



# BEA WebLogic Server™

## Type 4 JDBC Drivers

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BETA

# About This Document

This document explains how to use the BEA WebLogic Type 4 JDBC drivers with WebLogic Server. This document covers the following topics:

- [Chapter 1, “Using WebLogic Type 4 JDBC Drivers,”](#) provides information about connecting to a database with BEA WebLogic Type 4 JDBC drivers.
- [Chapter 2, “The DB2 Driver,”](#) provides detailed information about the DB2 driver.
- [Chapter 3, “The Informix Driver,”](#) provides detailed information about the Informix driver.
- [Chapter 4, “The MS SQL Server Driver”](#) provides detailed information about the Microsoft SQL Server driver.
- [Chapter 5, “The Oracle Driver,”](#) provides detailed information about the Oracle driver.
- [Chapter 6, “The Sybase Driver,”](#) provides detailed information about the Sybase driver.
- [Appendix A, “JDBC Support”](#) lists support for standard and extension JDBC methods.
- [Appendix B, “GetTypeInfo,”](#) provides results returned from the method `DataBaseMetaData.getTypeinfo` for all of the BEA WebLogic Type 4 JDBC drivers.
- [Appendix C, “SQL Escape Sequences for JDBC,”](#) describes the scalar functions supported for the BEA WebLogic Type 4 JDBC drivers. Your data store may not support all of these functions.
- [Appendix E, “Tracking JDBC Calls with WebLogic JDBC Spy,”](#) describes how to configure the BEA WebLogic JDBC Spy, which logs JDBC usage.

## What You Need to Know

This document is intended for programmers or administrators that want to use the BEA WebLogic Type 4 JDBC drivers to connect to a database through WebLogic Server. This document assumes that you are familiar with JDBC programming and JDBC configuration with WebLogic Server. For more information about these topics, see:

- *[Configuring and Managing WebLogic JDBC](#)*
- *[Programming WebLogic JDBC](#)*

## Product Documentation on the dev2dev Web Site

BEA product documentation, along with other information about BEA software, is available from the BEA Web site:

<http://e-docs.bea.com>

To view the documentation for a particular product, select that product from the list on the documentation page. The home page for the complete documentation set for the product and release you have selected is displayed.

## Contact Us!

Your feedback on the BEA WebLogic Server documentation is important to us. Send us e-mail at **[docsupport@bea.com](mailto:docsupport@bea.com)** if you have questions or comments. Your comments will be reviewed directly by the BEA professionals who create and update the WebLogic Server documentation.

In your e-mail message, please indicate that you are using the documentation for BEA WebLogic Server 8.1.

If you have any questions about this version of BEA WebLogic Server, or if you have problems installing and running BEA WebLogic Server, contact BEA Customer Support at **<http://support.bea.com>**. You can also contact Customer Support by using the contact information provided on the quick reference sheet titled “BEA Customer Support,” which is included in the product package.

When contacting Customer Support, be prepared to provide the following information:

- Your name, e-mail address, phone number, and fax number
- Your company name and company address
- Your machine type and authorization codes

- The name and version of the product you are using
- A description of the problem and the content of pertinent error messages

## Documentation Conventions

The following documentation conventions are used throughout this document.

Convention	Item
Ctrl+Tab	Indicates that you must press two or more keys simultaneously.
<i>italics</i>	Indicates emphasis or book titles.
<b>bold</b>	Emphasizes important information. Also indicates button, menu, and icon names on which you can act. For example, click <b>Next</b> .
monospace text	<p>Indicates <i>user input</i>, as shown in the following examples:</p> <ul style="list-style-type: none"> <li>• Filenames: config.xml</li> <li>• Pathnames: BEAHOME/config/examples</li> <li>• Commands: java -Dbea.home=BEA_HOME</li> <li>• Code: public TextMsg createTextMsg(</li> </ul> <p>Indicates <i>computer output</i>, such as error messages, as shown in the following example:</p> <pre>Exception occurred during event dispatching:java.lang.ArrayIndexOutOfBoundsException: No such child: 0</pre>
<b>monospace boldface text</b>	<p>Identifies significant words in code.</p> <p><i>Example:</i></p> <pre>void <b>commit</b> ( )</pre>
<i>monospace italic text</i>	<p>Identifies variables in code.</p> <p><i>Example:</i></p> <pre>String <i>expr</i></pre>
{ }	Indicates a set of choices in a syntax line. The braces themselves should never be typed.
[ ]	<p>Indicates optional items in a syntax line. The brackets themselves should never be typed.</p> <p><i>Example:</i></p> <pre>java utils.MulticastTest -n name [-p portnumber]</pre>

Convention	Item
	<p>Separates mutually exclusive choices in a syntax line. The symbol itself should never be typed.</p> <p><i>Example:</i></p> <pre>java weblogic.deploy [list deploy update]</pre>
...	<p>Indicates one of the following in a command line:</p> <ul style="list-style-type: none"><li>• That an argument can be repeated several times in a command line</li><li>• That the statement omits additional optional arguments</li><li>• That you can enter additional parameters, values, or other information</li></ul> <p>The ellipsis itself should never be typed.</p> <p><i>Example:</i></p> <pre>buildobjclient [-v] [-o name] [-f "file1.cpp file2.cpp file3.cpp . . ."]</pre>
.	<p>Indicates the omission of items from a code example or from a syntax line. The vertical ellipsis itself should never be typed.</p>

# Using WebLogic Type 4 JDBC Drivers

BEA WebLogic Type 4 JDBC drivers provide JDBC access through WebLogic Server. They deliver high-performance access to industry-leading data stores across the Internet and intranets. The BEA WebLogic Type 4 JDBC drivers are optimized for the Java environment, allowing you to incorporate Java technology and extend the functionality and performance of your existing system.

The following sections provide more information about the BEA WebLogic Type 4 JDBC drivers:

- [“JDBC Specification Compliance” on page 1-2](#)
- [“Installation” on page 1-2](#)
- [“License Requirements” on page 1-2](#)
- [“Supported Databases” on page 1-3](#)
- [“Connecting Through Weblogic JDBC Data Sources” on page 1-3](#)
- [“Specifying Connection Properties” on page 1-4](#)
- [“Required Permissions for the Java Security Manager” on page 1-7](#)
- [“XA Support” on page 1-10](#)
- [“Unicode Support” on page 1-10](#)
- [“Error Handling” on page 1-11](#)

## JDBC Specification Compliance

BEA WebLogic Type 4 JDBC drivers are compliant with the JDBC 3.0 specification. They also support several JDBC 2.0 Standard Extension Features. For details, see [Appendix A, “JDBC Support.”](#)

## Installation

WebLogic Type 4 JDBC drivers are installed with WebLogic Server in the `WL_HOME\server\lib` folder, where `WL_HOME` is the directory in which you installed WebLogic Server. Driver class files are included in the manifest classpath in `weblogic.jar`, so the drivers are automatically added to your classpath on the server.

The WebLogic Type 4 JDBC drivers are not included in the manifest classpath of the WebLogic client jar files (e.g., `wlclient.jar`). To use the drivers with a WebLogic client, you must copy the following files to the client and add them to the classpath on the client:

- `wlbase.jar`
- `wlutil.jar`
- The DBMS-specific JAR file:
  - For DB2: `wldb2.jar`
  - For Informix: `wlinformix.jar`
  - For MS SQL Server: `wlsqlserver.jar`
  - For Oracle: `wloracle.jar`
  - For Sybase: `wlsybase.jar`

## License Requirements

BEA WebLogic Type 4 JDBC drivers are licensed for use with WebLogic Server and with WebLogic Server clients only. At least one of the following files must be in your classpath for the license check to succeed:

- `weblogic.jar`
- `wlclient.jar`



## Supported Databases

Table 1-1 shows the databases supported by each of the BEA WebLogic Type 4 JDBC drivers.

**Table 1-1**

Driver	Supported Databases
DB2	DB2 Universal Database (UDB) 7.1, 7.2, and 8.1 running on Windows NT, Windows 2000, Windows 2003, Windows XP, UNIX, Linux, and Linux/s390 via DRDA  DB2 6.1 and DB2 UDB 7.1 running on OS/390 and z/OS via DRDA  DB2 UDB V4R5, V5R1, and V5R2 running on iSeries and AS/400
Informix	Informix Dynamic Server with Universal Data Option 9.2 and higher running on Windows and UNIX via SQLI  Informix Dynamic Server 2000 9.2, 9.3, and 9.4 running on Windows and UNIX via SQLI
MS SQL Server	Microsoft SQL Server 7.0  Microsoft SQL Server 2000 (including SP1, SP2, and SP3a)
Oracle	Oracle8i R3 (8.1.7), Oracle9i R1 and R2, and Oracle10g
Sybase ASE	Sybase Adaptive Server Enterprise 12.0 and 12.5 running on Windows and UNIX via TDS (XA and non-XA)  Sybase Adaptive Server 11.5 and 11.9 running on Windows and UNIX via TDS (non-XA only)

## Connecting Through Weblogic JDBC Data Sources

To use the WebLogic Type 4 JDBC drivers, you create a JDBC data source in your WebLogic Server configuration and select the JDBC driver to create the physical database connections in the connection pool in the data source. Applications can then look up the data source on the JNDI tree and request a connection.

See the following related information:

- For information about JDBC and data sources in WebLogic Server, see [Configuring and Managing WebLogic JDBC](#).

- For information about requesting a connection from a data source, see “[Configuring and Using DataSources](#)” in *Programming WebLogic JDBC*.

## Specifying Connection Properties

You specify connection properties for connections in a data source using the WebLogic Server Administration Console, command line interface, or JMX API. Connection properties vary by DBMS. For the list of the connection properties specific to each BEA WebLogic Type 4 JDBC driver, see the appropriate driver chapter:

- For the DB2 driver, see “[DB2 Connection Properties](#)” on page 2-3.
- For the Informix driver, see “[Informix Connection Properties](#)” on page 3-2.
- For the MS SQL Server driver, see “[SQL Server Connection Properties](#)” on page 4-3.
- For the Oracle driver, see “[Oracle Connection Properties](#)” on page 5-2.
- For the Sybase driver, see “[Sybase Connection Properties](#)” on page 6-2.

## Limiting Connection Creation Time with LoginTimeout

When creating database connections in a JDBC data source, if the database is unavailable, the request may hang until the default system timeout expires. On some systems this can be as long as 9 minutes. The request will hang for each connection in the connection pool in the data source. To minimize this hang time, you can specify a `LoginTimeout` value for the connection. All WebLogic Type 4 JDBC Drivers support the `LoginTimeout` connection property. When you specify a `LoginTimeout` connection property, if the connection is not created immediately, the request waits for the time you specify. If the connection cannot be created within the time specified, the driver throws an SQL exception.

## Connection Failover with AlternateServers

All WebLogic Type 4 JDBC drivers support connection failover with the `AlternateServers` connection option in the connection URL. With the `AlternateServers` connection option, you can specify a list of additional database servers to connect to in case of connection creation failure. Connection attempts continue until a connection is successfully established or until all the alternate database servers have been tried the specified number of times.

The value of the `AlternateServers` connection option is a string that specifies the server name and port number of alternate servers. The `AlternateServers` string must be in the following format:

```
jdbc:bea:dbms://server1:1521;AlternateServers=(servername2:port2,servername3:port3, ..., servernameN:portN)
```

When creating database connections, the driver attempts to connect to the primary server identified by the `ServerName` and `PortNumber` connection options specified in the connection URL (`server1:1521` in the example above). If that connection attempt fails, the driver attempts to connect to the first server identified by `servername` and `port` in the `AlternateServers` connection option. If that connection attempt fails, the driver tries the next server in the list. The connection attempts continue until a connection is successfully established or until all the servers in the list have been tried. If a connection is not established after trying all the specified servers, a `SQLException` is generated.

With multiple alternate servers, it is likely that at least one connection attempt would succeed, but if no connection attempt succeeds, the driver can retry each database server (primary and alternate) for the number of attempts specified with the `ConnectionRetryCount` connection property.

For example:

```
jdbc:bea:oracle://server1:1521;SID=TEST;AlternateServers=(server2:1521,server3:1521,server4:1521)
```

With this URL, the driver attempts to connect to the `TEST` database on `server1` using port `1521`. If that connection attempt fails, the driver tries to connect to the `TEST` database on `server2`. If that attempt fails, the driver attempts to connect to `server3`, and so forth, until a connection is successfully created or until exhausting the list of alternate servers.

**Notes:** To use the `AlternateServers` connection option, you must specify the primary `ServerName` and `PortNumber` values in the URL. If you do not specify the primary `ServerName` and `PortNumber` values, the driver will not attempt to create connections.

The driver fails over to the next alternate server only if it cannot establish communication with the current server. If the driver successfully establishes communication with a server and the connection request is rejected by the server because the login information is invalid (for example, an invalid user name or password is specified) the driver will not try to connect to the next server in the list and generates a `SQLException` containing the error information returned by the database.

Connection failover provides protection for new connections only and does not preserve states for transactions or queries.

For details on configuring connection failover, see the appropriate driver chapter:

- [“Connection Failover with the DB2 Driver” on page 2-24](#)

- [“Connection Failover with the Informix Driver”](#) on page 3-12
- [“Connection Failover with the SQL Server Driver”](#) on page 4-19
- [“Connection Failover with the Oracle Driver”](#) on page 5-29
- [“Connection Failover with the Sybase Driver”](#) on page 6-15

## Using AlternateServers with WebLogic Server JDBC Data Sources

When you specify `AlternateServers` for connections in a WebLogic Server JDBC data source, the data source follows the same procedure when creating *each* connection in the connection pool in the data source: attempt to create a connection to the primary server; if that fails, then attempt to connect to the next alternate server until a connection is successfully created. If database servers start up or shut down before all connections are created, it is possible to have connections in a connection pool that connect to various database servers. Therefore, it is best to use the `AlternateServers` option with replicated databases or for read-only data.

Consider the following notes when configuring your JDBC data source with `AlternateServers`:

- Attempts to create a connection to a non-responding database will wait until the default system timeout before attempting to create a connection to an alternate server. On some systems, this can be as long as 9 minutes. To avoid this delay, set the `LoginTimeout` property for the connection. See the list of connection properties for the driver you are using.
- After database connections are initially created in the connection pool in a data source, if you want the data source to automatically recreate connections after a database fails, you must set connection testing options for the data source. See [“Connection Testing Options”](#) in the *Administration Console Online Help*.
- If connections from the data source participate in global transactions, select `Keep XA Connection Till Transaction Complete` in the Administration Console.

**Note:** You can also use JDBC multi data sources in WebLogic Server, which provide failover and load balancing at the server level, instead of the driver level. Multi data sources can provide faster failover in some network failure scenarios and also provide more control of the failover process. See [Configuring and Managing WebLogic JDBC](#) for more information.

## Client Load Balancing

*Client load balancing* helps distribute new connections in your environment so that no one server is overwhelmed with connection requests. When client load balancing is enabled, the order in which primary and alternate database servers are tried is random.

If client load balancing is not enabled, each database server is tried in sequential order, primary server first, and then, each alternate server based on their entry order in the alternate servers list.

For details on configuring client load balancing, see the appropriate driver chapter.

**Note:** You can also use JDBC multi data sources in WebLogic Server, which provide failover and load balancing at the server level, instead of the driver level. See [Configuring and Managing WebLogic JDBC](#) for more information.

## Required Permissions for the Java Security Manager

Using the BEA WebLogic Type 4 JDBC drivers with the Java Security Manager enabled requires certain permissions to be set in the security policy file of the domain. WebLogic Server provides a sample security policy file that you can edit and use. The file is located at `WL_HOME\server\lib\weblogic.policy`. The `weblogic.policy` file includes all necessary permissions for the drivers except for access to temporary files and access to `tnsnames.ora`. If you use the `weblogic.policy` file without changes, you may not need to grant any further permissions. If you use another security policy file or if you use driver features that require additional permissions, see the following sections for details about required permissions.

**Note:** Web browser applets running in the Java 2 plug-in are always running in a Java Virtual Machine with the Java Security Manager enabled.

For more information about using the Java Security Manager with WebLogic Server, see “[Using Java Security to Protect WebLogic Resources](#)” in *Programming WebLogic Security*.

## Permissions for Establishing Connections

To establish a connection to the database server, the BEA WebLogic Type 4 JDBC drivers must be granted the permissions as shown in the following examples. You must grant permissions to the `wlbase.jar` and `wlutil.jar` files as well as the jar for your specific database management system. You can grant the permissions to all JAR files in the directory or just to the specific files.

For all JAR files in the directory:

## Using WebLogic Type 4 JDBC Drivers

```
grant codeBase "file:WL_HOME${}/server${}/lib${/}-" {  
    permission java.net.SocketPermission "*", "connect";  
};
```

For individual JAR files:

```
grant codeBase "file:WL_HOME${}/server${}/lib${/}wlbase.jar" {  
    permission java.net.SocketPermission "*", "connect";  
};  
  
grant codeBase "file:WL_HOME${}/server${}/lib${/}wlutil.jar" {  
    permission java.net.SocketPermission "*", "connect";  
};
```

And one or more of the following:

```
//For DB2:  
grant codeBase "file:WL_HOME${}/server${}/lib${/}wldb2.jar" {  
    permission java.net.SocketPermission "*", "connect";  
};  
  
//For Informix:  
grant codeBase "file:WL_HOME${}/server${}/lib${/}wlinformix.jar" {  
    permission java.net.SocketPermission "*", "connect";  
};  
  
//For MS SQL Server:  
grant codeBase "file:WL_HOME${}/server${}/lib${/}wlsqserver.jar" {  
    permission java.net.SocketPermission "*", "connect";  
};  
  
//For Oracle:  
grant codeBase "file:WL_HOME${}/server${}/lib${/}wloracle.jar" {  
    permission java.net.SocketPermission "*", "connect";  
};  
  
//For Sybase:  
grant codeBase "file:WL_HOME${}/server${}/lib${/}wlsybase.jar" {  
    permission java.net.SocketPermission "*", "connect";  
};
```

where *WL\_HOME* is the directory in which you installed WebLogic Server.

In addition, if Microsoft SQL Server named instances are used, permission must be granted for the listen and accept actions as shown in the following example:

```
grant codeBase "file:WL_HOME${}/server${}/lib${/}" {
    permission java.net.SocketPermission "*", "listen, connect, accept";
};
```

## Granting Access to Java Properties

To allow the BEA WebLogic Type 4 JDBC drivers to read the value of various Java properties to perform certain operations, permissions must be granted as shown in the following example:

```
grant codeBase "file:WL_HOME${}/server${}/lib${/}" {
    permission java.util.PropertyPermission "false", "read";
    permission java.util.PropertyPermission "user.name", "read";
    permission java.util.PropertyPermission "user.language", "read";
    permission java.util.PropertyPermission "user.country", "read";
    permission java.util.PropertyPermission "os.name", "read";
    permission java.util.PropertyPermission "os.arch", "read";
    permission java.util.PropertyPermission "java.specification.version",
        "read";
};
```

where *WL\_HOME* is the directory in which you installed WebLogic Server.

You can also grant these permissions to individual files as shown in [“Permissions for Establishing Connections” on page 1-7](#).

## Granting Access to Temporary Files

Access to the temporary directory specified by the Java Virtual Machine configuration must be granted in the security policy file, typically in the security policy file used by the JVM in the *JAVA\_HOME/jre/lib/security* folder. To use insensitive scrollable cursors or to perform client-side sorting of DatabaseMetaData result sets, all code bases must have access to temporary files. The following example shows permissions that have been granted for the *C:\TEMP* directory:

```
// permissions granted to all domains
grant codeBase "file:WL_HOME${}/server${}/lib${/}" {
    // Permission to create and delete temporary files.
    // Adjust the temporary directory for your environment.
```

```
    permission java.io.FilePermission "C:\\TEMP\\-", "read,write,delete";  
};
```

where *WL\_HOME* is the directory in which you installed WebLogic Server.

You can also grant these permissions to individual files as shown in [“Permissions for Establishing Connections” on page 1-7](#).

## Granting Access to Oracle tnsnames.ora Files

If you are using an Oracle tnsnames.ora file to connect with the BEA WebLogic Type 4 Oracle driver, read access to the tnsnames.ora file must be granted to the driver in the security policy file of the Java 2 Platform.

```
grant codeBase "file:WL_HOME${/}server${/}lib${/}-" {  
    permission java.io.FilePermission "C:\\oracle\\ora92\\network\\admin\\  
        tnsnames.ora", "read";  
};
```

where *WL\_HOME* is the directory in which you installed WebLogic Server.

You can also grant these permissions to individual files as shown in [“Permissions for Establishing Connections” on page 1-7](#).

See [“Using tnsnames.ora Files” on page 5-12](#) for more information about using tnsnames.ora files to connect to Oracle databases.

