syntax

Boolean **lookupBackwardForColumns(** UInt16 *numColumns* **)**

Parameters

- ♦ **numColumns** For composite indexes, the number of columns to use in the lookup. For example, if you have a three column index, and you want to look up a value that matches based on the first column only, you should set the value for the first column, and then supply a **numColumns** value of **1**.

Returns

true if successful, **false** otherwise.

Remarks

To specify the value for which to search, set the column value for each column in the index. The cursor is left on the first row that matches or is less than the index value. On failure (no rows less than the value being looked for) the cursor position is before the first row (isBOF).

Each search must be preceded by a call to the lookupBegin method.

lookupBegin method

Prepares to perform a new lookup on this table.

Syntax

lookupBegin( )

Remarks

The value(s) for which to search are specified by calling the appropriate set*Type* method(s) on the columns in the index with which this table was opened.

lookupForward method

Move forward through the table from the beginning, looking for a row that matches or is greater than a value or full set of values in the current index.

Syntax

Boolean **lookupForward( )**

Returns

true if successful, **false** otherwise.

Remarks

To specify the value for which to search, set the column value for each column in the index. The cursor is left on the first row that matches or is greater than the index value. On failure (no rows greater than the value being looked for) the cursor position is after the last row (isEOF).

Each search must be preceded by a call to the lookupBegin method.

lookupForwardForColumns method

Move forward through the table from the beginning, looking for a row that matches or is greater than a value or partial set of values in the current index.

Syntax

Boolean **lookupForwardForColumns(** UInt16 *numColumns* **)**

Parameters

♦ **numColumns** For composite indexes, the number of columns to use in the lookup. For example, if you have a three column index, and you want to look up a value that matches based on the first column only, you should set the value for the first column, and then supply a **numColumns** value of **1**.

Returns

true if successful, **false** otherwise.

Remarks

To specify the value for which to search, set the column value for each column in the index. The cursor is left on the first row that matches or is greater than the index value. On failure (no rows greater than the value being looked for) the cursor position is after the last row (isEOF).

Each search must be preceded by a call to the lookupBegin method.

isBOF method

Returns **true** if successful, **false** otherwise.

Syntax

Boolean **isBOF( )**

isEOF method

Returns **true** if successful, **false** otherwise.

Syntax

Boolean **isEOF( )**

isNull method

Returns **true** if the value is null, **false** otherwise.

Syntax

Boolean **isNull(** Uint16 *index* **)**

Parameters

index	The column index value.

isOpen method

Returns **true** if the ResultSet is open, **false** otherwise.

Syntax

Boolean **isOpen( )**

moveAfterLast method

Moves to a position after the last row of the ULResultSet.

Syntax

Boolean **moveAfterLast( )**

Returns

true if successful.

false if unsuccessful. The method fails, for example, if there are no rows.

moveBeforeFirst method

Moves to a position before the first row.

Syntax

Boolean **moveBeforeFirst( )**

Returns

true if successful.

false if unsuccessful. The method fails, for example, if there are no rows.

moveFirst method

Moves to the first row.

Syntax

Boolean **moveFirst( )**

Returns

True if successful.

False if unsuccessful. The method fails, for example, if there are no rows.

moveLast method

Moves to the last row.

Syntax

Boolean **moveLast( )**

Returns

True if successful.

False if unsuccessful. The method fails, for example, if there are no rows.

moveNext method

Moves to the next row.

Syntax

Boolean **moveNext( )**

Returns

True if successful.

False if unsuccessful. The method fails, for example, if there are no rows.

movePrevious method

Moves to the previous row.

Syntax

Boolean **movePrevious( )**

Returns

true if successful.

false if unsuccessful. The method fails, for example, if there are no rows.

moveRelative method

Moves a certain number of rows relative to the current row.

Syntax

Boolean **moveRelative(** Int32 *index* **)**

Parameters

index The number of rows to move. The value can be positive, negative, or zero.

Returns

true if successful.

false if unsuccessful. The method fails, for example, if there are no rows.

Remarks

Relative to the current position of the cursor in the result set, positive index values move forward in the result set, negative index values move backward in the result set and zero does not move the cursor.

open method

Opens this table for data access using its primary key.

Syntax

open()

openWithIndex method

Opens this table for data access using the specified index.

Syntax

openWithIndex(String *index***)**

Parameters

- ♦ **index** The name of the index with which to open the table. If null, the primary key is used.

setBoolean method

Sets the value for the specified column using a **boolean**.

Syntax

setBoolean(short *columnID*, boolean *value***)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an **insert** or **update**, and that change is not permanent until it is committed.

Example

The following statement sets the value for the first column to **false**:

```
t.setBoolean( 1, false );
```

setBytes method

Sets the value for the specified column using an array of **byte**s.

Syntax

setBytes(UInt16 *columnID*, Array *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

Suitable for columns of type **SQLType.BINARY** or **SQLType.LONGBINARY** only. The data in the row is not actually changed until you execute an **insert** or **update**, and that change is not permanent until it is committed.

Example

The following statements set the value of the first column:

```
var blob = new Array( 3 );
blob[ 0 ] = 78;
blob[ 1 ] = 0'
blob[ 2 ] = 68;
t.setBytes( 1, blob );
```

setDate method

Sets the value for the specified column using a **Date**.

Syntax

setDate(UInt16 *columnID*, Date *value***)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an insert or update, and that change is not permanent until it is committed.