## XA Support

Although the WebLogic Type 4 JDBC drivers support XA, you may need to configure your database to support XA with the drivers. See the following sections for more details:

- For DB2, see [“JTA Support” on page 2-22](#).
- For Microsoft SQL Server, see [“Installing Stored Procedures for JTA” on page 4-16](#).
- For Oracle, see [“Oracle JTA Support” on page 5-27](#).
- For Sybase, see [“Sybase JTA Support” on page 6-18](#)

## Unicode Support

Multi-lingual applications can be developed on any operating system platform with JDBC using the BEA WebLogic Type 4 JDBC drivers to access both Unicode and non-Unicode enabled



databases. Internally, Java applications use UTF-16 Unicode encoding for string data. When fetching data, the WebLogic Type 4 JDBC drivers automatically perform the conversion from the character encoding used by the database to UTF-16. Similarly, when inserting or updating data in the database, the drivers automatically convert UTF-16 encoding to the character encoding used by the database.

The JDBC API provides mechanisms for retrieving and storing character data encoded as Unicode (UTF-16) or ASCII. Additionally, the Java string object contains methods for converting UTF-16 encoding of string data to or from many popular character encodings.

## Error Handling

The BEA WebLogic Type 4 JDBC drivers report errors to the calling application by throwing `SQLExceptions`. Each `SQLException` contains the following information:

- Description of the probable cause of the error, prefixed by the component that generated the error
- Native error code (if applicable)
- String containing the XOPEN `SQLState`

## Driver Errors

An error generated by a WebLogic Type 4 JDBC driver has the following format:

```
[BEA][WebLogic Type 4 JDBC driver name]message
```

For example:

```
[BEA][SQLServer JDBC Driver]Timeout expired.
```

You may need to check the last JDBC call your application made and refer to the JDBC specification for the recommended action.

## Database Errors

An error generated by the database has the following format:

```
[BEA][WebLogic Type 4 JDBC driver name][DBMS name] message
```

For example:

```
[BEA][SQL Server JDBC Driver][SQL Server] Invalid Object Name.
```

Use the native error code to look up details about the possible cause of the error. For these details, refer to your database documentation.

BETA

# The DB2 Driver

The following sections describe how to configure and use the BEA WebLogic Type 4 JDBC driver for DB2:

- [“Database Version Support” on page 2-2](#)
- [“DB2 Driver Classes” on page 2-2](#)
- [“DB2 URL” on page 2-2](#)
- [“DB2 Connection Properties” on page 2-3](#)
- [“Sample Data Source Configuration” on page 2-13](#)
- [“Creating a DB2 Package” on page 2-14](#)
- [“Data Types” on page 2-17](#)
- [“Using a Non-Default Schema for Catalog Methods” on page 2-19](#)
- [“SQL Escape Sequences” on page 2-21](#)
- [“Isolation Levels” on page 2-21](#)
- [“Using Scrollable Cursors” on page 2-22](#)
- [“JTA Support” on page 2-22](#)
- [“Large Object \(LOB\) Support” on page 2-22](#)
- [“Performance Workaround for Batch Inserts and Updates” on page 2-23](#)

- [“Parameter Metadata Support” on page 2-23](#)
- [“Auto-Generated Keys Support” on page 2-24](#)
- [“Connection Failover with the DB2 Driver” on page 2-24](#)

## Database Version Support

The BEA WebLogic Type 4 JDBC driver for DB2 (the “DB2 driver”) supports:

- DB2 Universal Database (UDB) 7.1, 7.2, and 8.1 on Windows NT, Windows 2000, Windows 2003, Windows XP, UNIX, Linux, and Linux/s390 via DRDA
- DB2 6.1 and DB2 UDB 7.1 running on OS/390 and z/OS via DRDA
- DB2 UDB V4R5, V5R1, and V5R2 running on iSeries and AS/400

**Note:** This documentation uses the following terms to describe the different DB2 versions:

- “DB2 UDB” refers to all versions of DB2 running on Windows, UNIX, and Linux/s390 platforms
- “DB2 OS/390” refers to all versions of DB2 on OS/390 and z/OS platforms
- “DB2 iSeries” refers to all versions of DB2 on iSeries and AS/400

## DB2 Driver Classes

The driver class for the BEA WebLogic Type 4 JDBC DB2 driver is:

XA: `weblogic.jdbc.db2.DB2DataSource`

Non-XA: `weblogic.jdbc.db2.DB2Driver`

Use these driver classes when configuring a JDBC data source in your WebLogic Server domain.

## DB2 URL

To connect to a DB2 database, use the appropriate URL format:

- DB2 on Windows NT, Windows 2000, Windows 2003, Windows XP, UNIX, Linux, and Linux/s3901:

`jdbc:bea:db2://db2_server_name:port;DatabaseName=your_database`

- DB2 on OS/390, z/OS, iSeries, and AS/4001:

```
jdbc:bea:db2://db2_server_name:port;Location=db2_location;CollectionId=
your_collectionname
```

The DB2 driver also supports the `AlternateServers` option for connection failover. See [“Connection Failover with AlternateServers” on page 1-4](#).

## DB2 Connection Properties

[Table 2-1](#) lists the JDBC connection properties supported by the DB2 driver, and describes each property. You can use these connection properties in a JDBC data source configuration in your WebLogic Server domain. To specify a property, use the following form in the JDBC data source configuration:

```
property=value
```

**Note:** All connection property names are case-insensitive. For example, Password is the same as password.

**Table 2-1 DB2 Connection Properties**

Property	Description
AddToCreateTable OPTIONAL	A string that is automatically added to all Create Table statements. This field is primarily for users who need to add an “in database” clause.
AllowImplicitResultSetCloseForXA OPTIONAL	<p>{true   false}. DB2 provides a mechanism that automatically closes a result set when all rows of the result set have been fetched. This mechanism increases application performance by reducing the number of database round trips. The WebLogic DB2 driver uses this mechanism by default.</p> <p><b>Note:</b> Problems have been noted when using this mechanism. As a workaround, you should add <code>AllowImplicitResultSetCloseForXA=false</code> to the properties in your data source configuration.</p> <p>The default is true.</p>
AlternateID OPTIONAL	Sets the default DB2 schema used by unqualified SQL identifiers to the specified value. The value must be a valid DB2 schema.

Table 2-1 DB2 Connection Properties

Property	Description
AlternateServers OPTIONAL	<p>A list of alternate database servers that the driver will try to connect to if the primary database server is unavailable. The value of this property is a string that specifies each alternate server. This string has the format:</p> <pre>(servername1[:port1][;property=value[;...]], servername2[:port2][;property=value[;...]],...)</pre> <p>The server name is required for each alternate server entry. Port number and connection properties (<i>property=value</i>) are optional for each alternate server entry. If the port is unspecified, the port number of the primary server is used. If the port number of the primary server is unspecified, the default port number of 50000 is used. Optional connection properties for the driver are DatabaseName (for DB2 UDB) and LocationName (for DB2 OS/390 and iSeries). For example:</p> <pre>jdbc:bea:db2://server1:50000; DatabaseName=TEST;User=test;Password=secret; AlternateServers=(server2:50000; DatabaseName=TEST2, server3:50000;DatabaseName=TEST3)</pre> <p>contains alternate server entries for server2 and server3. The alternate server entries contain the optional DatabaseName property.</p> <p>The <a href="#">ConnectionRetryCount</a> property controls the number of times the driver retries the list of servers (primary and alternate) while attempting to establish a connection. The <a href="#">ConnectionRetryDelay</a> property sets the wait interval, in seconds, between retry attempts.</p> <p>The <a href="#">LoadBalancing</a> property controls the order in which the driver sequences through the list of servers (primary and alternate) while attempting to establish a connection.</p> <p>See “<a href="#">Connection Failover with the DB2 Driver</a>” on page 2-24 for more information about specifying connection information for primary and alternate servers.</p>

**Table 2-1 DB2 Connection Properties**

Property	Description
BatchPerformanceWorkaround OPTIONAL	<p>{true   false}. For DB2 UDB 8.1, the native DB2 batch mechanism is used. This property determines whether certain restrictions are enforced to facilitate data conversions.</p> <ul style="list-style-type: none"> <li>When set to <i>false</i>, the methods used to set the parameter values of a batch operation performed using a <code>PreparedStatement</code> must match the database data type of the column the parameter is associated with. This is because DB2 servers do not perform implicit data conversions.</li> <li>When set to <i>true</i>, this restriction is removed; however, parameter sets may not be executed in the order they were specified.</li> </ul> <p>The default is <i>false</i>.</p> <p>See <a href="#">“Performance Workaround for Batch Inserts and Updates” on page 2-23</a> for more information.</p> <p><b>Note:</b> For data sources used as a JMS JDBC store that use the WebLogic Type 4 JDBC driver for DB2, the <code>BatchPerformanceWorkaround</code> property must be set to <i>true</i>.</p>
CatalogIncludesSynonyms OPTIONAL	<p>{true   false}. When set to <i>true</i>, synonyms are included in the result sets returned from the following <code>DatabaseMetaData</code> methods: <code>getColumns</code>, <code>getProcedureColumns</code>, and <code>getIndexInfo</code>. When set to <i>false</i>, synonyms are omitted from result sets.</p> <p>The default is <i>true</i>.</p>
CatalogSchema OPTIONAL	<p>The DB2 schema to use for catalog functions. The value must be the name of a valid DB2 schema.</p> <p>The default is <code>SYSCAT</code> for DB2 UDB, <code>SYSIBM</code> for DB2 OS/390, and <code>QSYS2</code> for DB2 iSeries.</p> <p>To improve performance, views of system catalog tables can be created in a schema other than the default catalog schema. Setting this property to a schema that contains views of the catalog tables allows the driver to use those views. To ensure that catalog methods function correctly, views for specific catalog tables must exist in the specified schema. The views that are required depend on your DB2 database. See <a href="#">“Using a Non-Default Schema for Catalog Methods” on page 2-19</a> for the required views of catalog tables.</p>

**Table 2-1 DB2 Connection Properties**

Property	Description
CharsetFor65535 OPTIONAL	The code page to use to convert character data stored as bit data in character columns (Char, Varchar, Longvarchar, Char for Bit Data, Varchar for Bit Data, Longvarchar for Bit Data) defined with CCSID 65535. All character data stored as bit data retrieved from the database using columns defined with CCSID 65535 is converted using the specified code page. The value must be a string containing the name of a valid code page supported by your Java Virtual Machine, for example, CharsetFor65535=CP950. This property has no effect when writing data to character columns defined with CCSID 65535.
CodePageOverride OPTIONAL	A code page to be used to convert Character and Clob data. The specified code page overrides the default database code page. All Character and Clob data retrieved from or written to the database is converted using the specified code page. The value must be a string containing the name of a valid code page supported by your Java Virtual Machine, for example, CodePageOverride=CP950.
CollectionId OPTIONAL	The collection (group of packages) to which the package is bound. This property is ignored for DB2 UDB. The default is NULLID.



**Table 2-1 DB2 Connection Properties**

Property	Description
ConnectionRetryCount OPTIONAL	<p>The number of times the driver retries connection attempts to a list of database servers (primary and alternate) until a successful connection is established. Valid values are 0 and any positive integer.</p> <p>If set to 0, the driver does not retry connections if a successful connection is not established on the driver's first pass through the list.</p> <p>The default is 0.</p> <p>For example, in the case where the following properties are specified:</p> <pre>AlternateServers=(server2:50000,server3:50000,server4:50000)</pre> <p>and</p> <pre>ConnectionRetryCount=1</pre> <p>If a connection is not successfully established on the driver's first pass through the list of database servers, the driver retries all the servers in the list only once.</p> <p>If an application sets a login timeout value (for example, using <code>DataSource.loginTimeout</code>), the login timeout takes precedence over this property. For example, if the login timeout expires, any connection attempts stop.</p> <p>The <a href="#">ConnectionRetryDelay</a> property specifies the wait interval, in seconds, used between retry attempts.</p> <p>See <a href="#">“Connection Failover with the DB2 Driver” on page 2-24</a> for more information about specifying connection information for primary and alternate servers.</p>

**Table 2-1 DB2 Connection Properties**

Property	Description
ConnectionRetryDelay OPTIONAL	<p>The number of seconds the driver will wait between connection retry attempts when <a href="#">ConnectionRetryCount</a> is set to a positive integer.</p> <p>The default is 3.</p> <p>For example, in the case where the following properties are specified:</p> <pre>AlternateServers=(server2:50000,server3:50000,server4:50000)</pre> <p>and</p> <pre>ConnectionRetryCount=2</pre> <p>and</p> <pre>ConnectionRetryDelay=3</pre> <p>If a connection is not successfully established on the driver's first pass through the list of database servers, the driver retries the list of servers twice. It waits 3 seconds between the first connection retry attempt and the second connection retry attempt.</p> <p>See <a href="#">“Connection Failover with the DB2 Driver” on page 2-24</a> for more information about specifying connection information for primary and alternate servers.</p>
CreateDefaultPackage OPTIONAL	<p>{true   false}. Determines whether the default package should be created. For DB2 OS/390 and DB2 iSeries, the package is created in the collection specified by the <a href="#">CollectionId</a> property. This would be used if the package does not yet exist.</p> <p>For more information about creating DB2 packages, see <a href="#">“Creating a DB2 Package” on page 2-14</a>.</p> <p>The default is false.</p>
DatabaseName	The name of the database to which you want to connect (used with UDB).
DynamicSections OPTIONAL	<p>Specifies the number of statements that the DB2 driver package can prepare for a single user.</p> <p>The default is 200.</p>

**Table 2-1 DB2 Connection Properties**

Property	Description
Grantee OPTIONAL	<p>Specifies the name of the schema to which you want to grant EXECUTE privileges for DB2 packages. This property is ignored if the <a href="#">GrantExecute</a> property is set to false.</p> <p>See <a href="#">“Creating a DB2 Package” on page 2-14</a> for more information about creating DB2 packages.</p> <p>The default is PUBLIC.</p>
GrantExecute OPTIONAL	<p>{true   false}. Determines whether EXECUTE privileges for DB2 packages are granted to a schema other than the one used to create them. If set to true, EXECUTE privileges are granted to the schema specified by the <a href="#">Grantee</a> property. If set to false, EXECUTE privileges are not granted to another schema.</p> <p>See <a href="#">“Creating a DB2 Package” on page 2-14</a> for more information about creating DB2 packages.</p> <p>The default is true.</p>
InsensitiveResultSetBufferSize	<p>{-1   0   <i>x</i>}. Determines the amount of memory used by the driver to cache insensitive result set data. It must have one of the following values:</p> <p>If set to -1, the driver caches all insensitive result set data in memory. If the size of the result set exceeds available memory, an <code>OutOfMemoryException</code> is generated. Because the need to write result set data to disk is eliminated, the driver processes the data more efficiently.</p> <p>If set to 0, the driver caches all insensitive result set data in memory, up to a maximum of 2 GB. If the size of the result set data exceeds available memory, the driver pages the result set data to disk. Because result set data may be written to disk, the driver may have to reformat the data to write it correctly to disk.</p> <p>If set to <i>x</i>, where <i>x</i> is a positive integer that specifies the size (in KB) of the memory buffer used to cache insensitive result set data. If the size of the result set data exceeds the buffer size, the driver pages the result set data to disk. Because the result set data may be written to disk, the driver may have to reformat the data to write it correctly to disk. Specifying a buffer size that is a power of 2 results in more efficient memory use.</p> <p>The default is 2048 (KB)</p>

**Table 2-1 DB2 Connection Properties**

Property	Description
LoadBalancing OPTIONAL	<p>{true   false}. Determines whether the driver will use client load balancing in its attempts to connect to a list of database servers (primary and alternate). The list of alternate servers is specified by the <a href="#">AlternateServers</a> property.</p> <p>If set to true, client load balancing is used and the driver attempts to connect to the list of database servers (primary and alternate servers) in random order.</p> <p>If set to false, client load balancing is not used and the driver connects to each server based on their sequential order (primary server first, then, alternate servers in the order they are specified).</p> <p>The default is false.</p> <p>For example, in the case where the following properties are specified:</p> <pre>AlternateServers=(server2:50000,server3:50000,server4:50000)</pre> <p>and</p> <pre>LoadBalancing=true</pre> <p>the driver randomly selects from the list of primary and alternate servers which server to connect to first. If that connection fails, the driver again randomly selects from this list of servers until all servers in the list have been tried or a connection is successfully established.</p> <p>See <a href="#">“Connection Failover with the DB2 Driver” on page 2-24</a> for more information about specifying connection information for primary and alternate servers.</p>
LocationName	The name of the DB2 location that you want to access (used with OS/390 and iSeries).
LoginTimeout OPTIONAL	The maximum time in seconds that attempts to create a database connection will wait. A value of 0 specifies that the timeout is the default system timeout if there is one; otherwise it specifies that there is no timeout.
PackageOwner OPTIONAL	<p>Specifies the owner of DB2 packages.</p> <p>See <a href="#">“Creating a DB2 Package” on page 2-14</a> for more information about creating DB2 packages.</p> <p>The default is NULL.</p>

**Table 2-1 DB2 Connection Properties**

Property	Description
Password	A case-sensitive password used to connect to your DB2 database. A password is required only if security is enabled on your database. If so, contact your system administrator to get your password.
PortNumber OPTIONAL	The TCP port on which the database server listens for connections. The default is 50000.
ReplacePackage OPTIONAL	<p>{true   false}. Specifies whether the current bind process should replace an existing DB2 package. On DB2 UDB, this property must be used in conjunction with <a href="#">CreateDefaultPackage</a>.</p> <p>For more information about creating DB2 packages, see <a href="#">“Creating a DB2 Package” on page 2-14</a>.</p> <p>The default is false.</p>
SecurityMechanism OPTIONAL	<p>{ClearText   EncryptedPassword   EncryptedUIDPassword}. Determines the security method the driver uses to authenticate the user to the DB2 server when establishing a connection. If the specified authentication method is not supported by the DB2 server, the connection fails and the driver generates an exception.</p> <p>If set to ClearText, the driver sends the password in clear text to the DB2 server for authentication.</p> <p>If set to EncryptedPassword, the driver sends an encrypted password to the DB2 server for authentication.</p> <p>If set to EncryptedUIDPassword, the driver sends an encrypted user ID and password to the DB2 server for authentication.</p> <p>The default is ClearText.</p> <p>Requires JDK 1.4 or higher.</p>

**Table 2-1 DB2 Connection Properties**

Property	Description
SendStreamAsBlob OPTIONAL	<p>{true   false}. Determines whether binary stream data that is less than 32K bytes is sent to the database as Long Varchar for Bit Data or Blob data. Binary stream data that is less than 32K bytes can be inserted into a Long Varchar for Bit Data column, which has a maximum length of 32K bytes, or a Blob column. Binary streams that are larger than 32K bytes can only be inserted into a Blob column. The driver always sends binary stream data larger than 32K bytes to the database as Blob data.</p> <p>If set to true, the driver sends binary stream data that is less than 32K to the database as Blob data. If the target column is a Long Varchar for Bit Data column and not a Blob column, the Insert or Update statement fails. The driver automatically retries the Insert or Update statement, sending the data as Long Varchar for Bit Data, if the stream passed into the driver is resettable. Sending binary stream data that is less than 32K bytes in length initially as a Blob significantly improves performance if the Insert or Update column is a Blob column.</p> <p>If set to false, the driver sends binary stream data that is less than 32K to the database as Long Varchar for Bit Data data. If the target column is a Blob column and not a Long Varchar for Bit Data column, the Insert or Update statement fails. The driver retries the Insert or Update statement, sending the data as Blob data.</p> <p>The default is false.</p>
ServerName	The name or IP address of the database server.
StripNewlines OPTIONAL	<p>{true   false}. Specifies whether new-line characters in a SQL statement are sent to the DB2 server. When StripNewlines=true, the DB2 driver removes all new-line characters from SQL statements.</p> <p>The default is true.</p>

**Table 2-1 DB2 Connection Properties**

Property	Description
UseCurrentSchema OPTIONAL	<p>{true   false}. Specifies whether results are restricted to the tables in the current schema if a DatabaseMetaData.getTables call is called without specifying a schema or if the schema is specified as the wildcard character %. Restricting results to the tables in the current schema improves the performance of calls for getTables methods that do not specify a schema.</p> <p>If set to true, results that are returned from the getTables method are restricted to tables in the current schema. If set to false, results of the getTables method are not restricted.</p> <p>The default is false.</p>
User	The case-sensitive user name used to connect to your DB2 database.
WithHoldCursors OPTIONAL	<p>{true   false}. Determines whether the cursor stays open on commit—either DB2 closes all open cursors (Delete cursors) after a commit or leaves them open (Preserve cursors). If set to true, the cursor behavior is Preserve. If set to false, the cursor behavior is Delete. Rolling back a transaction closes all cursors regardless of how this property is specified.</p> <p>The default is true.</p>

## Sample Data Source Configuration

[Table 2-2](#) lists configuration attributes for a sample WebLogic Server data source that uses the non-XA version of the WebLogic Type 4 DB2 JDBC driver. [Table 2-3](#) lists configuration attributes for a sample WebLogic Server data source that uses the XA version of the driver.

**Table 2-2 Data Source Attributes Using the Non- XA WebLogic Type 4 DB2 JDBC Driver**

Attribute	Value
URL	<code>jdbc:bea:db2://host:port</code>
Driver Class Name	<code>weblogic.jdbc.db2.DB2Driver</code>

**Table 2-2 Data Source Attributes Using the Non- XA WebLogic Type 4 DB2 JDBC Driver**

Attribute	Value
Properties	<i>user=username</i> <i>PortNumber=port</i> <i>ServerName=host</i> <i>DatabaseName=dbname</i> <i>batchPerformanceWorkaround=true</i> <i>AllowImplicitResultSetCloseForXA=false</i>
Password	<i>password</i>
Target	<i>server or cluster name</i>

**Table 2-3 Data Source Attributes Using the XA WebLogic Type 4 DB2 JDBC Driver**

Attribute	Value
URL	<i>jdbc:bea:db2://host:port</i>
Driver Class Name	<i>weblogic.jdbcx.db2.DB2DataSource</i>
Properties	<i>user=username</i> <i>PortNumber=port</i> <i>ServerName=host</i> <i>DatabaseName=dbname</i> <i>batchPerformanceWorkaround=true</i> <i>AllowImplicitResultSetCloseForXA=false</i>
SupportsLocalTransaction	<i>true</i> (required only for local transactions)
Password	<i>password</i>
Target	<i>server or cluster name</i>

## Creating a DB2 Package

A DB2 package is a control structure on the DB2 server produced during program preparation that is used to execute SQL statements. The DB2 driver automatically creates all DB2 packages required at connection time. If a package already exists, the driver uses the existing package to establish a connection.



**Note:** The initial connection may take a few minutes because of the number and size of the packages that must be created for the connection. Subsequent connections do not incur this delay.

By default, DB2 packages created by the DB2 driver contain 200 dynamic sections and are created in the NULLID collection (or library). In most cases, you do not need to create DB2 packages because the DB2 driver automatically creates them at connection time. If required, you can create DB2 packages in either of the following ways:

- Manually force the DB2 driver to create a package using the WebLogic Server `dbping` utility. See [“Creating a DB2 Package Using dbping” on page 2-15](#).
- Automatically create a package by setting specific connection properties in the connection URL. See [“Creating a DB2 Package Using Connection Properties” on page 2-15](#).

**Note:** Your user ID must have CREATE PACKAGE privileges on the database, or your database administrator must create packages for you.

Your user ID (the user ID listed in the JDBC data source configuration) must be the owner of the package.

The user ID creating the DB2 packages must have BINDADD privileges on the database. Consult with your database administrator to ensure that you have the correct privileges.

## Creating a DB2 Package Using dbping

To create a package on the DB2 server with the WebLogic Type 4 JDBC DB2 driver, you can use the WebLogic Server `dbping` utility. The `dbping` utility is used to test the connection between your client machine and a DBMS via a JDBC driver. Because the WebLogic Type 4 JDBC DB2 driver automatically creates a DB2 package if one does not already exist, running this utility creates a default DB2 package on the DB2 server.

## Creating a DB2 Package Using Connection Properties

You can create a DB2 package automatically by specifying specific connection properties in the initial connection URL. [Table 2-4](#) lists the connection properties you should use in your initial connection URL when you create a DB2 package:

**Note:** This method is not recommended for use with WebLogic Server JDBC data sources because every connection in the connection pool in the data source uses the same URL and connection properties. When a JDBC data source with multiple connections is created, the package would be recreated when each database connection is created.

**Table 2-4 Connection Properties for an Initial Connection URL When Creating DB2 Packages**

Property	Database
CollectionId= <i>collection_name</i> (where <i>collection_name</i> is the name of the collection or library to which DB2 packages are bound)	DB2 OS/390 and iSeries
CreateDefaultPackage=true	DB2 UDB, OS/390, and iSeries
ReplacePackage=true	DB2 UDB
DynamicSections= <i>x</i> (where <i>x</i> is a positive integer)	DB2 UDB, OS/390, and iSeries

Using CreateDefaultPackage=TRUE creates a package with a default name. If you use CreateDefaultPackage=TRUE, and you do not specify a CollectionId, the NULLID CollectionId is created.

**Note:** On DB2 UDB, you must use ReplacePackage=TRUE in conjunction with CreateDefaultPackage to create a new package; however, if a package already exists, it will be replaced when using ReplacePackage=TRUE.

**Example for DB2 UDB:**

The following URL creates DB2 packages with 400 dynamic sections. If any DB2 packages already exist, they will be replaced by the new ones being created.

```
jdbc:bea:db2://server1:50000;DatabaseName=SAMPLE;  
CreateDefaultPackage=TRUE;ReplacePackage=TRUE;DynamicSections=400
```

**Example for DB2 OS/390 and iSeries:**

The following URL creates DB2 packages with 400 dynamic sections.

```
jdbc:bea:db2://server1:50000;LocationName=SAMPLE;CollectionId=DEFAULT;  
CreateDefaultPackage=TRUE;DynamicSections=400
```

# Notes About Increasing Dynamic Sections in the DB2 Package

A dynamic section is the actual executable object that contains the logic needed to satisfy a dynamic SQL request. These sections are used for handles and prepared statements and the associated result sets.

In some cases, you may need to create DB2 packages with more than the default number of dynamic sections (200). Consider the following information if your application requires DB2 packages with a large number of dynamic sections:

- Creating DB2 packages with a large number of dynamic sections may exhaust certain server resources. In particular, you may need to increase the database parameter `PCKCACHE_SZ` to allow the larger packages to be created.
- The creation of more dynamic sections will slow down the initial creation of the DB2 package.
- Using DB2 packages with a large number of dynamic sections may impact application performance. If a small number of sections are in use at one time, there will be no impact on the application. If a large number of sections are in use at one time, the performance of the application may decrease because the database will expend resources to check all open sections for locks.
- As the number of open sections increases, so does the likelihood that a deadlock situation may occur.
- If your application is mostly executing select statements, it is best to operate in the default mode of automatically committing the database. Dynamic sections are not freed in the DB2 package until the database is committed even if the statements are closed in the application. In this mode the database will commit every time a SQL statement is executed and free all of the sections that were opened. If you need to operate in a manual commit mode, then it is advisable to commit the database as often as possible to ensure that all server resources are freed in a timely manner.
- Statements cached in the WebLogic Server prepared statement cache will keep sections in use so that the prepared statements can be reused.
- The DB2 server has a limit on dynamic sections. It is possible to try to create more sections than the server will allow you to create.

## Data Types

Table 2-5 lists the data types supported by the DB2 driver and how they are mapped to JDBC data types.

**Table 2-5 DB2 Data Types**

<b>DB2 Data Type</b>	<b>JDBC Data Type</b>
Bigint <sup>1</sup>	BIGINT
Blob <sup>2</sup>	BLOB
Char	CHAR
Char for Bit Data	BINARY
Clob	CLOB
Date	DATE
DBClob <sup>3</sup>	CLOB
Decimal	DECIMAL
Double	DOUBLE
Float	FLOAT
Integer	INTEGER
Long Varchar	LONGVARCHAR
Long Varchar for Bit Data	LONGVARBINARY
Numeric	NUMERIC
Real	REAL
Rowid <sup>4</sup>	VARBINARY
Smallint	SMALLINT
Time	TIME
Timestamp	TIMESTAMP
Varchar	VARCHAR
Varchar for Bit Data	VARBINARY

1. Bigint data type is supported only for DB2 UDB 8.1.

2. Blob data type is supported only for DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2 (see [“Large Object \(LOB\) Support” on page 2-22](#)).
3. DBClob data type is supported only for DB2 UDB 8.1, DB2 7.x OS/390, and DB2 iSeries V5R2 (see [“Large Object \(LOB\) Support” on page 2-22](#)).
4. Rowid data type is supported only for DB2 OS/390 and DB2 iSeries V5R2.

See [“GetTypeInfo” on page B-1](#) for more information about data types.

## Using a Non-Default Schema for Catalog Methods

To improve performance, views of system catalog tables can be created in a schema other than the default catalog schema. Setting the CatalogSchema property to a DB2 schema that contains views of catalog tables allows the driver to use those views. To ensure that catalog methods function correctly, views for the catalog tables listed in [Table 2-6](#) must exist in the specified schema. The views that are required depend on your DB2 database.

**Table 2-6 Catalog Tables for DB2**

Database	Catalog Tables
DB2 UDB	SYSCAT.TABLES SYSCAT.COLUMNS SYSCAT.PROCEDURES SYSCAT.PROCPARAMS SYSCAT.COLAUTH SYSCAT.TABAUTH SYSCAT.KEYCOLUSE SYSCAT.INDEXES SYSCAT.INDEXCOLUSE SYSCAT.REFERENCES SYSCAT.SYSSCHEMATA SYSCAT.TYPEMAPPINGS SYSCAT.DBAUTH

**Table 2-6 Catalog Tables for DB2 (Continued)**

Database	Catalog Tables
DB2 OS/390	SYSIBM.SYSTABCONST SYSIBM.SYSTABLES SYSIBM.SYSSYNONYMS SYSIBM.SYSCOLUMNS SYSIBM.SYSPROCEDURES SYSIBM.SYSROUTINES SYSIBM.SYSPARMS SYSIBM.SYSCOLAUTH SYSIBM.SYSTABAUTH SYSIBM.SYSKEYS SYSIBM.SYSINDEXES SYSIBM.SYSRELS SYSIBM.SYSFOREIGNKEYS SYSIBM.SYSSCHEMAAUTH SYSIBM.SYSDBAUTH
DB2 iSeries	QSYS2.SYSCST QSYS2.SYSKEYCST QSYS2.SYSPROCS QSYS2.SYSPARMS QSYS2.SYSTABLES QSYS2.SYSSYNONYMS QSYS2.SYSCOLUMNS QSYS2.SQLTABLEPRIVILEGES QSYS2.SYSKEYS QSYS2.SYSINDEXES QSYS2.SYSREFCST

## SQL Escape Sequences

See [“SQL Escape Sequences for JDBC” on page C-1](#) for information about SQL escape sequences supported by the DB2 driver.

## Isolation Levels

The DB2 driver supports the isolation levels listed in [Table 2-7](#). JDBC isolation levels are mapped to the appropriate DB2 transaction isolation levels as shown. The default isolation level is Read Committed.

**Table 2-7 Supported Isolation Levels**

JDBC Isolation Level	DB2 Isolation Level
None	No Commit <sup>1</sup>
Read Committed	Cursor Stability
Read Uncommitted	Uncommitted Read
Repeatable Read	Read Stability
Serializable	Repeatable Read

1. Supported for DB2 iSeries versions that do not enable journaling.

## Using Scrollable Cursors

The DB2 driver supports scroll-insensitive result sets and updatable result sets.

**Note:** When the DB2 driver cannot support the requested result set type or concurrency, it automatically downgrades the cursor and generates one or more SQLWarnings with detailed information.

## JTA Support

To use JDBC distributed transactions through JTA with the DB2 driver, DB2 UDB 8.1 is required.

## Large Object (LOB) Support

Retrieving and updating Blobs is supported by the DB2 driver only with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.

Retrieving and updating Clobs is supported by the DB2 driver. The DB2 driver supports Clobs up to a maximum of 2 GB with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2; it supports Clobs up to a maximum of 32 KB with all other supported DB2 database versions.

Retrieving and updating DBClobs is supported by the DB2 driver only with DB2 UDB 8.1, DB2 OS/390 7.x, and DB2 iSeries V5R2.



## Performance Workaround for Batch Inserts and Updates

For DB2 UDB 8.1 and DB2 OS/390, the DB2 driver uses the native DB2 batch mechanism. By default, the methods used to set the parameter values of a batch performed using a `PreparedStatement` must match the database data type of the column with which the parameter is associated.

DB2 servers do not perform any implicit data conversions, so specifying parameter values that do not match the column data type causes the DB2 server to generate an error. For example, to set the value of a Blob parameter using a stream or byte array when the length of the stream or array is less than 32K, you must use the `setObject` method and specify the target JDBC type as `BLOB`; you cannot use `setBinaryStream` or `setBytes` methods.

To remove the method-type restriction, set the `BatchPerformanceWorkaround` connection property to `true` (see [“DB2 Connection Properties” on page 2-3](#)). For example, you can use the `setBinaryStream` or `setBytes` methods to set the value of a Blob parameter regardless of the length of the stream or array; however, the parameter sets may not be executed in the order they were specified.

**Notes:** When you create a data source in the Administration Console, the Administration Console sets the `BatchPerformanceWorkaround` connection property to `true` by default.

For data sources used as a JMS JDBC store that use the WebLogic Type 4 JDBC driver for DB2, the `BatchPerformanceWorkaround` property *must* be set to `true`.

## Parameter Metadata Support

The DB2 driver supports returning parameter metadata for all statements with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.

For all other supported DB2 database versions, the DB2 driver supports returning parameter metadata for the following forms of SQL:

- `INSERT INTO foo VALUES (?, ?, ?)`
- `INSERT INTO foo (col1, col2, col3) VALUES (?, ?, ?)`
- `UPDATE foo SET col1=?, col2=?, col3=? WHERE col1 operator ? [{AND | OR} col2 operator ?]`

where *operator* is any of the following SQL operators: `=`, `<`, `>`, `<=`, `>=`, and `<>`.

## Auto-Generated Keys Support

The DB2 driver supports retrieving the values of auto-generated keys. An auto-generated key returned by the DB2 driver is the value of an auto-increment column.

How you return those values depends on whether you are using an Insert statement that contains parameters:

- When using an Insert statement that does not contain any parameters, the DB2 driver supports the following form of the `Statement.execute` and `Statement.executeUpdate` methods to inform the driver to return the values of auto-generated keys:
  - `Statement.execute (String sql, int autoGeneratedKeys)`
  - `Statement.executeUpdate (String sql, int autoGeneratedKeys)`
- When using an Insert statement that contains parameters, the DB2 driver supports the following form of the `Connection.prepareStatement` method to inform the driver to return the values of auto-generated keys:
  - `Connection.prepareStatement (String sql, int autoGeneratedKeys)`

The application fetches the values of generated keys from the driver using the `Statement.getGeneratedKeys` method.

## Connection Failover with the DB2 Driver

The DB2 driver allows you to specify a list of alternate database servers that are tried at connection time if the primary server is not accepting connections using the `AlternateServers` property. Connection attempts continue until a connection is successfully established or until all the database servers (primary and alternate) have been tried the specified number of times.

## Specifying Primary and Alternate Servers

Connection information for primary and alternate servers is specified in the URL of a WebLogic JDBC data source. For example, the following connection URL for the DB2 driver specifies connection information for the primary and alternate servers:

```
jdbc:bea:db2://server1:50000;DatabaseName=TEST;User=test;  
Password=secret;AlternateServers=(server2:50000;DatabaseName=TEST2,  
server3:50000;DatabaseName=TEST3)
```

In this example:

```
...server1:50000;DatabaseName=TEST...
```

is the part of the connection URL that specifies connection information for the primary server. Alternate servers are specified using the `AlternateServers` property. For example:

```
...;AlternateServers=(server2:50000;DatabaseName=TEST2,
server3:50000;DatabaseName=TEST3)
```

## Using the AlternateServers Property

Connection information for alternate servers is specified using the `AlternateServers` property in the connection URL in a WebLogic JDBC data source. The value of the `AlternateServers` property is a string that has the following format:

```
(servername1[:port1][;property=value[;...]],servername2[:port2]
[;property=value[;...]],...)
```

where:

*servername1* is the IP address or server name of the first alternate database server,  
*servername2* is the IP address or server name of the second alternate database server, and so on.

The IP address or server name is required for each alternate server entry.

*port1* is the port number on which the first alternate database server is listening, *port2* is the port number on which the second alternate database server is listening, and so on. Port numbers are optional for each alternate server entry. If unspecified, the port number specified for the primary server is used. If a port number is unspecified for the primary server, a default port number of 50000 is used.

*property=value* is one of the following connection properties: `DatabaseName` or `LocationName`. These connection properties are optional for each alternate server entry. For example:

```
jdbc:bea:db2://server1:50000;DatabaseName=TEST;User=test;
Password=secret;AlternateServers=(server2:50000;DatabaseName=TEST2,
server3:50000;DatabaseName=TEST2)
```

or

```
jdbc:bea:db2://server1:50000;LocationName=TEST;User=test;
Password=secret;AlternateServers=(server2:50000;LocationName=TEST2,
server3:50000;LocationName=TEST3)
```

If you do not specify an optional connection property in an alternate server entry, the connection to that alternate server uses the property specified in the URL for the primary server. For example, if you specify `DatabaseName=TEST` for the primary server, but do not specify a database name

in the alternate server entry as shown in the following URL, the driver uses the database name specified for the primary server and tries to connect to the TEST database on the alternate server:

```
jdbc:bea:db2://server1:50000;DatabaseName=TEST;User=test;  
Password=secret;AlternateServers=(server2:50000,server3:50000)
```

## Specifying Connection Retry

Connection retry allows the DB2 driver to retry connections to a list of database servers (primary and alternate) until a successful connection is established. You use the `ConnectionRetryCount` and `ConnectionRetryDelay` properties to enable and control how connection retry works. For example:

```
jdbc:bea:db2://server1:50000;DatabaseName=TEST;User=test;  
Password=secret;AlternateServers=(server2:50000;DatabaseName=TEST2,  
server3:50000;DatabaseName=TEST3);ConnectionRetryCount=2;  
ConnectionRetryDelay=5
```

In this example, if a successful connection is not established on the DB2 driver's first pass through the list of database servers (primary and alternate), the driver retries the list of servers in the same sequence twice (`ConnectionRetryCount=2`). If a successful connection is not established on the first retry pass through the list of servers, the driver makes another pass through the list of servers. Because the connection retry delay has been set to five seconds (`ConnectionRetryDelay=5`), the driver waits five seconds between retry passes.

## Connection Failover Properties

[Table 2-8](#) summarizes the connection properties that control how connection failover works with the DB2 driver. See [“DB2 Connection Properties” on page 2-3](#) for details about configuring each property.

**Table 2-8 Summary: Connection Failover Properties for the DB2 Driver**

Property	Characteristic
AlternateServers	List of alternate database servers. An IP address or server name identifying each server is required. Port number and supported connection properties (DatabaseName or LocationName) are optional. If the port number is unspecified, the port specified for the primary server is used. If a port number is not specified for the primary server, a default port number of 50000 is used.
ConnectionRetryCount	Number of times the driver retries the list of database servers (primary and alternate) until a successful connection is established. The default is 0 (connection retry is not used).
ConnectionRetryDelay	Wait interval, in seconds, used between attempts to connect to a list of database servers (primary and alternate) when the ConnectionRetryCount property is set to a positive integer. The default is 3.
DatabaseName	The name of the database to which you want to connect.
LoadBalancing	Sets whether the driver will use client load balancing in its attempts to connect to the list of database servers (primary and alternate). If client load balancing is enabled, the driver uses a random pattern instead of a sequential pattern in its attempts to connect. The default is false (client load balancing is not used).
PortNumber	Port listening for connections on the primary database server. The default port number is 50000.
ServerName	IP address or server name of the primary database server.

See [“Connection Failover with AlternateServers” on page 1-4](#) and [“Client Load Balancing” on page 1-7](#) for overviews of connection failover and client load balancing.

BETA

# The Informix Driver

The following sections describe how to configure and use the BEA WebLogic Type 4 JDBC Informix driver:

- [“Informix Database Version Support” on page 3-1](#)
- [“Informix Driver Classes” on page 3-2](#)
- [“Informix URL” on page 3-2](#)
- [“Informix Connection Properties” on page 3-2](#)
- [“Sample Data Source Configuration” on page 3-8](#)
- [“Data Types” on page 3-10](#)
- [“SQL Escape Sequences” on page 3-11](#)
- [“Isolation Levels” on page 3-11](#)
- [“Using Scrollable Cursors” on page 3-11](#)
- [“Blob and Clob Searches” on page 3-12](#)
- [“Auto-Generated Keys Support” on page 3-12](#)

## Informix Database Version Support

The BEA WebLogic Type 4 JDBC Informix driver (the “Informix driver”) supports:

- Informix Dynamic Server with Universal Data Option 9.2 and higher
- Informix Dynamic Server 2000 9.2, 9.3, and 9.4

## Informix Driver Classes

The driver classes for the BEA WebLogic Type 4 JDBC Informix driver are:

XA: `weblogic.jdbcx.informix.InformixDataSource`

Non-XA: `weblogic.jdbc.informix.InformixDriver`

Use these driver classes when configuring a JDBC data source in your WebLogic Server domain.

## Informix URL

To connect to an Informix database, use the following URL format:

```
jdbc:bea:informix://dbserver1:1543;informixServer=dbserver1;databaseName=d  
bname
```

The Informix driver also supports the `AlternateServers` option for connection failover. See [“Connection Failover with AlternateServers” on page 1-4](#).