Example

The following statement sets the value of the first column to 2004/09/27:

```
t.setDate(
  1, new Date( 2002,9,27,0,0,0,0 )
);
```

setDouble method

Sets the value for the specified column using a **double**.

Syntax

setDouble(UInt16 *columnID*, Double *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an insert or update, and that change is not permanent until it is committed.

Example

The following example sets the value of the first column:

```
t.setDouble( 1, Number.MAX_VALUE );
```

setFloat method

Sets the value for the specified column using a Float.

Syntax

setFloat(UInt16 *columnID*, Float *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an insert or update, and that change is not permanent until it is committed.

Example

The following statement sets the value of the first column:

```
t.setFloat(
   1,
   (2 - Math.pow(2,-23)) * Math.pow(2,127)
);
```

setInt method

Sets the value for the specified column using an Integer.

Syntax

setInt(UInt16 *columnID*, Int32 *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an insert or update, and that change is not permanent until it is committed.

Example

The following statement sets the value of the first column to 2147483647:

```
t.setInt( 1, 2147483647 );
```

setLong method

Sets the value for the specified column using an Int64.

Syntax

setLong(UInt16 *columnID*, Int64 *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an insert or update, and that change is not permanent until it is committed.

Example

The following statement sets the value of the first column to 9223372036854770000:

```
t.setLong( 1, 9223372036854770000 );
```

setNull method

Sets a column to the SQL NULL.

Syntax

setNull(UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

Remarks

The data is not actually changed until you execute an insert or update, and that change is not permanent until it is committed.

setShort method

Sets the value for the specified column using a UInt16.

Syntax

setShort(UInt16 *columnID*, Int16 *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an insert or update, and that change is not permanent until it is committed.

Example

The following statement sets the value of the first column to 32767:

```
t.setShort( 1, 32767 );
```

setString method

Sets the value for the specified column using a String.

Syntax

setString(UInt16 *columnID*, String *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an insert or update, and that change is not permanent until it is committed.

Example

The following statement sets the value of the first column to **abc**.

```
t.setString( 1, "abc" );
```

setTime method

Sets the value for the specified column using a Date.

Syntax

setTime(UInt16 *columnID*, Date *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an insert or update, and that change is not permanent until it is committed.

Example

The following statement sets the value for the first column to 18:02:13:0000:

```
t.setTime(
  1, new Date( 1966,4,1,18,2,13,0 )
);
```

setTimestamp method

Sets the value for the specified column using a Date.

Syntax

setTimestamp(UInt16 *columnID*, Date *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an insert or update, and that change is not permanent until it is committed.

Example

The following statement sets the value of the first column to 1966/04/01 18:02:13:0000:

```
t.setTimestamp(
  1, new Date( 1966,4,1,18,2,13,0 )
);
```

setToDefault method

Sets the value for the specified column to its default value.

Syntax

setToDefault(UInt16 *columnID* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.

Remarks

The data in the row is not actually changed until you execute an insert or update, and that change is not permanent until it is committed.

setULong method

Sets the value for the specified column using a 64-bit integer treated as an unsigned value.

Syntax

setULong(UInt16 *columnID*, UInt64 *value* **)**

Parameters

- **columnID** The ID number of the column. The first column in the table has an ID value of one.
- **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an insert or update, and that change is not permanent until it is committed.

Example

The following statement sets the value for the first column:

```
t.setULong(
  1, 9223372036854770000 * 4096
);
```

setUUID method

Sets the value for the specified column using a UUID.

Syntax

setUUID(UInt16 *columnID*, UUID *value* **)**

Parameters

- ♦ **columnID** The ID number of the column. The first column in the table has an ID value of one.
- ♦ **value** The new value for the column.

Remarks

The data in the row is not actually changed until you execute an insert or update, and that change is not permanent until it is committed. Only valid for columns of type SQLType.BINARY and length 16.

Example

The following statement sets a new UUID value for the first column in the table:

```
t.setUUID( 1, conn.getNewUUID(); );
```

See also

- ♦ "Using UUIDs" [*MobiLink - Server Administration*]

truncate method

Deletes all rows in the table while temporarily activating stop synchronization delete.

Syntax

truncate()

update method

Updates the current row with the current column values (specified using the set methods).

Syntax

update()

Remarks

Each update must be preceded by a call to updateBegin.

updateBegin method

Prepares to update the current row in this table.

Syntax

updateBegin()

Remarks

Column values are modified by calling the appropriate set*Type* method or methods.

The data in the row is not actually changed until you execute the update, and that change is not permanent until it is committed.

Modifying columns in the index used to open the table will affect any active searches in unpredictable ways. Columns in the primary key of the table can not be updated.

UUID class

Represents a UUID. A UUID (Universally Unique Identifer) or GUID (Globally Unique Identifier) is a generated value guaranteed to be unique across all computers and databases. UUIDs are stored as SQLType.BINARY(16) values in UltraLite databases and can be used to uniquely identify rows. The UUID class stores immutable UUIDs.

A UUID is associated with the Connection that created it and can no longer be converted to a string after the connection is closed.

equals method

Returns **true** if this UUID is the same as the other argument, **false** otherwise.

Syntax

Boolean **equals(** UUID *other* **)**

Parameters

♦ **other** UUID with which to compare.

toString method

Returns a string representation of this UUID.

Syntax

String **toString()**

Remarks

The string is of the format XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX, where X is a hexadecimal digit or null if the Connection associated with the UUID is closed.

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