## Informix Connection Properties

[Table 3-1](#) lists the JDBC connection properties supported by the Informix driver, and describes each property. You can use these connection properties in a JDBC data source configuration in your WebLogic Server domain. To specify a property, use the following form in the JDBC data source configuration:

```
property=value
```

**Note:** All connection property names are case-insensitive. For example, Password is the same as password.



**Table 3-1 Informix Connection String Properties**

Property	Description
AlternateServers OPTIONAL	<p>A comma-separated list of alternate database servers the driver will try to connect to if the primary database server is unavailable. The value of this property is a string that specifies each alternate server. This string has the format:</p> <pre>(servername1[:port1][;property=value[;...]], servername2[:port2][;property=value[;...]],...)</pre> <p>The server name is required for each alternate server entry. Port number and connection properties (<i>property=value</i>) are optional for each alternate server entry. If the port is unspecified, the port number of the primary server is used. Optional connection properties for the driver are <a href="#">DatabaseName</a> and <a href="#">InformixServer</a>. For example, the following URL:</p> <pre>jdbc:bea:informix://server1:2003; InformixServer=TestServer;DatabaseName=Test; AlternateServers=(server2:2003;InformixServer= TestServer2,server3:2003;InformixServer=TestServer3)</pre> <p>contains alternate server entries for server2 and server3. The alternate server entries contain the optional <a href="#">InformixServer</a> property.</p> <p>The <a href="#">ConnectionRetryCount</a> property controls the number of times the driver retries the list of servers (primary and alternate) while attempting to establish a connection. The <a href="#">ConnectionRetryDelay</a> property sets the wait interval, in seconds, between retry attempts.</p> <p>The <a href="#">LoadBalancing</a> property controls the order in which the driver sequences through the list of servers (primary and alternate) while attempting to establish a connection.</p> <p>See “<a href="#">Connection Failover with the Informix Driver</a>” on page 3-12 for more information about specifying connection information for primary and alternate servers.</p>
CodePageOverride OPTIONAL	<p>The code page the driver uses when converting character data. The specified code page overrides the default database code page. All character data retrieved from or written to the database is converted using the specified code page. The value must be a string containing the name of a valid code page supported by your Java Virtual Machine, for example, CodePageOverride=CP950.</p>

**Table 3-1 Informix Connection String Properties (Continued)**

Property	Description
ConnectionRetryCount OPTIONAL	<p>The number of times the driver retries connections to a list of database servers (primary and alternate) until a successful connection is established. Valid values are 0 and any positive integer.</p> <p>If set to 0, the driver does not retry a connection to the list of database servers if a connection is not established on the driver’s first pass through the list.</p> <p>The default is 0.</p> <p>For example, in the case where the following properties are specified:</p> <pre>AlternateServers= (server2:2003,server3:2003,server4:2003)</pre> <p>and</p> <pre>ConnectionRetryCount=1</pre> <p>If a connection is not successfully established on the driver’s first pass through the list of database servers, the driver retries all the servers in the list only once.</p> <p>If an application sets a login timeout value (for example, using <code>DataSource.loginTimeout</code>), the login timeout takes precedence over this property. For example, if the login timeout expires, any connection attempts to alternate servers stop.</p> <p>If the <a href="#">LoadBalancing</a> property is set to true, the driver may sequence through the list of servers (primary and alternate) in a different order each time.</p> <p>The <a href="#">ConnectionRetryDelay</a> property specifies the wait interval, in seconds, used between retry attempts.</p> <p>See <a href="#">“Connection Failover with the Informix Driver” on page 3-12</a> for more information about specifying connection information for primary and alternate servers.</p>

**Table 3-1 Informix Connection String Properties (Continued)**

Property	Description
ConnectionRetryDelay OPTIONAL	<p>The number of seconds the driver will wait between connection retry attempts when <a href="#">ConnectionRetryCount</a> is set to a positive integer.</p> <p>The default is 3.</p> <p>For example, in the case where the following properties are specified:</p> <pre>AlternateServers=(server2:2003,server3:2003,server4:2003)</pre> <p>and</p> <pre>ConnectionRetryCount=2</pre> <p>and</p> <pre>ConnectionRetryDelay=3</pre> <p>If a connection is not successfully established on the driver's first pass through the list of database servers, the driver retries the list of servers twice. It waits 3 seconds between the first connection retry attempt and the second connection retry attempt.</p> <p><b>Note:</b> If the <a href="#">LoadBalancing</a> property is set to true, the driver may sequence through the list of servers (primary and alternate) in a different order each time.</p> <p>See "<a href="#">Connection Failover with the Informix Driver</a>" on page 3-12 for more information about specifying connection information for primary and alternate servers.</p>
DatabaseName OPTIONAL	<p>The name of the database to which you want to connect.</p> <p>If this property is not specified, a connection is established to the specified server without connecting to a particular database. A connection that is established to the server without connecting to the database allows an application to use CREATE DATABASE and DROP DATABASE SQL statements. These statements require that the driver cannot be connected to a database. An application can connect to the database after the connection is established by executing the DATABASE SQL statement.</p> <p>Refer to your IBM Informix documentation for details on using the CREATE DATABASE, DROP DATABASE, and DATABASE SQL statements.</p>
InformixServer	The name of the Informix database server to which you want to connect.

Table 3-1 Informix Connection String Properties (Continued)

Property	Description
InsensitiveResultSetBufferSize OPTIONAL	<p><code>{-1   0   x}</code>. Determines the amount of memory used by the driver to cache insensitive result set data.</p> <p>If set to -1, the driver caches all insensitive result set data in memory. If the size of the result set exceeds available memory, an <code>OutOfMemoryException</code> is generated. Because the need to write result set data to disk is eliminated, the driver processes the data more efficiently.</p> <p>If set to 0, the driver caches all insensitive result set data in memory, up to a maximum of 2 GB. If the size of the result set data exceeds available memory, the driver pages the result set data to disk. Because result set data may be written to disk, the driver may have to reformat the data to write it correctly to disk.</p> <p>If set to <math>x</math>, where <math>x</math> is a positive integer, the driver caches all insensitive result set data in memory, using this value to set the size (in KB) of the memory buffer for caching insensitive result set data. If the size of the result set data exceeds the buffer size, the driver pages the result set data to disk. Because the result set data may be written to disk, the driver may have to reformat the data to write it correctly to disk. Specifying a buffer size that is a power of 2 results in more efficient memory use.</p> <p>The default is 2048 (KB)</p>

**Table 3-1 Informix Connection String Properties (Continued)**

Property	Description
LoadBalancing OPTIONAL	<p>{ true   false }. Determines whether the driver will use client load balancing in its attempts to connect to a list of database servers (primary and alternate). The list of alternate servers is specified by the <a href="#">AlternateServers</a> property.</p> <p>If set to true, client load balancing is used and the driver attempts to connect to the list of database servers (primary and alternate servers) in random order.</p> <p>If set to false, client load balancing is not used and the driver connects to each server based on their sequential order (primary server first, then, alternate servers in the order they are specified).</p> <p>The default is false.</p> <p>For example, in the case where the following properties are specified:</p> <pre>AlternateServers=(server2:2003,server3:2003,server4:2003)</pre> <p>and</p> <pre>LoadBalancing=true</pre> <p>the driver randomly selects from the list of primary and alternate servers which server to connect to first. If that connection fails, the driver again randomly selects from this list of servers until all servers in the list have been tried or a connection is successfully established.</p> <p>See <a href="#">“Connection Failover with the Informix Driver”</a> on page 3-12 for more information about specifying connection information for primary and alternate servers.</p>
LoginTimeout OPTIONAL	<p>The maximum time in seconds that attempts to create a database connection will wait. A value of 0 specifies that the timeout is the default system timeout if there is one; otherwise it specifies that there is no timeout.</p>
Password	<p>A case-insensitive password used to connect to your Informix database. A password is required only if security is enabled on your database. If so, contact your system administrator to get your password.</p>
PortNumber	<p>The TCP port on which the database server listens for connections. The default varies depending on operating system.</p>

**Table 3-1 Informix Connection String Properties (Continued)**

Property	Description
ServerName	Specifies either the IP address or the server name (if your network supports named servers) of the primary database server. For example, 122.23.15.12 or InformixServer.
User	The case-insensitive default user name used to connect to your Informix database. A user name is required only if security is enabled on your database. If so, contact your system administrator to get your user name.

## Sample Data Source Configuration

[Table 3-2](#) lists configuration attributes for a sample WebLogic Server data source that uses the non-XA version of the WebLogic Type 4 Informix JDBC driver. [Table 3-3](#) lists configuration attributes for a sample WebLogic Server data source that uses the XA version of the driver.

**Table 3-2 Data Source Attributes Using the Non-XA WebLogic Type 4 Informix JDBC Driver**

Attribute	Value
URL	<code>jdbc:bea:informix://dbserver1:1543;informixServer=dbserver1;databaseName=dbname</code>
Driver Class Name	<code>weblogic.jdbc.informix.InformixDriver</code>
Properties	<code>informixServer=dbserver1</code> <code>user=username</code> <code>portNumber=1543</code> <code>DatabaseName=dbname</code> <code>serverName=dbserver1</code>
Password	<code>password</code>
Statement Cache Size	0 (See <a href="#">“Informix Limitation for Prepared Statements”</a> on page 3-9 for more information.)
Target	<code>serverName</code>

**Table 3-3 Data Source Attributes Using the XA WebLogic Type 4 Informix JDBC Driver**

Attribute	Value
URL	<code>jdbc:bea:informix://dbserver1:1543;informixServer=dbserver1;databaseName=dbname</code>
Driver Class Name	<code>weblogic.jdbcx.informix.InformixDataSource</code>
Properties	<code>informixServer=dbserver1</code> <code>user=username</code> <code>portNumber=1543</code> <code>DatabaseName=dbname</code> <code>serverName=dbserver1</code>
Password	<code>password</code>
Statement Cache Size	0 (See <a href="#">"Informix Limitation for Prepared Statements" on page 3-9</a> for more information.)
Target	<code>serverName</code>

## Informix Limitation for Prepared Statements

If anything causes a change to a database table or procedure, such as adding an index, or recompiling the procedure, all existing JDBC PreparedStatements that access it must be re-prepared before they can be used again. This is a limitation of the Informix database management system. WebLogic Server caches, retains, and reuses application PreparedStatements along with pooled connections, so if your application uses prepared statements that access tables or procedures that are dropped and recreated or for which the definition is changed, re-execution of a cached prepared statement will fail once. WebLogic Server will then remove the defunct prepared statement from the cache and replace it when the application asks for the statement again.

To avoid any PreparedStatement failure due to table or procedure changes in the DBMS while WebLogic Server is running, set the Statement Cache Size to 0. WebLogic will make a new PreparedStatement for each request. However, with the statement cache disabled, you will lose the performance benefit of statement caching.

For information about setting the Statement Cache Size, see [“Increasing Performance with the Statement Cache”](#) in the *Administration Console Online Help*.

## Data Types

[Table 3-4](#) lists the data types supported by the Informix driver and how they are mapped to the JDBC data types.

**Table 3-4 Informix Data Types**

Informix Data Type	JDBC Data Type
blob	BLOB
boolean	BIT
byte	LONGVARBINARY
clob	CLOB
char	CHAR
date	DATE
datetime hour to second	TIME
datetime year to day	DATE
datetime year to fraction(5)	TIMESTAMP
datetime year to second	TIMESTAMP
decimal	DECIMAL
float	FLOAT
int8	BIGINT
integer	INTEGER
lvarchar	VARCHAR
money	DECIMAL
nchar	CHAR
nvarchar	VARCHAR
serial	INTEGER



**Table 3-4 Informix Data Types (Continued)**

Informix Data Type	JDBC Data Type
serial8	BIGINT
smallfloat	REAL
smallint	SMALLINT
text	LONGVARCHAR
varchar	VARCHAR

See [“GetTypeInfo” on page B-1](#) for more information about data types.

## SQL Escape Sequences

See [Appendix C, “SQL Escape Sequences for JDBC”](#) for information about the SQL escape sequences supported by the Informix driver.

## Isolation Levels

Informix supports the Read Committed, Read Uncommitted, Repeatable Read, and Serializable isolation levels. The default is Read Committed.

## Using Scrollable Cursors

The Informix driver supports scroll-sensitive result sets, scroll-insensitive result sets, and updatable result sets.

**Note:** When the Informix driver cannot support the requested result set type or concurrency, it automatically downgrades the cursor and generates one or more `SQLWarnings` with detailed information.

## Parameter Metadata Support

The Informix driver supports parameter metadata only for Insert and Update statements. It does not return parameter metadata for Select statements or for stored procedure arguments.

## Blob and Clob Searches

When searching a Clob value for a string pattern using the Clob.position method, the search pattern must be less than or equal to a maximum value of 4096 bytes. Similarly, when searching a Blob value for a byte pattern using the Blob.position method, the search pattern must be less than or equal to a maximum value of 4096 bytes.

## Auto-Generated Keys Support

The Informix driver supports retrieving the values of auto-generated keys. An auto-generated key returned by the Informix driver is the value of a SERIAL column or a SERIAL8 column.

- When using an Insert statement that contains no parameters, the Informix driver supports the following form of the Statement.execute and Statement.executeUpdate methods to inform the driver to return the values of auto-generated keys:

```
Statement.execute (String sql, int autoGeneratedKeys)
Statement.executeUpdate (String sql, int autoGeneratedKeys).
```

- When using a Insert statement that contains parameters, the Informix driver supports the following form of the Connection.prepareStatement method to inform the driver to return the values of auto-generated keys:

```
Connection.prepareStatement (String sql, int autoGeneratedKeys)
```

The application fetches the values of generated keys from the driver using the Statement.getGeneratedKeys() method.

## Connection Failover with the Informix Driver

The Informix driver allows you to specify a list of alternate database servers that are tried at connection time if the primary server is not accepting connections. Connection attempts continue until a connection is successfully established or until all the database servers (primary and alternate) have been tried the specified number of times.

## Specifying Primary and Alternate Servers

Connection information for primary and alternate servers is specified in the URL of a WebLogic JDBC data source. For example, the following connection URL for the Informix driver specifies connection information for the primary and alternate servers:

```
jdbc:bea:informix://server1:2003;InformixServer=TestServer;
DatabaseName=TestServer;User=test;Password=secret;
AlternateServers=(server2:2003;InformixServer=TestServer2,server3:2003)
```

In this example:

```
...server1:2003;InformixServer=TestServer;
DatabaseName=TestServer...
```

is the part of the connection URL that specifies connection information for the primary server. Alternate servers are specified using the AlternateServers property. For example:

```
...;AlternateServers=(server2:2003;
InformixServer=TestServer2,server3:2003)
```

## Using the AlternateServers Property

Connection information for alternate servers is specified using the AlternateServers property in the connection URL in a WebLogic JDBC data source. The value of the AlternateServers property is a string that has the following format:

```
(servername1[:port1][:property=value[;...]],servername2[:port2]
[:property=value[;...]],...)
```

where:

*servername1* is the IP address or server name of the first alternate database server, *servername2* is the IP address or server name of the second alternate database server, and so on.

The IP address or server name is required for each alternate server entry.

*port1* is the port number on which the first alternate database server is listening, *port2* is the port number on which the second alternate database server is listening, and so on. The port number is optional for each alternate server entry. If unspecified, the port number specified for the primary server is used.

*property=value* is either of the following connection properties: DatabaseName or InformixServer. These connection properties are optional for each alternate server entry. For example:

```
jdbc:bea:informix://server1:2003;InformixServer=TestServer;
DatabaseName=TestServer;User=test;Password=secret;
AlternateServers=(server2:2003;InformixServer=TestServer2;
DatabaseName=TestServer,server3:2003)
```

If you do not specify an optional connection property in an alternate server entry, the connection to that alternate server uses the property specified in the URL. For example, if you specify `InformixServer=TestServer` and `DatabaseName=TestServer` for the primary server, but do not specify the `InformixServer` and `DatabaseName` properties in the alternate server entry as shown in the following URL, the driver uses the `InformixServer` and `DatabaseName` specified for the primary server and tries to connect to the `TestServer` database on the Informix server `TestServer`:

```
jdbc:bea:informix://server1:2003;InformixServer=TestServer;  
DatabaseName=TestServer;AlternateServers=(server2:2003,server3:2003)
```

## Specifying Connection Retry

Connection retry allows the Informix driver to retry connections to a list of database servers (primary and alternate) until a successful connection is established. You use the `ConnectionRetryCount` and `ConnectionRetryDelay` properties to enable and control how connection retry works. For example:

```
jdbc:bea:informix://server1:2003;InformixServer=TestServer;  
DatabaseName=TestServer;User=test;Password=secret;  
AlternateServers=(server2:2003;DatabaseName=TEST2,  
server3:2003;DatabaseName=TEST3);ConnectionRetryCount=2;  
ConnectionRetryDelay=5
```

In this example, if a successful connection is not established on the Informix driver's first pass through the list of database servers (primary and alternate), the driver retries the list of servers in the same sequence twice (`ConnectionRetryCount=2`). If a successful connection is not established on the first retry pass through the list of servers, the driver makes another pass through the list of servers. Because the connection retry delay has been set to five seconds (`ConnectionRetryDelay=5`), the driver waits five seconds between retry passes.

## Connection Failover Properties

[Table 3-5](#) summarizes the connection properties that control how connection failover works with the Informix driver. See [Table 3-1](#) for details about configuring each property.

**Table 3-5 Summary: Connection Failover Properties for the Informix Driver**

Property	Characteristic
AlternateServers	List of alternate database servers. An IP address or server name identifying each server is required. Port number and supported connection properties (DatabaseName and InformixServer) are optional. If the port number is unspecified, the port specified for the primary server is used.
ConnectionRetryCount	Number of times the driver retries the list of database servers (primary and alternate) until a successful connection is established. The default is 0 (connection retry is not used).
ConnectionRetryDelay	Wait interval, in seconds, used between attempts to connect to a list of database servers (primary and alternate) when the ConnectionRetryCount property is set to a positive integer. The default is 3.
DatabaseName	The name of the Informix database to which you want to connect.
InformixServer	The name of the Informix database server to which you want to connect.
LoadBalancing	Sets whether the driver will use client load balancing in its attempts to connect to the list of database servers (primary and alternate). If client load balancing is enabled, the driver uses a random pattern instead of a sequential pattern in its attempts to connect. The default is false (client load balancing is disabled).
PortNumber	Port listening for connections on the primary database server.
ServerName	IP address or server name of the primary database server.

See [“Connection Failover with AlternateServers” on page 1-4](#) and [“Client Load Balancing” on page 1-7](#) for overviews of connection failover and client load balancing.

BETA

# The MS SQL Server Driver

The following sections describe how to configure and use the BEA WebLogic Type 4 JDBC SQL Server driver:

- [“SQL Server Database Version Support” on page 4-2](#)
- [“Driver Class” on page 4-2](#)
- [“URL” on page 4-2](#)
- [“Connecting to Named Instances” on page 4-2](#)
- [“SQL Server Connection Properties” on page 4-3](#)
- [“Sample Data Source Configuration” on page 4-12](#)
- [“Data Types” on page 4-13](#)
- [“SQL Escape Sequences” on page 4-15](#)
- [“Isolation Levels” on page 4-15](#)
- [“Using Scrollable Cursors” on page 4-15](#)
- [“Server-Side Updatable Cursors” on page 4-15](#)
- [“Installing Stored Procedures for JTA” on page 4-16](#)
- [“Large Object \(LOB\) Support” on page 4-17](#)
- [“Batch Inserts and Updates” on page 4-18](#)

- [“Parameter Metadata Support” on page 4-19](#)
- [“Auto-Generated Keys Support” on page 4-19](#)
- [“Connection Failover with the SQL Server Driver” on page 4-19](#)

**Note:** The BEA WebLogic Type 4 JDBC MS SQL Server driver (the subject of this chapter) replaces the WebLogic jDriver for Microsoft SQL Server, which is deprecated. The new driver offers JDBC 3.0 compliance, support for some JDBC 2.0 extensions, and better performance. BEA recommends that you use the new BEA WebLogic Type 4 JDBC MS SQL Server driver in place of the WebLogic jDriver for Microsoft SQL Server.

## SQL Server Database Version Support

The BEA WebLogic Type 4 JDBC MS SQL Server driver (the “SQL Server driver”) supports the following database management system versions:

- Microsoft SQL Server 7.0
- Microsoft SQL Server 2000 (including SP1, SP2, and SP3a)
- Microsoft SQL Server 2000 Enterprise Edition (64-bit) on Windows

To use JDBC distributed transactions through JTA, you must install stored procedures for SQL Server. See [“Installing Stored Procedures for JTA” on page 4-16](#) for details.

## Driver Class

The driver classes for the BEA WebLogic Type 4 JDBC MS SQL Server driver are:

XA: `weblogic.jdbcx.sqlserver.SQLServerDataSource`

Non-XA: `weblogic.jdbc.sqlserver.SQLServerDriver`

## URL

To connect to a Microsoft SQL Server database, use the following URL format:

`jdbc:bea:sqlserver://dbserver:port`

## Connecting to Named Instances

Microsoft SQL Server supports multiple instances of a SQL Server database running concurrently on the same server. An instance is identified by an instance name.



To connect to a named instance using a connection URL, use the following URL format:

```
jdbc:bea:sqlserver://server_name\\instance_name
```

**Note:** The first back slash character (\) in \\*instance\_name* is an escape character.

where:

*server\_name* is the IP address or hostname of the server.

*instance\_name* is the name of the instance to which you want to connect on the server.

For example, the following connection URL connects to an instance named instance1 on server1:

```
jdbc:bea:sqlserver://server1\\instance1;User=test;Pasword=secret
```

The MS SQL Server driver also supports the `AlternateServers` option for connection failover. See [“Connection Failover with AlternateServers” on page 1-4](#).

## SQL Server Connection Properties

[Table 4-1](#) lists the JDBC connection properties supported by the SQL Server driver, and describes each property. You can use these connection properties in a JDBC data source configuration in your WebLogic Server domain. To specify a property, use the following form in the JDBC data source configuration:

```
property=value
```

**Note:** All connection string property names are case-insensitive. For example, Password is the same as password.

**Table 4-1 SQL Server Connection Properties**

Property	Description
AlternateServers OPTIONAL	<p>A comma-separated list of alternate database servers that the driver will try to connect to if the primary database server is unavailable. The value of this property is a string that specifies each alternate server. This string has the format:</p> <pre>(servername1[:port1] [;property=value] , servername2[:port2] [;property=value] , ...)</pre> <p>The server name is required for each alternate server entry. Port number and connection properties (property=value) are optional for each alternate server entry. If the port is unspecified, the port number specified for the primary server is used. If a port number for the primary server is unspecified, the default port number of 1433 is used. The driver allows only one optional connection property, <a href="#">DatabaseName</a>. For example:</p> <pre>jdbc:bea:sqlserver://server1:1433; DatabaseName=TEST;User=test;Password=secret; AlternateServers=(server2:1433;DatabaseName=TEST2, server3:1433;DatabaseName=TEST3)</pre> <p>contains alternate server entries for server2 and server3. The alternate server entries contain the optional <a href="#">DatabaseName</a> property.</p> <p>The <a href="#">ConnectionRetryCount</a> property controls the number of times the driver retries the list of servers (primary and alternate) while attempting to establish a connection. The <a href="#">ConnectionRetryDelay</a> property sets the wait interval, in seconds, between retry attempts.</p> <p>The <a href="#">LoadBalancing</a> property controls the order in which the driver sequences through the list of servers (primary and alternate) while attempting to establish a connection.</p> <p>See “<a href="#">Connection Failover with the SQL Server Driver</a>” on page 4-19 for more information about specifying connection information (including information for Microsoft SQL Server named instances) for primary and alternate servers.</p>

**Table 4-1 SQL Server Connection Properties**

Property	Description
AlwaysReportTriggerResults OPTIONAL	<p>{true   false}. Determines how the driver reports results generated by database triggers (procedures that are stored in the database and executed, or fired, when a table is modified).</p> <p>If set to true, the driver returns all results, including results generated by triggers. Multiple trigger results are returned one at a time. Use the <code>Statement.getMoreResults</code> method to retrieve individual trigger results. Warnings and errors are reported in the results as they are encountered.</p> <p>If set to false, the driver does not report trigger results if the statement is a single Insert, Update, or Delete statement. In this case, the only result that is returned is the update count generated by the statement that was executed (if errors do not occur). Although trigger results are ignored, any errors generated by the trigger are reported. Any warnings generated by the trigger are enqueued. If errors are reported, the update count is not reported.</p> <p>The default is false.</p>
CodePageOverride OPTIONAL	<p>Specifies the code page the driver uses when converting character data. The specified code page overrides the default database code page. All character data retrieved from or written to the database is converted using the specified code page. The value must be a string containing the name of a valid code page supported by your Java Virtual Machine, for example, <code>CodePageOverride=CP950</code>.</p> <p>If a value is set for the <code>CodePageOverride</code> property and the <code>SendStringParametersAsUnicode</code> property is set to true, the driver ignores the <a href="#">SendStringParametersAsUnicode</a> property and generates a warning. The driver always sends parameters using the code page specified by <code>CodePageOverride</code> if this property is specified.</p>

Table 4-1 SQL Server Connection Properties

Property	Description
ConnectionRetryCount OPTIONAL	<p>The number of times the driver retries connections to a list of database servers (primary and alternate) until a successful connection is established. Valid values are 0 and any positive integer.</p> <p>If set to 0, the driver does not retry a connection to the list of database servers if a connection is not established on the driver's first pass through the list.</p> <p>The default is 0.</p> <p>For example, in the case where the following properties are specified:</p> <pre>AlternateServers=(server2:1433,server3:1433,server4:1433)</pre> <p>and</p> <pre>ConnectionRetryCount=1</pre> <p>If a connection is not successfully established on the driver's first pass through the list of database servers, the driver retries all the servers in the list only once.</p> <p>If an application sets a login timeout value (for example, using <code>DataSource.loginTimeout</code>), the login timeout takes precedence over this property. For example, if the login timeout expires, any connection attempts to alternate servers stop.</p> <p>If the <a href="#">LoadBalancing</a> property is set to true, the driver may sequence through the list of servers (primary and alternate) in a different order each time.</p> <p>The <a href="#">ConnectionRetryDelay</a> property specifies the wait interval, in seconds, used between attempts.</p> <p>See <a href="#">“Connection Failover with the SQL Server Driver” on page 4-19</a> for more information about specifying connection information for primary and alternate servers.</p>

**Table 4-1 SQL Server Connection Properties**

Property	Description
ConnectionRetryDelay OPTIONAL	<p>The number of seconds the driver waits before retrying a list of database servers (primary and alternate) when <a href="#">ConnectionRetryCount</a> is set to a positive integer.</p> <p>The default is 3.</p> <p>For example, in the case where the following properties are specified:</p> <pre>AlternateServers=(server2:1433,server3:1433,server4:1433)</pre> <p>and</p> <pre>ConnectionRetryCount=2</pre> <p>and</p> <pre>ConnectionRetryDelay=3</pre> <p>If a connection is not successfully established on the driver's first pass through the list of database servers, the driver retries the list of servers twice. It waits 3 seconds between the first connection retry attempt and the second connection retry attempt.</p> <p><b>Note:</b> If the <a href="#">LoadBalancing</a> property is set to true, the driver may sequence through the list of servers (primary and alternate) in a different order each time.</p> <p>See <a href="#">“Connection Failover with the SQL Server Driver”</a> on page 4-19 for more information about specifying connection information for primary and alternate servers.</p>
DatabaseName OPTIONAL	<p>The name of the database to which you want to connect.</p>
HostProcess OPTIONAL	<p>The process ID of the application connecting to Microsoft SQL Server. The value of this property appears in the hostprocess column of the master.dbo.sysprocesses table and may be useful for database administration purposes.</p> <p>The default is 0.</p>

Table 4-1 SQL Server Connection Properties

Property	Description
InsensitiveResultSetBufferSize OPTIONAL	<p>{-1   0   x}. Determines the amount of memory used by the driver to cache insensitive result set data. It must have one of the following values:</p> <p>If set to -1, the driver caches all insensitive result set data in memory. If the size of the result set exceeds available memory, an <code>OutOfMemoryException</code> is generated. Because the need to write result set data to disk is eliminated, the driver processes the data more efficiently.</p> <p>If set to 0, the driver caches all insensitive result set data in memory, up to a maximum of 2 GB. If the size of the result set data exceeds available memory, the driver pages the result set data to disk. Because result set data may be written to disk, the driver may have to reformat the data to write it correctly to disk.</p> <p>If set to x, where x is a positive integer, the driver caches all insensitive result set data in memory, using this value to set the size (in KB) of the memory buffer for caching insensitive result set data. If the size of the result set data exceeds the buffer size, the driver pages the result set data to disk. Because the result set data may be written to disk, the driver may have to reformat the data to write it correctly to disk. Specifying a buffer size that is a power of 2 results in more efficient memory use.</p> <p>The default is 2048 (KB).</p>

**Table 4-1 SQL Server Connection Properties**

Property	Description
LoadBalancing OPTIONAL	<p>{true   false}. Determines whether the driver will use client load balancing in its attempts to connect to a list of database servers (primary and alternate). The list of alternate servers is specified by the <a href="#">AlternateServers</a> property.</p> <p>If set to true, client load balancing is used and the driver attempts to connect to the list of database servers (primary and alternate servers) in random order.</p> <p>If set to false, client load balancing is not used and the driver connects to each server based on their sequential order (primary server first, then, alternate servers in the order they are specified).</p> <p>The default is false.</p> <p>For example, in the case where the following properties are specified:  AlternateServers=(server2:1433,server3:1433,server4:1433)  and  LoadBalancing=true  the driver randomly selects from the list of primary and alternate servers which server to connect to first. If that connection fails, the driver again randomly selects from this list of servers until all servers in the list have been tried or a connection is successfully established.</p> <p>See <a href="#">“Connection Failover with the SQL Server Driver”</a> on page 4-19 for more information about specifying connection information for primary and alternate servers.</p>
LoginTimeout OPTIONAL	<p>The maximum time in seconds that attempts to create a database connection will wait. A value of 0 specifies that the timeout is the default system timeout if there is one; otherwise it specifies that there is no timeout.</p>
NetAddress OPTIONAL	<p>The Media Access Control (MAC) address of the network interface card of the application connecting to Microsoft SQL Server. The value of this property appears in the net_address column of the master.dbo.sysprocesses table and may be useful for database administration purposes.</p> <p>The default is 000000000000.</p>
Password	<p>A case-insensitive password used to connect to your Microsoft SQL Server database.</p>

**Table 4-1 SQL Server Connection Properties**

Property	Description
PortNumber OPTIONAL	<p>The TCP port of the primary database server that is listening for connections to the Microsoft SQL Server database.</p> <p>The default is 1433.</p>
ProgramName OPTIONAL	<p>The name of the application connecting to Microsoft SQL Server. The value of this property appears in the program_name column of the master.dbo.sysprocesses table and may be useful for database administration purposes.</p> <p>The default is an empty string.</p>
SelectMethod OPTIONAL	<p>{direct   cursor}. A hint to the driver that determines whether the driver requests a database cursor for Select statements. Performance and behavior of the driver are affected by this property, which is defined as a hint because the driver may not always be able to satisfy the requested method.</p> <ul style="list-style-type: none"><li>• Direct—When the driver uses the Direct method, the database server sends the complete result set in a single response to the driver when responding to a query. A server-side database cursor is not created. Typically, responses are not cached by the driver. Using this method, the driver must process all the response to a query before another query is submitted. If another query is submitted (using a different statement on the same connection, for example), the driver caches the response to the first query before submitting the second query. Typically, the Direct method performs better than the Cursor method.</li><li>• Cursor—When the driver uses the Cursor method, a server-side cursor is requested. The rows are retrieved from the server in blocks when returning forward-only result sets. The JDBC Statement method setFetchSize can be used to control the number of rows that are retrieved for each request. Performance tests show that the value of setFetchSize significantly impacts performance when the Cursor method is used. There is no simple rule for determining the setFetchSize value that you should use. BEA recommends that you experiment with different setFetchSize values to determine which value gives the best performance for your application. The Cursor method is useful for queries that produce a large amount of data, particularly if multiple open result sets are used.</li></ul> <p>The default is Direct.</p>



**Table 4-1 SQL Server Connection Properties**

Property	Description
SendStringParametersAsUnicode OPTIONAL	<p>{true   false}. Determines whether string parameters are sent to the Microsoft SQL Server database in Unicode or in the default character encoding of the database.</p> <p>If set to true, string parameters are sent to Microsoft SQL Server in Unicode.</p> <p>If set to false, string parameters are sent in the default encoding, which can improve performance because the server does not need to convert Unicode characters to the default encoding. You should, however, use default encoding only if the parameter string data you specify is the same as the default encoding of the database.</p> <p>The default is true.</p> <p>If a value is specified for the <a href="#">CodePageOverride</a> property and this property is set to true, this property is ignored and a warning is generated.</p>
ServerName	<p>Specifies either the IP address or the server name (if your network supports named servers) of the primary database server. For example, 122.23.15.12 or SQLServerServer.</p> <p>To connect to a named instance, specify <i>server_name</i>\\<i>instance_name</i> for this property, where <i>server_name</i> is the IP address and <i>instance_name</i> is the name of the instance to which you want to connect on the specified server.</p>
User	<p>The case-insensitive user name used to connect to your Microsoft SQL Server database.</p>
UseServerSideUpdatableCursors	<p>{true   false}. Determines whether the driver uses server-side cursors when an updatable result set is requested.</p> <p>If set to true, server-side updatable cursors are created when an updatable result set is requested.</p> <p>If set to false, the default updatable result set functionality is used.</p> <p>The default is false.</p> <p>See <a href="#">“Server-Side Updatable Cursors” on page 4-15</a> for more information about using server-side updatable cursors.</p>

**Table 4-1 SQL Server Connection Properties**

Property	Description
WSID OPTIONAL	The workstation ID, which typically is the network name of the computer on which the application resides. If specified, this value is stored in the hostname column of the master.dbo.sysprocesses table and can be returned by sp_who and the Transact-SQL HOST_NAME function. The value can be useful for database administration purposes.  The default is an empty string.
XATransactionGroup OPTIONAL	The transaction group ID that identifies any transactions initiated by the connection. This ID can be used for distributed transaction cleanup purposes.

## Sample Data Source Configuration

[Table 4-2](#) lists configuration attributes for a sample WebLogic Server data source that uses the non-XA version of the WebLogic Type 4 MS SQL Server JDBC driver. [Table 4-3](#) lists configuration attributes for a sample WebLogic Server data source that uses the XA version of the driver.

**Table 4-2 Data Source Attributes Using the Non-XA WebLogic Type 4 MS SQL Server JDBC Driver**

Attribute	Value
URL	<code>jdbc:bea:sqlserver://dbserver1:1433</code>
Driver Class Name	<code>weblogic.jdbc.sqlserver.SQLServerDriver</code>
Properties	<code>user=username</code> <code>DatabaseName=dbname</code>
Password	<code>password</code>
Target	<code>serverName</code>

**Table 4-3 Data Source Attributes Using the XA WebLogic Type 4 MS SQL Server JDBC Driver**

Attribute	Value
URL	<code>jdbc:bea:sqlserver://dbserver1:1433</code>
Driver Class Name	<code>weblogic.jdbcx.sqlserver.SQLServerDataSource</code>
Properties	<code>user=username</code> <code>DatabaseName=dbname</code> <code>selectMethod=cursor</code>
SupportsLocalTransaction	<code>true</code>
KeepXAConnTillTxComplete	<code>true</code>
Password	<code>password</code>
Target	<code>serverName</code>

## Data Types

[Table 4-4](#) lists the data types supported by the SQL Server driver in SQL Server 7 and SQL Server 2000 and how they are mapped to the JDBC data types.

**Table 4-4 Data Types Supported by SQL Server 7 and SQL Server 2000**

SQL Server Data Type	JDBC Data Type
binary	BINARY
bit	BIT
char	CHAR
datetime	TIMESTAMP
decimal	DECIMAL
decimal() identity	DECIMAL
float	FLOAT
image	LONGVARBINARY

**Table 4-4 Data Types Supported by SQL Server 7 and SQL Server 2000**

SQL Server Data Type	JDBC Data Type
int	INTEGER
int identity	INTEGER
money	DECIMAL
nchar	CHAR
ntext	LONGVARCHAR
numeric	NUMERIC
numeric() identity	NUMERIC
nvarchar	VARCHAR
real	REAL
smalldatetime	TIMESTAMP
smallint	SMALLINT
smallint identity	SMALLINT
smallmoney	DECIMAL
sysname	VARCHAR
text	LONGVARCHAR
timestamp	BINARY
tinyint	TINYINT
tinyint identity	TINYINT
uniqueidentifier	CHAR
varbinary	VARBINARY
varchar	VARCHAR

[Table 4-5](#) lists additional data types supported by SQL Server 2000 only.

**Table 4-5 Addition Data Types Supported by SQL Server 2000**

SQL Server Data Type	JDBC Data Type
bigint	BIGINT
bigint identity	BIGINT
sql_variant	VARCHAR

See [“GetTypeInfo” on page B-1](#) for more information about data types.

## SQL Escape Sequences

See [Appendix C, “SQL Escape Sequences for JDBC,”](#) for information about the SQL escape sequences supported by the SQL Server driver.

## Isolation Levels

The SQL Server driver supports the Read Committed, Read Uncommitted, Repeatable Read, and Serializable isolation levels. The default is Read Committed.

## Using Scrollable Cursors

The SQL Server driver supports scroll-sensitive result sets, scroll-insensitive result sets, and updatable result sets.

**Note:** When the SQL Server driver cannot support the requested result set type or concurrency, it automatically downgrades the cursor and generates one or more SQLWarnings with detailed information.

## Server-Side Updatable Cursors

In most cases, using server-side updatable cursors is faster, but server-side updatable cursors cannot be used with insensitive result sets or with sensitive result sets that do not have a primary key. By default, the MS SQL Server driver allows insensitive result sets and sensitive result sets that do not contain a primary key to be updatable. To use server-side cursors when an updatable result set is requested, you set the `UseServerSideUpdatableCursors` property.

When the `UseServerSideUpdatableCursors` property is set to `true` and a scroll-insensitive updatable result set is requested, the driver downgrades the request to a scroll-insensitive

read-only result set. Similarly, when a scroll-sensitive updatable result set is requested and the table does not contain a primary key, the driver downgrades the request to a scroll-sensitive read-only result set. In either case, a warning is generated.

When server-side updatable cursors are used with sensitive result sets that contain a primary key, any changes you make to the result set are visible. Using the default behavior of the driver, those changes would not be visible.

## Installing Stored Procedures for JTA

To use JDBC distributed transactions through JTA, your system administrator should use the following procedure to install Microsoft SQL Server JDBC XA procedures. This procedure must be repeated for each MS SQL Server installation that will be involved in a distributed transaction.

**Note:** If you install a patch on your Microsoft SQL Server DBMS installation, you must reinstall the stored procedures for JTA (as described below).

Also, some WebLogic Server service packs include driver updates and may require that you reinstall the stored procedures for JTA (as described below).

### To install stored procedures for JTA:

1. Copy the `sqljdbc.dll` and `instjdbc.sql` files from the `WL_HOME\server\lib` directory to the `SQL_Server_Root/bin` directory of the MS SQL Server database server, where `WL_HOME` is the directory in which WebLogic server is installed, typically `c:\bea\weblogic81`.

**Note:** If you are installing stored procedures on a database server with multiple Microsoft SQL Server instances, each running SQL Server instance must be able to locate the `sqljdbc.dll` file. Therefore the `sqljdbc.dll` file needs to be anywhere on the global PATH or on the application-specific path. For the application-specific path, place the `sqljdbc.dll` file into the `<drive>:\Program Files\Microsoft SQL Server\MSSQL$<Instance 1 Name>\Binn` directory for each instance.

2. From the database server, use the ISQL utility to run the `instjdbc.sql` script. The system administrator should back up the master database before running `instjdbc.sql`.

At a command prompt, use the following syntax to run `instjdbc.sql`:

```
ISQL -Usa -Psa_password -Sserver_name -ilocation\instjdbc.sql
```

where:

`sa_password` is the password of the system administrator.

`server_name` is the name of the server on which SQL Server resides.

*location* is the full path to `instjdbc.sql`. (You copied this script to the `SQL_Server_Root/bin` directory in step 1.)

The `instjdbc.sql` script generates many messages. In general, these messages can be ignored; however, the system administrator should scan the output for any messages that may indicate an execution error. The last message should indicate that `instjdbc.sql` ran successfully. The script fails when there is insufficient space available in the master database to store the JDBC XA procedures or to log changes to existing procedures.

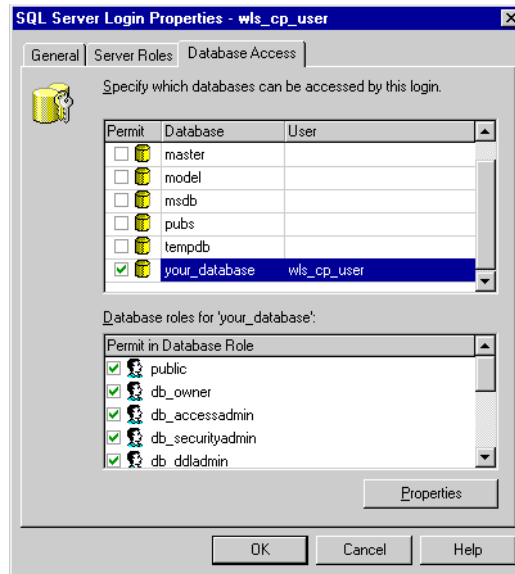
3. Start the DTC (distributed transaction coordinator) service for the Microsoft SQL Server database.
4. Using the Microsoft SQL Server Enterprise Manager, create a SQL Server login on the database server. Grant the new login access to the database on the server with the following roles:
  - public
  - db\_owner
  - db\_accessadmin
  - db\_securityadmin
  - db\_ddladmin
  - db\_datareader
  - db\_datawriter

**Figure 4-1 Granting Access and Permissions in the SQL Server Enterprise Manager**

5. Use the username and password for this new login when configuring a JDBC data source in your WebLogic Server domain. See [Table 4-3](#) for more details. WebLogic Server will create database connections in the JDBC data source using the database user account. Applications will request a database connection from the data source.

## Large Object (LOB) Support

Although Microsoft SQL Server does not define a Blob or Clob data type, the SQL Server driver allows you to retrieve and update long data, specifically LONGVARBINARY and LONGVARCHAR data, using JDBC methods designed for Blobs and Clobs. When using these methods to update long data as Blobs or Clobs, the updates are made to the local copy of the data contained in the Blob or Clob object.



Retrieving and updating long data using JDBC methods designed for Blobs and Clobs provides some of the same advantages as retrieving and updating Blobs and Clobs. For example, using Blobs and Clobs:

- Provides random access to data
- Allows searching for patterns in the data, such as retrieving long data that begins with a specific character string

To provide these advantages of Blobs and Clobs, data must be cached. Because data is cached, you will incur a performance penalty, particularly if the data is read once sequentially. This performance penalty can be severe if the size of the long data is larger than available memory.

## Batch Inserts and Updates

The SQL Server driver implementation for batch Inserts and Updates is JDBC 3.0 compliant. When the SQL Server driver detects an error in a statement or parameter set in a batch Insert or Update, it generates a `BatchUpdateException` and continues to execute the remaining statements or parameter sets in the batch. The array of update counts contained in the `BatchUpdateException` contain one entry for each statement or parameter set. Any entries for statements or parameter sets that failed contain the value `Statement.EXECUTE_FAILED`.



## Parameter Metadata Support

The SQL Server driver supports returning parameter metadata for the following forms of SQL:

- `INSERT INTO foo VALUES (?, ?, ?)`
- `INSERT INTO foo (col1, col2, col3) VALUES (?, ?, ?)`
- `UPDATE foo SET col1=?, col2=?, col3=? WHERE col1 operator ? [{AND | OR} col2 operator ?]`

where *operator* is any of the following SQL operators: =, <, >, <=, >=, and <>.

## Auto-Generated Keys Support

The SQL Server driver supports retrieving the values of auto-generated keys. An auto-generated key returned by the SQL Server driver is the value of an identity column.

How you return those values depends on whether you are using an Insert statement that contains parameters:

- When using an Insert statement that contains no parameters, the MS SQL Server driver supports the following form of the `Statement.execute` and `Statement.executeUpdate` methods to inform the driver to return the values of auto-generated keys:
  - `Statement.execute (String sql, int autoGeneratedKeys)`
  - `Statement.executeUpdate (String sql, int autoGeneratedKeys)`
- When using an Insert statement that contains parameters, the MS SQL Server driver supports the following form of the `Connection.prepareStatement` method to inform the driver to return the values of auto-generated keys:
  - `Connection.prepareStatement (String sql, int autoGeneratedKeys)`

The application fetches the values of generated keys from the driver using the `Statement.getGeneratedKeys ()` method.

## Connection Failover with the SQL Server Driver

The SQL Server driver allows you to specify a list of alternate database servers that are tried at connection time if the primary server is not accepting connections. Connection attempts continue until a connection is successfully established or until all the database servers in the list have been tried the specified number of times.

## Specifying Primary and Alternate Servers

Connection information for primary and alternate servers can be specified using a connection URL. For example, the following connection URL for the SQL Server driver specifies connection information for the primary and alternate servers using a connection URL:

```
jdbc:bea:sqlserver://server1:1433;DatabaseName=TEST;User=test;  
Password=secret;AlternateServers=(server2:1433;DatabaseName=TEST2,  
server3:1433;DatabaseName=TEST3)
```

In this example:

```
...server1:1433;DatabaseName=TEST...
```

is the part of the connection URL that specifies connection information for the primary server. Alternate servers are specified using the `AlternateServers` property. For example:

```
...;AlternateServers=(server2:1433;DatabaseName=TEST2,  
server3:1433;DatabaseName=TEST3)
```

## Connection Failover with MS SQL Server Named Instances

The SQL Server driver also allows you to specify connections to named instances, multiple instances of a Microsoft SQL Server database running concurrently on the same server. If specifying named instances for the primary and alternate servers, the connection URL would look like this:

```
jdbc:bea:sqlserver://server1\\instance1;User=test;Password=secret;  
AlternateServers=(server2\\instance2:1433;DatabaseName=TEST2,  
server3\\instance3:1433;DatabaseName=TEST3)
```

## Using the AlternateServers Property

Connection information for alternate servers is specified using the `AlternateServers` property in a connection URL. The value of the `AlternateServers` property is a string that has the format:

```
(servername1[:port1][;property=value],servername2[:port2]  
[;property=value],...)
```

or, if connecting to named instances:

```
(servername1\\instance1[;property=value[;...]],  
servername2\\instance2[;property=value],...)
```

where:

*servername1* is the IP address or server name of the first alternate database server, *servername2* is the IP address or server name of the second alternate database server, and so on. The IP address or server name is required for each alternate server entry.

*instance1* is the named instance on the first alternate database server, *servername2* is the named instance on the second alternate database server, and so on. If connecting to named instances, the named instance is required for each alternate server entry.

*port1* is the port number on which the first alternate database server is listening, *port2* is the port number on which the second alternate database server is listening, and so on. The port number is optional for each alternate server entry. If unspecified, the port number specified for the primary server is used. If a port number is unspecified for the primary server, a default port number of 1433 is used.

*property=value* is the DatabaseName connection property. This property is optional for each alternate server entry. For example:

```
jdbc:bea:sqlserver://server1:1433;DatabaseName=TEST;User=test;
Password=secret;AlternateServers=(server2:1433;DatabaseName=TEST2,
server3:1433;DatabaseName=TEST3)
```

or, if connecting to named instances:

```
jdbc:bea:sqlserver://server1\\instance1:1433;DatabaseName=TEST;
User=test;Password=secret;AlternateServers=(server2\\instance2:1433;
DatabaseName=TEST2,server3\\instance3:1433;DatabaseName=TEST3)
```

If you do not specify the DatabaseName connection property in an alternate server entry, the connection to that alternate server uses the property specified in the URL for the primary server. For example, if you specify DatabaseName=TEST for the primary server, but do not specify a database name in the alternate server entry as shown in the following URL, the driver tries to connect to the TEST database on the alternate server:

```
jdbc:bea:sqlserver://server1:1433;DatabaseName=TEST;User=test;
Password=secret;AlternateServers=(server2:1433,server3:1433)
```

## Specifying Connection Retry

Connection retry allows the SQL Server driver to retry connections to a list of database servers (primary and alternate) until a successful connection is established. You use the ConnectionRetryCount and ConnectionRetryDelay properties to enable and control how connection retry works. For example:

```
jdbc:bea:sqlserver://server1:1433;DatabaseName=TEST;User=test;  
Password=secret;AlternateServers=(server2:1433;DatabaseName=TEST2,  
server3:1433;DatabaseName=TEST3);ConnectionRetryCount=2;  
ConnectionRetryDelay=5
```

In this example, if a successful connection is not established on the SQL Server driver's first pass through the list of database servers (primary and alternate), the driver retries the list of servers in the same sequence twice (`ConnectionRetryCount=2`). If a successful connection is not established on the first retry pass through the list of servers, the driver makes another pass through the list of servers. Because the connection retry delay has been set to five seconds (`ConnectionRetryDelay=5`), the driver waits five seconds between retry passes.

## Connection Failover Properties

[Table 4-6](#) summarizes the connection properties that control how connection failover works with the SQL Server driver. See [Table 4-1](#) for details about configuring each property.

**Table 4-6 Summary: Connection Failover Properties for the SQL Server Driver**

Property	Characteristic
AlternateServers	List of alternate database servers. An IP address or server name identifying each server is required. Port number and supported connection properties (DatabaseName) are optional. If the port number is unspecified, the port number specified for the primary server is used. If a port number is unspecified for the primary server, the default port number of 1433 is used.
ConnectionRetryCount	Number of times the driver retries the list of database servers (primary and alternate) until a successful connection is established. The default is 0 (connection retry is not used).
ConnectionRetryDelay	Wait interval, in seconds, used between attempts to connect to a list of database servers (primary and alternate) when the ConnectionRetryCount property is set to a positive integer. The default is 3.
DatabaseName	The name of the database to which you want to connect.
LoadBalancing	Sets whether the driver will use client load balancing in its attempts to connect to the list of database servers (primary and alternate). If client load balancing is enabled, the driver uses a random pattern instead of a sequential pattern in its attempts to connect. The default is false (client load balancing is disabled).

**Table 4-6 Summary: Connection Failover Properties for the SQL Server Driver**

Property	Characteristic
PortNumber	Port listening for connections on the primary database server. The default port number is 1433.
ServerName	IP address or server name for the primary database server.

See [“Connection Failover with AlternateServers” on page 1-4](#) and [“Client Load Balancing” on page 1-7](#) for overviews of connection failover and client load balancing.

BETA

BETA

# The Oracle Driver

The following sections describe how to configure and use the BEA WebLogic Type 4 JDBC Oracle driver:

- [“Oracle Database Version Support” on page 5-2](#)
- [“Oracle Driver Classes” on page 5-2](#)
- [“Oracle URL” on page 5-2](#)
- [“Oracle Connection Properties” on page 5-2](#)
- [“Using tnsnames.ora Files” on page 5-12](#)
- [“Sample Data Source Configuration” on page 5-19](#)
- [“Data Types” on page 5-20](#)
- [“SQL Escape Sequences” on page 5-27](#)
- [“Isolation Levels” on page 5-27](#)
- [“Using Scrollable Cursors” on page 5-27](#)
- [“Oracle JTA Support” on page 5-27](#)
- [“Batch Inserts and Updates” on page 5-28](#)
- [“Parameter Metadata Support” on page 5-28](#)
- [“Auto-Generated Keys Support” on page 5-28](#)

- [“Connection Failover with the Oracle Driver” on page 5-29](#)

## Oracle Database Version Support

The BEA WebLogic Type 4 JDBC Oracle driver (the "Oracle driver") supports Oracle8i R3 (8.1.7), Oracle9i R1 and R2, and Oracle10g.

## Oracle Driver Classes

The driver classes for the BEA WebLogic Type 4 JDBC Oracle driver are:

XA: `weblogic.jdbcx.oracle.OracleDataSource`

Non-XA: `weblogic.jdbc.oracle.OracleDriver`

Use these driver classes when configuring a JDBC data source in your WebLogic Server domain.

## Oracle URL

To connect to an Oracle database, use the following URL format:

`jdbc:bea:oracle://dbserver:port`

The Oracle driver also supports the `AlternateServers` option for connection failover. See [“Connection Failover with AlternateServers” on page 1-4](#).

## Oracle Connection Properties

[Table 5-1](#) lists the JDBC connection properties supported by the Oracle driver, and describes each property. You can use these connection properties in a JDBC data source configuration in your WebLogic Server domain. To specify a property, use the following form in the JDBC data source configuration:

`property=value`

**Note:** All connection property names are case-insensitive. For example, `Password` is the same as `password`.



**Table 5-1 Oracle Connection String Properties**

Property	Description
AlternateServers OPTIONAL	<p>A comma-separated list of alternate database servers that the driver will try to connect to if the primary database server is unavailable. The value of this property is a string that specifies each alternate server. This string has the format:</p> <pre>(servername1[:port1][;property=value], servername2[:port2][;property=value], ...)</pre> <p>The server name is required for each alternate server entry. Port number and connection properties (property=value) are optional for each alternate server entry. If the port is unspecified, the port number of the primary server is used. If the port number of the primary server is unspecified, the default port number of 1521 is used. Optional connection properties are ServiceName and SID. For example:</p> <pre>jdbc:bea:oracle://server1:1521; ServiceName=TEST;AlternateServers=(server2:1521; ServiceName=TEST2,server3:1521;ServiceName=TEST3)</pre> <p>contains alternate server entries for server2 and server3. The alternate server entries contain the optional <a href="#">ServiceName</a> property. Similarly, you can use the optional <a href="#">SID</a> property instead.</p> <p>The <a href="#">ConnectionRetryCount</a> property controls the number of times the driver retries the list of servers (primary and alternate) while attempting to establish a connection. The <a href="#">ConnectionRetryDelay</a> property sets the wait interval, in seconds, between retry attempts.</p> <p>The <a href="#">LoadBalancing</a> property controls the order in which the driver sequences through the list of servers (primary and alternate) while attempting to establish a connection.</p> <p>If using a tnsnames.ora file to retrieve connection information, do not specify this property. See <a href="#">“Using tnsnames.ora Files” on page 5-12</a> for more information.</p> <p>See <a href="#">“Connection Failover with the Oracle Driver” on page 5-29</a> for more information about specifying connection information for primary and alternate servers.</p>

**Table 5-1 Oracle Connection String Properties**

Property	Description
BatchPerformanceWorkaround OPTIONAL	<p>{ true   false }. Determines the method used to execute batch operations.</p> <p>If set to true, the native Oracle batch mechanism is used. The native Oracle batch mechanism does not return individual update counts for each statement or parameter set in the batch. For this reason, the driver returns a value of SUCCESS_NO_INFO (-2) for each entry in the returned update count array.</p> <p>If set to false, the JDBC 3.0-compliant batch mechanism is used. If an application can accept not receiving update count information, setting this property to true can significantly improve performance. The default is false.</p> <p>See <a href="#">“Batch Inserts and Updates” on page 5-28</a> for details.</p>
CatalogIncludesSynonyms DEPRECATED	<p>This property is recognized for compatibility with existing data sources, but we recommend that you use the <a href="#">CatalogOptions</a> property instead to include synonyms in result sets.</p>
CatalogOptions OPTIONAL	<p>{ 0   1   2   3 }. Determines the type of information included in result sets returned from catalog functions.</p> <p>If set to 0, result sets contain default DatabaseMetaData results.</p> <p>If set to 1, result sets contain Remarks information returned from the DatabaseMetaData methods: getTables and getColumns.</p> <p>If set to 2, result sets contain synonyms returned from the DatabaseMetaData methods: getColumns, getProcedures, getProcedureColumns, and getIndexInfo.</p> <p>If set to 3, result sets contain remarks and synonyms (as described in options 1 and 2).</p> <p>The default is 2.</p>

**Table 5-1 Oracle Connection String Properties**

Property	Description
ConnectionRetryCount OPTIONAL	<p>The number of times the driver retries connections to a list of database servers (primary and alternate) until a successful connection is established. Valid values are 0 and any positive integer.</p> <p>If set to 0, the driver does not retry a connection to the list of database servers if a connection is not established on the driver's first pass through the list.</p> <p>The default is 0.</p> <p>For example, in the case where the following properties are specified:</p> <pre>AlternateServers=(server2:1521,server3:1521,server4:1521)</pre> <p>and</p> <pre>ConnectionRetryCount=1</pre> <p>If a connection is not successfully established on the driver's first pass through the list of database servers, the driver retries all the servers in the list only once.</p> <p>If an application sets a login timeout value (for example, using <code>DataSource.loginTimeout</code>), the login timeout takes precedence over this property. For example, if the login timeout expires, any connection attempts to alternate servers stop.</p> <p>If the <a href="#">LoadBalancing</a> property also is specified, the driver may sequence through the list of servers (primary and alternate) in a different order each time.</p> <p>The <a href="#">ConnectionRetryDelay</a> property specifies the wait interval, in seconds, used between attempts.</p> <p>See <a href="#">“Connection Failover with the Oracle Driver” on page 5-29</a> for more information about specifying connection information for primary and alternate servers.</p>

**Table 5-1 Oracle Connection String Properties**

Property	Description
ConnectionRetryDelay OPTIONAL	<p>The number of seconds the driver waits before retrying connections to a list of database servers (primary and alternate) when ConnectionRetryCount is set to a positive integer.</p> <p>The default is 3.</p> <p>For example, in the case where the following properties are specified:</p> <pre>AlternateServers=(server2:1521,server3:1521,server4:1521)</pre> <p>and</p> <pre>ConnectionRetryCount=2</pre> <p>and</p> <pre>ConnectionRetryDelay=3</pre> <p>If a connection is not successfully established on the driver's first pass through the list of database servers, the driver retries the list of servers twice. It waits 3 seconds between the first connection retry attempt and the second connection retry attempt.</p> <p>If the <a href="#">LoadBalancing</a> property also is specified, the driver may sequence through the list of servers (primary and alternate) in a different order each time.</p> <p>The <a href="#">ConnectionRetryCount</a> property specifies the number of times the driver will attempt to connect to all the servers in the list of alternate servers.</p> <p>See <a href="#">“Connection Failover with the Oracle Driver” on page 5-29</a> for more information about specifying connection information for primary and alternate servers.</p>
FetchTSWTZasTimestamp OPTIONAL	<p>{true   false}. If set to true, allows column values with the TIMESTAMP WITH TIME ZONE data type (Oracle9i or higher) to be retrieved as a JDBC TIMESTAMP data type.</p> <p>If set to false, column values with the TIMESTAMP WITH TIME ZONE data type must be retrieved as a string.</p> <p>The default is false.</p> <p>See <a href="#">“TIMESTAMP WITH TIME ZONE Data Type” on page 5-23</a> for more information.</p>

**Table 5-1 Oracle Connection String Properties**

Property	Description
InsensitiveResultSetBufferSize OPTIONAL	<p>{-1   0   x}. Determines the amount of memory used by the driver to cache insensitive result set data. It must have one of the following values:</p> <p>If set to -1, the driver caches all insensitive result set data in memory. If the size of the result set exceeds available memory, an <code>OutOfMemoryException</code> is generated. Because the need to write result set data to disk is eliminated, the driver processes the data more efficiently.</p> <p>If set to 0, the driver caches all insensitive result set data in memory, up to a maximum of 2 GB. If the size of the result set data exceeds available memory, the driver pages the result set data to disk. Because result set data may be written to disk, the driver may have to reformat the data to write it correctly to disk.</p> <p>If set to x, where x is a positive integer, the driver caches all insensitive result set data in memory, using this value to set the size (in KB) of the memory buffer for caching insensitive result set data. If the size of the result set data exceeds the buffer size, the driver pages the result set data to disk. Because the result set data may be written to disk, the driver may have to reformat the data to write it correctly to disk. Specifying a buffer size that is a power of 2 results in more efficient memory use.</p> <p>The default is 2048 (KB).</p>

**Table 5-1 Oracle Connection String Properties**

Property	Description
LoadBalancing OPTIONAL	<p>{ true   false }. Determines whether the driver will use client load balancing in its attempts to connect to a list of database servers (primary and alternate). The list of alternate servers is specified by the AlternateServers property.</p> <p>If set to true, client load balancing is used and the driver attempts to connect to the list of database servers (primary and alternate servers) in random order.</p> <p>If set to false, client load balancing is not used and the driver connects to each server based on their sequential order (primary server first, then, alternate servers in the order they are specified).</p> <p>The default is false.</p> <p>For example, in the case where the following properties are specified:</p> <pre>AlternateServers=(server2:1521,server3:1521,server4:1521)</pre> <p>and</p> <pre>LoadBalancing=true</pre> <p>the driver randomly selects from the list of primary and alternate servers which server to connect to first. If that connection fails, the driver again randomly selects from this list of servers until all servers in the list have been tried or a connection is successfully established.</p> <p>If using a tnsnames.ora file to retrieve connection information, do not specify this property. See <a href="#">“Using tnsnames.ora Files” on page 5-12</a> for more information.</p> <p>See <a href="#">“Connection Failover with the Oracle Driver” on page 5-29</a> for more information about specifying connection information for primary and alternate servers.</p>
LoginTimeout OPTIONAL	<p>The maximum time in seconds that attempts to create a database connection will wait. A value of 0 specifies that the timeout is the default system timeout if there is one; otherwise it specifies that there is no timeout.</p>
Password	<p>A case-insensitive password used to connect to your Oracle database. A password is required only if security is enabled on your database. If so, contact your system administrator to obtain your password.</p>

**Table 5-1 Oracle Connection String Properties**

Property	Description
PortNumber OPTIONAL	<p>The TCP port of the Oracle listener running on the Oracle database server. The default is 1521, which is the Oracle default port number when installing the Oracle database software.</p> <p>If using a tnsnames.ora file to provide connection information, do not specify this property. See <a href="#">“Using tnsnames.ora Files” on page 5-12</a> for information about specifying a port number for the Oracle listener using a tnsnames.ora file.</p>
ServerName OPTIONAL	<p>Specifies either the IP address or the server name (if your network supports named servers) of the Oracle server. For example, 122.23.15.12 or OracleAppServer.</p> <p>If using a tnsnames.ora file to provide connection information, do not specify this property.</p> <p>See <a href="#">“Using tnsnames.ora Files” on page 5-12</a> for information about specifying a server name using a tnsnames.ora file.</p>
ServerType OPTIONAL	<p>{ Shared   Dedicated }. Specifies whether the connection is established using a shared or dedicated server process (UNIX) or thread (Windows).</p> <p>If set to Shared, the server process to be used is retrieved from a pool. The socket connection between the client and server is made to a dispatcher process on the server. This setting allows there to be fewer processes than the number of connections, reducing the need for server resources. Use this value when a server must handle many users with fewer server resources.</p> <p>If set to Dedicated, a server process is created to service only that connection. When that connection ends, so does the process (UNIX) or thread (Windows). The socket connection is made directly between the application and the dedicated server process or thread. When connecting to UNIX servers, a dedicated server process can provide significant performance improvement, but uses more resources on the server. When connecting to Windows servers, the server resource penalty is insignificant. Use this value if you have a batch environment with low numbers of users.</p> <p>If unspecified, the driver uses the server type set on the server.</p> <p>If using a tnsnames.ora file to provide connection information, do not specify this property.</p> <p>See <a href="#">“Using tnsnames.ora Files” on page 5-12</a> for information about specifying the server type using a tnsnames.ora file.</p>

Table 5-1 Oracle Connection String Properties

Property	Description
ServiceName OPTIONAL	<p>The database service name that specifies the database used for the connection. The service name is a string that is the global database name-a name that typically comprises the database name and domain name. For example:</p> <pre>sales.us.acme.com</pre> <p>This property is useful to specify connections to an Oracle Real Application Clusters (RAC) system rather than a specific Oracle instance because the nodes in a RAC system share a common service name.</p> <p>If using a tnsnames.ora file to provide connection information, do not specify this property.</p> <p>See <a href="#">“Using tnsnames.ora Files” on page 5-12</a> for information about specifying the database service name using a tnsnames.ora file.</p>
SID OPTIONAL	<p>The Oracle System Identifier that refers to the instance of the Oracle database running on the server. This property is mutually exclusive with the <a href="#">ServiceName</a> property.</p> <p>The default is ORCL, which is the default SID that is configured when installing your Oracle database.</p> <p>If using a tnsnames.ora file to provide connection information, do not specify this property.</p> <p>See <a href="#">“Using tnsnames.ora Files” on page 5-12</a> for information about specifying an Oracle SID using a tnsnames.ora file.</p>



**Table 5-1 Oracle Connection String Properties**

Property	Description
TNSNamesFile OPTIONAL	<p data-bbox="530 390 1224 534">The path and filename to the tnsnames.ora file from which connection information is retrieved. The tnsnames.ora file contains connection information that is mapped to Oracle net service names. Using a tnsnames.ora file to centralize connection information simplifies maintenance when changes occur.</p> <p data-bbox="530 546 1157 604">The value of this property must be a valid path and filename to a tnsnames.ora file.</p> <p data-bbox="530 616 1224 673">If you specify this property, you also must specify the <a href="#">TNSServerName</a> property.</p> <p data-bbox="530 685 1204 743">If this property is specified, do not specify the following properties to prevent connection information conflicts:</p> <p data-bbox="530 755 696 782"><a href="#">AlternateServers</a></p> <p data-bbox="530 795 682 822"><a href="#">LoadBalancing</a></p> <p data-bbox="530 835 655 862"><a href="#">PortNumber</a></p> <p data-bbox="530 874 655 902"><a href="#">ServerName</a></p> <p data-bbox="530 914 646 942"><a href="#">ServerType</a></p> <p data-bbox="530 954 663 982"><a href="#">ServiceName</a></p> <p data-bbox="530 994 575 1022"><a href="#">SID</a></p> <p data-bbox="530 1034 1210 1124">If any of these properties are specified in addition to this property, the driver generates an exception. See <a href="#">“Using tnsnames.ora Files”</a> on <a href="#">page 5-12</a> for information about using tnsnames.ora files to connect.</p>

**Table 5-1 Oracle Connection String Properties**

Property	Description
TNSServerName OPTIONAL	<p>The Oracle net service name used to reference the connection information in a tnsnames.ora file. The value of this property must be a valid net service name entry in the tnsnames.ora file specified by the <a href="#">TNSNamesFile</a> property.</p> <p>If this property is specified, you also must specify the <a href="#">TNSNamesFile</a> property.</p> <p>If this property is specified, do not specify the following properties to prevent connection information conflicts:</p> <p><a href="#">AlternateServers</a></p> <p><a href="#">LoadBalancing</a></p> <p><a href="#">PortNumber</a></p> <p><a href="#">ServerName</a></p> <p><a href="#">ServerType</a></p> <p><a href="#">ServiceName</a></p> <p><a href="#">SID</a></p> <p>If any of these properties are specified in addition to this property, the driver generates an exception. See “<a href="#">Using tnsnames.ora Files</a>” on <a href="#">page 5-12</a> for information about using tnsnames.ora files to connect.</p>
User	<p>The case-insensitive default user name used to connect to your Oracle database. A user name is required only if security is enabled on your database. If so, contact your system administrator to obtain your user name. Operating System authentication is not currently supported by the Oracle driver.</p>

## Using tnsnames.ora Files

The tnsnames.ora file is used to map connection information for each Oracle service to a logical alias. The Oracle driver allows you to retrieve basic connection information from a tnsnames.ora file, including:

- Oracle server name and port
- Oracle System Identifier (SID) or Oracle service name
- Server process type (shared or dedicated)

- Connection failover instructions
- Client load balancing instructions

In a tnsnames.ora file, connection information for an Oracle service is associated with an alias, or Oracle net service name. Each net service name entry contains connect descriptors that define listener and service information. The following example in [Listing 5-1](#) shows connection information in a tnsnames.ora file configured for the net service name entries, FITZGERALD.SALES and ARMSTRONG.ACCT.

#### Listing 5-1 tnsnames.ora Example

---

```
FITZGERALD.SALES =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP) (HOST = server1) (PORT = 1521))
    (CONNECT_DATA =
      (SID = ORCL)
    )
  )

ARMSTRONG.ACCT =
  (DESCRIPTION =
    (ADDRESS_LIST=
      (FAILOVER = on)
      (LOAD_BALANCE = on)
      (ADDRESS= (PROTOCOL = TCP) (HOST = server1) (PORT = 1521))
      (ADDRESS= (PROTOCOL = TCP) (HOST = server2) (PORT = 1521))
      (ADDRESS= (PROTOCOL = TCP) (HOST = server3) (PORT = 1521))
    )
    (CONNECT_DATA=
      (SERVICE_NAME = acct.us.yourcompany.com)
    )
  )
```

)

---

Using this example, if the Oracle driver referenced the Oracle net service name entry FITGERALD.SALES, the driver would connect to the Oracle database instance identified by the Oracle SID ORCL (`SID=ORCL`). Similarly, if the Oracle driver referenced ARMSTRONG.ACCT, the driver would connect to the Oracle database identified by the service name `acct.us.yourcompany.com` (`SERVICE_NAME=acct.us.yourcompany.com`). In addition, the driver would enable connection failover (`FAILOVER=on`) and client load balancing (`LOAD_BALANCE=on`).

Typically, a `tnsnames.ora` file is installed when you install an Oracle database. By default, the `tnsnames.ora` file is located in the `ORACLE_HOME\network\admin` directory on Windows and the `$ORACLE_HOME/network/admin` directory on UNIX.

## Connecting to the Database

To retrieve connection information from an Oracle `tnsnames.ora` file with the Oracle driver, you must inform the driver which `tnsnames.ora` file (using the `TNSNamesFile` property) and Oracle service name entry (using the `TNSServerName` property) to use so that the driver can reference the correct connection information. For example, the following connection URL:

```
jdbc:bea:oracle:TNSNamesFile=c:\oracle92\NETWORK\ADMIN\
tnsnames.ora;TNSServerName=FITZGERALD.SALES
```

specifies the path and filename of the `tnsnames.ora` file

(`TNSNamesFile=c:\oracle92\NETWORK\ADMIN\tnsnames.ora`) and the net service name entry (`TNSServerName=FITZGERALD.SALES`) to use for the connection.

### Notes:

- The connection URL does not specify the server name and port of the database server; that information is specified in the `tnsnames.ora` file referenced by the `TNSNamesFile` property.
- If coding a path on Windows to the `tnsnames.ora` file in a Java string, the backslash character (\) must be preceded by the Java escape character, a backslash. For example: `TNSNamesFile=c:\\oracle92\\NETWORK\\ADMIN\\tnsnames.ora`.

If using `tnsnames.ora` files with a Security Manager on a Java 2 Platform, read permission must be granted to the `tnsnames.ora` file. See [“Granting Access to Oracle tnsnames.ora Files” on page 1-10](#) for an example.

## Configuring the tnsnames.ora File

If using a tnsnames.ora file to retrieve connection information, do not specify the following connection properties to prevent connection information conflicts:

AlternateServers	PortNumber
LoadBalancing	ServerType
ServerName	SID
ServiceName	

If any of these properties are specified in addition to the TNSNamesFile and TNSServerName properties, the driver generates an exception. For example, if the net service name entry **ARMSTRONG.ACCT** specifies the **LOAD\_BALANCE** parameter as shown in the following example:

```
ARMSTRONG.ACCT =
(DESCRIPTION =
  (ADDRESS_LIST=
    (FAILOVER = on)
    (LOAD_BALANCE = on)
    (ADDRESS= (PROTOCOL = TCP) (HOST = server1) (PORT = 1521))
    (ADDRESS= (PROTOCOL = TCP) (HOST = server2) (PORT = 1521))
    (ADDRESS= (PROTOCOL = TCP) (HOST = server3) (PORT = 1521))
  )
)
```

and you specify the LoadBalancing property in the driver connection URL as shown in the following example, the driver generates an exception.

```
jdbc:bea:oracle:TNSNamesFile=c:\\oracle92\\NETWORK\\ADMIN\\
tnsnames.ora;TNSServerName=FITZGERALD.SALES;LoadBalancing=true
```

**Table 5-2** lists the Oracle driver properties that correspond to tnsnames.ora connect descriptor parameters. If using a tnsnames.ora file, do not specify any of the driver properties listed to prevent connection information conflicts.

**Table 5-2 Oracle Driver Property Mappings to tnsnames.ora Connect Descriptor Parameters**

Oracle Driver Property	tnsnames.ora Attribute
AlternateServers = <i>servers_list</i>	<p>ADDRESS_LIST = <i>servers_list</i></p> <p>The ADDRESS_LIST parameter contains connection information for one or multiple servers, using the ADDRESS parameter to specify the primary and alternate servers. For example:</p> <pre>(ADDRESS_LIST=   (ADDRESS= (PROTOCOL = TCP) (HOST = server1)     (PORT = 1521))   (ADDRESS= (PROTOCOL = TCP) (HOST = server2)     (PORT = 1521))   (ADDRESS= (PROTOCOL = TCP) (HOST = server3)     (PORT = 1521)) )</pre> <p>The first ADDRESS parameter specifies connection information for the primary server. The second and third ADDRESS parameter specifies connection information for alternate servers.</p> <p>When multiple servers are specified by the ADDRESS_LIST parameter, connection failover is automatically enabled. If FAILOVER=off, connection failover is disabled. You also can explicitly specify connection failover using the FAILOVER parameter.</p>
LoadBalancing = {true   false}	<p>LOAD_BALANCE = {on   off}</p> <p>If LOAD_BALANCE=on, enables client load balancing. For example:</p> <pre>(ADDRESS_LIST=   (LOAD_BALANCE=on)   (ADDRESS= (PROTOCOL = TCP) (HOST = server1)     (PORT = 1521))   (ADDRESS= (PROTOCOL = TCP) (HOST = server2)     (PORT = 1521))   (ADDRESS= (PROTOCOL = TCP) (HOST = server3)     (PORT = 1521)) )</pre> <p>If the LOAD_BALANCE parameter is unspecified or LOAD_BALANCE=off, client load balancing is disabled.</p>

**Table 5-2 Oracle Driver Property Mappings to tnsnames.ora Connect Descriptor Parameters (Continued)**

Oracle Driver Property	tnsnames.ora Attribute
PortNumber = <i>port</i>	<p data-bbox="588 388 727 423">PORT = <i>port</i></p> <p data-bbox="588 430 1243 574">The ADDRESS_LIST parameter contains connection information for one or multiple servers, using the ADDRESS parameter to specify the primary and alternate servers. The PORT parameter is used within the ADDRESS parameter to specify the port number for each server entry. For example:</p> <pre data-bbox="588 591 1210 760">(ADDRESS_LIST=   (ADDRESS= (PROTOCOL = TCP) (HOST = server1)     (PORT = 1521))   ... )</pre> <p data-bbox="588 777 1243 829">A port of 1521, the default port number when installing an Oracle database, is specified for server1.</p>
ServerName = <i>server_name</i>	<p data-bbox="588 857 827 892">HOST = <i>server_name</i></p> <p data-bbox="588 899 1243 1072">The ADDRESS_LIST parameter contains connection information for one or multiple servers, using the ADDRESS parameter to specify the primary and alternate servers. The HOST parameter is used within the ADDRESS parameter to specify the server name for each server entry. The server entry can be an IP address or a server name. For example:</p> <pre data-bbox="588 1090 1210 1258">(ADDRESS_LIST=   (ADDRESS= (PROTOCOL = TCP) (HOST = server1)     (PORT = 1521))   ... )</pre> <p data-bbox="588 1275 1170 1298">The server name server1 is specified in the first server entry.</p>

**Table 5-2 Oracle Driver Property Mappings to tnsnames.ora Connect Descriptor Parameters (Continued)**

Oracle Driver Property	tnsnames.ora Attribute
ServerType = { shared   dedicated }	<p data-bbox="525 388 841 413">SERVER = { shared   dedicated }.</p> <p data-bbox="525 430 1176 513">If SERVER=shared is specified in the CONNECT_DATA parameter in the tnsnames.ora file, the server process (UNIX) or thread (Windows) to be used is retrieved from a pool. For example:</p> <pre data-bbox="525 531 767 621">(CONNECT_DATA=   (SERVER=shared) )</pre> <p data-bbox="525 638 1176 722">When SERVER=shared, this setting allows there to be fewer processes than the number of connections, reducing the need for server resources.</p> <p data-bbox="525 739 1176 821">When SERVER=dedicated, a server process is created to service only that connection. When that connection ends, so does the process (UNIX) or thread (Windows).</p>
ServiceName = <i>service_name</i>	<p data-bbox="525 852 897 876">SERVICE_NAME = <i>service_name</i></p> <p data-bbox="525 894 1176 1005">The database service name that specifies the database used for the connection. The service name is a string that is the global database name—a name that typically comprises the database name and domain name. For example:</p> <p data-bbox="525 1022 700 1046">sales.us.acme.com</p> <p data-bbox="525 1064 1176 1112">The service name is specified in the CONNECT_DATA parameter. For example:</p> <pre data-bbox="525 1130 1002 1220">(CONNECT_DATA=   (SERVICE_NAME=sales.us.acme.com) )</pre> <p data-bbox="525 1237 1176 1315">This parameter is mutually exclusive with the SID attribute and is useful to specify connections to an Oracle Real Application Clusters (RAC) system rather than a specific Oracle instance.</p>



**Table 5-2 Oracle Driver Property Mappings to tnsnames.ora Connect Descriptor Parameters (Continued)**

Oracle Driver Property	tnsnames.ora Attribute
SID = <i>SID</i>	<p>SID = <i>SID</i></p> <p>The Oracle System Identifier (SID) that refers to the instance of the Oracle database running on the server. The default Oracle SID that is configured when installing your Oracle database software is ORCL. The SID is specified in the CONNECT_DATA parameter. For example:</p> <pre>(CONNECT_DATA=   (SID=ORCL) )</pre> <p>This parameter is mutually exclusive with the SERVICE_NAME attribute.</p>

For more information about configuring tnsnames.ora files, refer to your Oracle documentation.

## Sample Data Source Configuration

[Table 5-3](#) lists configuration attributes for a sample WebLogic Server data source that uses the non-XA version of the WebLogic Type 4 Oracle JDBC driver. [Table 5-4](#) lists configuration attributes for a sample WebLogic Server data source that uses the XA version of the driver.

**Table 5-3 Data Source Attributes Using the Non- XA WebLogic Type 4 Oracle JDBC Driver**

Attribute	Value
URL	<code>jdbc:bea:oracle://host:port</code>
Driver Class Name	<code>weblogic.jdbc.oracle.OracleDriver</code>
Properties	<code>user=username</code> <code>PortNumber=port</code> <code>ServerName=host</code> <code>SID=Oracle_SID</code>
Password	<code>password</code>
Target	<code>server or cluster name</code>

**Table 5-4 Data Source Attributes Using the XA WebLogic Type 4 Oracle JDBC Driver**

Attribute	Value
URL	<code>jdbc:bea:oracle://host:port</code>
Driver Class Name	<code>weblogic.jdbcx.oracle.OracleDataSource</code>
Properties	<code>uuser=username</code> <code>PortNumber=port</code> <code>ServerName=host</code> <code>ServiceName=db_name.db_domain</code>
SupportsLocalTransaction	<code>true</code> (required only for local transactions)
Password	<code>password</code>
Target	<code>server or cluster name</code>

## Data Types

[Table 5-5](#) lists the data types supported by the Oracle driver and describes how they are mapped to the JDBC data types.

**Table 5-5 Oracle Data Types**

Oracle Database	Oracle Data Type	JDBC Data Type
Oracle8i and higher	BFILE	BLOB
	BLOB	BLOB
	CHAR	CHAR
	CLOB	CLOB
	DATE	TIMESTAMP
	FLOAT(n)	DOUBLE
	LONG	LONGVARCHAR
	long raw	LONGVARBINARY
	NCHAR	CHAR
	NCLOB	CLOB
	NUMBER (p, s)	DECIMAL
	NUMBER	DOUBLE
	NVARCHAR2	VARCHAR
	RAW	VARBINARY
Oracle9i and higher	TIMESTAMP	TIMESTAMP
	TIMESTAMP WITH LOCAL TIME ZONE	TIMESTAMP
	TIMESTAMP WITH TIME ZONE	VARCHAR
	VARCHAR2	VARCHAR
	XMLType	CLOB
Oracle10g only	BINARY_FLOAT	REAL
	BINARY_DOUBLE	DOUBLE

See [“GetTypeInfo” on page B-1](#) for more information about data types.

## Oracle Date/Time Data Types

Oracle9i and higher supports the following date/time data types: `TIMESTAMP`, `TIMESTAMP WITH LOCAL TIME ZONE`, and `TIMESTAMP WITH TIME ZONE`. To understand how the Oracle driver supports these data types, you first must understand the values the Oracle driver assigns to the Oracle date/time session parameters.

### Date/Time Session Parameters

At connection time, the Oracle driver sets the following date/time session parameters:

Session Parameter	Description
<code>TIME_ZONE</code>	The Oracle session time zone. The Oracle driver sets the time zone to the current time zone as reported by the Java Virtual Machine.
<code>NLS_TIMESTAMP_FORMAT</code>	The default timestamp format. The Oracle driver uses the JDBC timestamp escape format: <code>YYYY-MM-DD HH24:MI:SS.FF</code>
<code>NLS_TIMESTAMP_TZ_FORMAT</code>	The default timestamp with time zone format. The Oracle driver uses the JDBC timestamp escape format with the time zone field appended: <code>YYYY-MM-DD HH24:MI:SS.FF TZh:TzM</code>

### TIMESTAMP Data Type

The Oracle `TIMESTAMP` data type is mapped to the JDBC `TIMESTAMP` data type.

### TIMESTAMP WITH LOCAL TIME ZONE Data Type

The Oracle `TIMESTAMP WITH LOCAL TIME ZONE` data type is mapped to the `TIMESTAMP` JDBC data type.

When retrieving `TIMESTAMP WITH LOCAL TIME ZONE` columns, the value returned to the user is converted to the time zone specified by the `TIME_ZONE` session parameter.

When setting `TIMESTAMP WITH LOCAL TIME ZONE` columns:

- Using a timestamp (using `PreparedStatement.setTimestamp`, for example), the value set is converted to the time zone specified by the `TIME_ZONE` session parameter.
- Using a string (using `PreparedStatement.setString`, for example), the string is passed as-is to the server. The supplied string must be in the format specified by the `NLS_TIMESTAMP_TZ_FORMAT` session parameter. If not, the Oracle server generates an error when it attempts to convert the string to the `TIMESTAMP WITH LOCAL TIME ZONE` type.

## TIMESTAMP WITH TIME ZONE Data Type

By default, the Oracle `TIMESTAMP WITH TIME ZONE` data type is mapped to the `VARCHAR` JDBC data type.

When retrieving `TIMESTAMP WITH TIME ZONE` values as a string (using `resultSet.getString`, for example), the value is returned as the string representation of the timestamp including time zone information. The string representation is formatted in the format specified by the Oracle `NLS_TIMESTAMP_TZ_FORMAT` session parameter.

By default, retrieving `TIMESTAMP WITH TIME ZONE` values as a timestamp (using `resultSet.getTimestamp`, for example) is not supported because the time zone information stored in the database would be lost when the data is converted to a timestamp. To provide backward compatibility with existing applications, you can use the `FetchTSWTZasTimestamp` property to allow `TIMESTAMP WITH TIME ZONE` values to be retrieved as a timestamp. The default value of the `FetchTSWTZasTimestamp` property is `false`, which disables retrieving `TIMESTAMP WITH TIME ZONE` values as timestamps.

When setting `TIMESTAMP WITH TIME ZONE` columns:

- Using a timestamp (using `PreparedStatement.setTimestamp`, for example), the value set is converted to the time zone specified by the `TIME_ZONE` session parameter.
- Using a string (using `PreparedStatement.setString`, for example), the string is passed as-is to the server. The supplied string must be in the format specified by the `NLS_TIMESTAMP_TZ_FORMAT` session parameter. If not, the Oracle server generates an error when it attempts to convert the string to the `TIMESTAMP WITH TIME ZONE` type.

## XMLType Data Type

The Oracle driver supports tables containing columns specified as `XMLType` for Oracle9i and higher. The driver maps the Oracle `XMLType` data type to the JDBC `CLOB` data type. `XMLType` columns can be used in queries just like any other column type. The data from `XMLType`

columns can be retrieved as a `String`, `Clob`, `CharacterStream`, or `AsciiStream`. When inserting or updating `XMLType` columns, the data to be inserted or updated must be in the form of an `XMLType` data type.

Oracle provides the `xmltype()` function to construct an `XMLType` data object. The `xmlData` argument of the `xmltype()` function can be specified as a string literal or a parameter marker. If a parameter marker is used, the parameter value may be set using the `setString`, `setClob`, `setCharacterStream`, or `setAsciiStream` methods.

The following code inserts data into an `XMLType` column using a statement with a string literal as the `xmlData` argument of the `xmltype()` function:

```
// Insert xml data as a literal

String sql = "insert into XMLTypeTbl values (1, xmltype('\" +
    "<emp><empNo>123</empNo><empName>Mark</empName></emp>' ) ) ";
Statement stmt = con.createStatement();
stmt.executeUpdate(sql);
```

The following code inserts data into an `XMLType` column using a prepared statement:

```
// Insert xml data as a String parameter

String xmlStr = "<emp><empNo>234</empNo><empName>Trish</empName></emp>";
String sql = "insert into XMLTypeTbl values (?, xmltype(?))";
PreparedStatement prepStmt = con.prepareStatement(sql);
prepStmt.setInt(1, 2);
prepStmt.setString(2, xmlStr);
prepStmt.executeUpdate();
```

When the data from an `XMLType` column is retrieved as a `Clob`, the `XMLType` data cannot be updated using the `Clob` object. Calling the `setString`, `setCharacterStream`, or `setAsciiStream` methods of a `Clob` object returned from an `XMLType` column generates a `SQLException`.

## REF CURSOR Data Type Support

`REF CURSOR` is the Oracle data type for a cursor variable. Because JDBC does not support a cursor variable data type, the Oracle driver returns `REF CURSOR` output parameters and return values to the application as result sets. The Oracle driver automatically converts the `REF CURSOR` data to a result set, which can be retrieved using `getResultSet` or `getMoreResults`.

Because REF CURSOR data is returned as result sets and not as output parameters, REF CURSOR output parameters are not included in results from DatabaseMetaData.getProcedureColumns calls.

In your application, omit any parameter markers for the REF CURSOR and do not declare an output parameter for the REF CURSOR as shown in the following examples. These examples reference the following stored procedure definition:

```
CREATE PACKAGE foo_pkg AS

    TYPE EmpCurTyp IS REF CURSOR RETURN fooTbl%ROWTYPE;

    PROCEDURE selectEmployeeManager(empId IN INT, empCursor OUT EmpCurTyp,
        mgrCursor out EmpCurTyp);

    FUNCTION selectEmployee2 (empId IN INT) return EmpCurTyp;

END foo_pkg;
```

#### **Listing 5-2 REF Cursor Example 1: Calling a Stored Procedure That Returns a Single REF CURSOR**

---

```
// Call a function that accepts an input parameter
// and returns a REF CURSOR as the return value. Omit the
// placeholder for the refcursor return value parameter.
// The REF CURSOR is returned as a result set.
sql = "{call foo_pkg.selectEmployee2(?)}";
callStmt = con.prepareCall(sql);
callStmt.setInt(1, 2);
moreResults = callStmt.execute();
while (true) {
    if (moreResults) {
        // Get the result set that represents the REF CURSOR
        resultSet = callStmt.getResultSet();
        displayResults(resultSet);
        resultSet.close();
    }
}
```

```
        resultSet = null;

        System.out.println();
    }
    else {
        updateCnt = callStmt.getUpdateCount();
        if (updateCnt == -1) {
            break;
        }
        System.out.println("Update Count: " + updateCnt);
    }
    moreResults = callStmt.getMoreResults();
}
```

---

### **Listing 5-3 REF Cursor Example 2: Calling a Stored Procedure that Returns Multiple REF CURSORS**

---

```
// Call the stored procedure that accepts an input parameter
// and returns two REF CURSORS. Omit the placeholder for
// REF CURSOR parameters. The REF CURSORS are returned as
// result sets.
sql = "{call foo_pkg.selectEmployeeManager(?)}";
callStmt = con.prepareCall(sql);
callStmt.setInt(1, 2);
moreResults = callStmt.execute();
while (true) {
    if (moreResults) {
        // Get the result set that represents the REF CURSOR
        resultSet = callStmt.getResultSet();
    }
}
```



```

        displayResults(resultSet);
        resultSet.close();
    }
    else {
        updateCnt = callStmt.getUpdateCount();
        if (updateCnt == -1) {
            break;
        }
    }
    moreResults = callStmt.getMoreResults();
}

```

---

## SQL Escape Sequences

See [Appendix C, “SQL Escape Sequences for JDBC”](#) for information about the SQL escape sequences supported by the Oracle driver.

## Isolation Levels

The Oracle driver supports the Read Committed and Serializable isolation levels. The default is Read Committed.

## Using Scrollable Cursors

The Oracle driver supports scroll-sensitive result sets, scroll-insensitive result sets, and updatable result sets.

**Note:** When the Oracle driver cannot support the requested result set type or concurrency, it automatically downgrades the cursor and generates one or more `SQLWarnings` with detailed information.

## Oracle JTA Support

To use JDBC distributed transactions through JTA, Oracle8.1.7 or higher is required.

## Batch Inserts and Updates

The Oracle driver provides two mechanisms for supporting batch operations:

- The first mechanism uses native Oracle batch functionality. This mechanism typically is the faster of the two mechanisms, but it is not compliant with the JDBC 3.0 specification because the native Oracle functionality returns a single update count for all operations in the batch. Because that single update count cannot be resolved into individual update counts for the driver, the driver returns a value of `SUCCESS_NO_INFO` (-2) for each entry in the update count array. The JDBC 3.0 specification requires individual update counts to be returned for each operation in the batch.
- The second mechanism uses code that resides in the driver to execute the batch operations and complies with the JDBC 3.0 specification, but it is slower than using native Oracle batch functionality.

The `BatchPerformanceWorkaround` property determines which batch mechanism is used. If the value of the `BatchPerformanceWorkaround` property is true, the native Oracle batch mechanism is used; otherwise, the JDBC 3.0-compliant mechanism is used. The default value of the `BatchPerformanceWorkaround` property is false.

## Parameter Metadata Support

The Oracle driver supports returning parameter metadata for the following forms of SQL:

- `INSERT INTO foo VALUES (?, ?, ?)`
- `INSERT INTO foo (col1, col2, col3) VALUES (?, ?, ?)`
- `UPDATE foo SET col1=?, col2=?, col3=? WHERE col1 operator ? [{AND | OR} col2 operator ?]`

where *operator* is any of the following SQL operators: `=`, `<`, `>`, `<=`, `>=`, and `<>`.

## Auto-Generated Keys Support

The Oracle driver supports retrieving the values of auto-generated keys. An auto-generated key returned by the Oracle driver is the value of a ROWID pseudo column.

How you return these values depends on whether you are using an Insert statement that contains parameters:

- When using an Insert statement that contains no parameters, the Oracle driver supports the following form of the `Statement.execute` and `Statement.executeUpdate` methods to inform the driver to return the values of auto-generated keys:
  - `Statement.execute (String sql, int autoGeneratedKeys)`
  - `Statement.executeUpdate (String sql, int autoGeneratedKeys)`
- When using an Insert statement that contains parameters, the Oracle driver supports the following form of the `Connection.prepareStatement` method to inform the driver to return the values of auto-generated keys:
  - `Connection.prepareStatement (String sql, int autoGeneratedKeys)`

The application fetches the values of generated keys from the driver using the `Statement.getGeneratedKeys` method.

## Connection Failover with the Oracle Driver

The Oracle driver allows you to specify a list of alternate database servers that are tried at connection time if the primary server is not accepting connections. Connection attempts continue until a connection is successfully established or until all the database servers in the list have been tried the specified number of times.

### Specifying Primary and Alternate Servers

Connection information for primary and alternate servers can be specified using a connection URL. For example, the following connection URL for the Oracle driver specifies connection information for the primary and alternate servers using a connection URL:

```
jdbc:bea:oracle://server1:1521;ServiceName=TEST;User=test;
Password=secret;AlternateServers=(server2:1521;ServiceName=TEST2,
server3:1521;ServiceName=TEST3)
```

In this example:

```
...server1:1521;ServiceName=TEST...
```

is the part of the connection URL that specifies connection information for the primary server. Alternate servers are specified using the `AlternateServers` property. For example:

```
...;AlternateServers=(server2:1521;ServiceName=TEST2,
server3:1521;ServiceName=TEST3)
```

For information about specifying connection information for primary and alternate servers using a `tnsnames.ora` file, see [“Using tnsnames.ora Files” on page 5-12](#).

## Using the AlternateServers Property

Connection information for alternate servers is specified using the `AlternateServers` property in a connection URL. The value of the `AlternateServers` property is a string that has the format:

```
(servername1[:port1][;property=value],servername2[:port2]
[:property=value],...)
```

where:

*servername1* is the server name of the first alternate database server, *servername2* is the server name of the second alternate database server, and so on. The server name is required for each alternate server entry.

*port1* is the port number on which the first alternate database server is listening, *port2* is the port number on which the second alternate database server is listening, and so on. The port number is optional for each alternate server entry. If unspecified, the port number specified for the primary server is used. If a port number is unspecified for the primary server, a default port number of 1521 is used.

*property=value* is one of the following connection properties: `ServiceName` or `SID`. These connection properties are optional for each alternate server entry and are mutually exclusive. For example:

```
jdbc:bea:oracle://server1:1521;ServiceName=TEST;User=test;
Password=secret;AlternateServers=(server2:1521;ServiceName=TEST2,
server3:1521)
```

or

```
jdbc:bea:oracle://server1:1521;SID=ORCL;User=test;Password=secret;
AlternateServers=(server2:1521;SID=ORCL2,server3:1521)
```

If you do not specify an optional connection property in an alternate server entry, the connection to that alternate server uses the property specified for the primary server. For example, if you specify `SID=ORCL` for the primary server, but do not specify a `SID` in the alternate server entry as shown in the following URL, the driver uses the `SID` specified for the primary server and tries to connect to the `ORCL` database on the alternate server:

```
jdbc:bea:oracle://server1:1521;SID=ORCL;User=test;Password=secret;
AlternateServers=(server2:1521,server3:1521)
```

## Specifying Connection Retry

Connection retry allows the Oracle driver to retry connections to a list of database servers (primary and alternate) until a successful connection is established. You use the `ConnectionRetryCount` and `ConnectionRetryDelay` properties to enable and control how connection retry works. For example:

```
jdbc:bea:oracle://server1:1521;ServiceName=TEST;User=test;
Password=secret;AlternateServers=(server2:1521;ServiceName=TEST2,
server3:1521;ServiceName=TEST3);ConnectionRetryCount=2;
ConnectionRetryDelay=5
```

In this example, if a successful connection is not established on the Oracle driver's first pass through the list of database servers (primary and alternate), the driver retries the list of servers in the same sequence twice (`ConnectionRetryCount=2`). If a successful connection is not established on the first retry pass through the list of servers, the driver makes another pass through the list of servers. Because the connection retry delay has been set to five seconds (`ConnectionRetryDelay=5`), the driver waits five seconds between retry passes.

## Connection Failover Properties

[Table 5-6](#) summarizes the connection properties that control how connection failover works with the Oracle driver. See [Table 5-1](#) for details about configuring each property.

**Table 5-6 Summary: Connection Failover Properties for the Oracle Driver**

Property	Characteristic
<code>AlternateServers</code>	List of alternate database servers. An IP address or server name identifying each server is required. Port number and the <code>ServiceName</code> or <code>SID</code> connection properties are optional. If the port number is unspecified, the port specified for the primary server is used. If a port number is not specified for the primary server, the default port number of 1521 is used.
<code>ConnectionRetryCount</code>	The number of times the driver retries the list of database servers (primary and alternate) until a successful connection is established. The default is 0 (connection retry is not used).
<code>ConnectionRetryDelay</code>	Wait interval, in seconds, used between attempts to connect to a list of database servers (primary and alternate) when the <code>ConnectionRetryCount</code> property is set to a positive integer. The default is 3.

**Table 5-6 Summary: Connection Failover Properties for the Oracle Driver**

Property	Characteristic
LoadBalancing	Sets whether the driver will use client load balancing in its attempts to connect to the list of database servers (primary and alternate). If client load balancing is enabled, the driver uses a random pattern instead of a sequential pattern in its attempts to connect. The default is false (client load balancing is disabled).
PortNumber	Port listening for connections on the primary database server. The default is 1521.
ServerName	IP address or server name of primary database server.
ServiceName	The database service name that specifies the database used for the connection. This property is mutually exclusive with the SID property.
SID	The Oracle System Identifier that refers to the instance of the Oracle database running on the server. The default is ORCL. This property is mutually exclusive with the ServiceName property.

See [“Connection Failover with AlternateServers” on page 1-4](#) and [“Client Load Balancing” on page 1-7](#) for overviews of connection failover and client load balancing.

# The Sybase Driver

The following sections describe how to configure and use the BEA WebLogic Type 4 JDBC Sybase driver:

- [“Database Version Support” on page 6-2](#)
- [“Driver Classes” on page 6-2](#)
- [“Sybase URL” on page 6-2](#)
- [“Sybase Connection Properties” on page 6-2](#)
- [“Sample Data Source Configuration” on page 6-10](#)
- [“Data Types” on page 6-11](#)
- [“SQL Escape Sequences” on page 6-13](#)
- [“Isolation Levels” on page 6-13](#)
- [“Using Scrollable Cursors” on page 6-13](#)
- [“Large Object \(LOB\) Support” on page 6-14](#)
- [“Batch Inserts and Updates” on page 6-14](#)
- [“Parameter Metadata Support” on page 6-14](#)
- [“Auto-Generated Keys Support” on page 6-15](#)
- [“Connection Failover with the Sybase Driver” on page 6-15](#)

- [“Sybase JTA Support” on page 6-18](#)

## Database Version Support

The BEA WebLogic Type 4 JDBC driver for Sybase (the “Sybase driver”) supports the following database versions:

- Sybase Adaptive Server 11.5 and 11.9
- Sybase Adaptive Server Enterprise 12.0, 12.5, and 12.5.1

**Note:** XA connections are supported with the Sybase Adaptive Server Enterprise 12.0 and later versions only. XA connections are *not* supported on Sybase Adaptive Server 11.5 and 11.9.

## Driver Classes

The driver class for the BEA WebLogic Type 4 JDBC Sybase driver is:

XA: `weblogic.jdbcx.sybase.SybaseDataSource`

Non-XA: `weblogic.jdbc.sybase.SybaseDriver`

Use these driver classes when configuring a JDBC data source in your WebLogic Server domain.

## Sybase URL

To connect to a Sybase database, use the following URL format:

`jdbc:bea:sybase://dbserver:port`

The Sybase driver also supports the `AlternateServers` option for connection failover. See [“Connection Failover with AlternateServers” on page 1-4](#).

## Sybase Connection Properties

[Table 6-1](#) lists the JDBC connection properties supported by the Sybase driver, and describes each property. You can use these connection properties in a JDBC data source configuration in your WebLogic Server domain. To specify a property, use the following form in the JDBC data source configuration:

`property=value`

**Note:** All connection string property names are case-insensitive. For example, `Password` is the same as `password`.



**Table 6-1 Sybase Connection Properties**

Property	Description
AlternateServers OPTIONAL	<p>A comma-separated list of alternate database servers that the driver will try to connect to if the primary database server is unavailable. The value of this property is a string that specifies each alternate server. This string has the format:</p> <pre>(servername1[:port1] [;property=value] , servername2[:port2] [;property=value] , ...)</pre> <p>The server name is required for each alternate server entry. Port number and connection properties (<i>property=value</i>) are optional for each alternate server entry. If the port is unspecified, the port number of the primary server is used. The driver only allows one optional connection property, <a href="#">DatabaseName</a>. For example:</p> <pre>jdbc:bea:sybase://server1:4100; DatabaseName=TEST;User=test;Password=secret; AlternateServers=(server2:4100;DatabaseName=TEST2, server3:4100;DatabaseName=TEST3)</pre> <p>contains alternate server entries for server2 and server3. The alternate server entries contain the optional <a href="#">DatabaseName</a> property.</p> <p>The <a href="#">ConnectionRetryCount</a> property controls the number of times the driver retries the list of servers (primary and alternate) while attempting to establish a connection. The <a href="#">ConnectionRetryDelay</a> property sets the wait interval, in seconds, between retry attempts.</p> <p>The <a href="#">LoadBalancing</a> property controls the order in which the driver sequences through the list of servers (primary and alternate) while attempting to establish a connection.</p> <p>See <a href="#">“Connection Failover with the Sybase Driver”</a> on page 6-15 for more information about specifying connection information for primary and alternate servers.</p>
BatchPerformanceWorkaround OPTIONAL	<p>{true   false}. Determines the method used to execute batch operations. If set to true, the native Sybase batch mechanism is used.</p> <p>If set to false, the JDBC 3.0-compliant batch mechanism is used. In most cases, using the native Sybase batch functionality provides significantly better performance, but the driver may not always be able to return update counts for the batch.</p> <p>The default is false.</p> <p>See <a href="#">“Batch Inserts and Updates”</a> on page 6-14.</p>

**Table 6-1 Sybase Connection Properties**

Property	Description
CodePageOverride OPTIONAL	<p>Specifies the code page the driver uses when converting character data. The specified code page overrides the default database code page. All character data retrieved from or written to the database is converted using the specified code page. The value must be a string containing the name of a valid code page supported by your Java Virtual Machine, for example, CodePageOverride=CP950.</p>
ConnectionRetryCount OPTIONAL	<p>The number of times the driver retries connections to a list of database servers (primary and alternate) until a successful connection is established. Valid values are 0 and any positive integer.</p> <p>If set to 0, the driver does not retry a connection to the list of database servers if a connection is not established on the driver's first pass through the list.</p> <p>The default is 0.</p> <p>For example, in the case where the following properties are specified:  AlternateServers=(server2:4100,server3:4100,  server4:4100)  and  ConnectionRetryCount=1</p> <p>If a connection is not successfully established on the driver's first pass through the list of database servers, the driver retries all the servers in the list only once.</p> <p>If an application sets a login timeout value (for example, using DataSource.loginTimeout), the login timeout takes precedence over this property. For example, if the login timeout expires, any connection attempts to alternate servers stop.</p> <p>If the <a href="#">LoadBalancing</a> property is set to true, the driver may sequence through the list of servers (primary and alternate) in a different order each time.</p> <p>The <a href="#">ConnectionRetryDelay</a> property specifies the wait interval, in seconds, used between attempts.</p> <p>See <a href="#">“Connection Failover with the Sybase Driver” on page 6-15</a> for more information about specifying connection information for primary and alternate servers.</p>

**Table 6-1 Sybase Connection Properties**

Property	Description
ConnectionRetryDelay OPTIONAL	<p>The number of seconds the driver waits before retrying connections to a list of database servers (primary and alternate) when <a href="#">ConnectionRetryCount</a> is set to a positive integer.</p> <p>The default is 3.</p> <p>For example, in the case where the following properties are specified:</p> <pre>AlternateServers=(server2:4100,server3:4100,server4:4100)</pre> <p>and</p> <pre>ConnectionRetryCount=2</pre> <p>and</p> <pre>ConnectionRetryDelay=3</pre> <p>If a connection is not successfully established on the driver's first pass through the list of database servers, the driver retries the list of servers twice. It waits 3 seconds between the first connection retry attempt and the second connection retry attempt.</p> <p>If the <a href="#">LoadBalancing</a> property is set to true, the driver may sequence through the list of servers (primary and alternate) in a different order each time.</p> <p>See "<a href="#">Connection Failover with the Sybase Driver</a>" on page 6-15 for more information about specifying connection information for primary and alternate servers.</p>
DatabaseName OPTIONAL	<p>The name of the database to which you want to connect.</p>

Table 6-1 Sybase Connection Properties

Property	Description
InsensitiveResultSetBufferSize OPTIONAL	<p>{-1   0   <math>x</math>}. Determines the amount of memory used by the driver to cache insensitive result set data. It must have one of the following values:</p> <p>If set to -1, the driver caches all insensitive result set data in memory. If the size of the result set exceeds available memory, an <code>OutOfMemoryException</code> is generated. Because the need to write result set data to disk is eliminated, the driver processes the data more efficiently.</p> <p>If set to 0, the driver caches all insensitive result set data in memory, up to a maximum of 2 GB. If the size of the result set data exceeds available memory, the driver pages the result set data to disk. Because result set data may be written to disk, the driver may have to reformat the data to write it correctly to disk.</p> <p>If set to <math>x</math>, where <math>x</math> is a positive integer, the driver caches all insensitive result set data in memory, using this value to set the size (in KB) of the memory buffer for caching insensitive result set data. If the size of the result set data exceeds the buffer size, the driver pages the result set data to disk. Because the result set data may be written to disk, the driver may have to reformat the data to write it correctly to disk. Specifying a buffer size that is a power of 2 results in more efficient memory use.</p> <p>The default is 2048 (KB).</p>

**Table 6-1 Sybase Connection Properties**

Property	Description
LoadBalancing OPTIONAL	<p>{true   false}. Determines whether the driver will use client load balancing in its attempts to connect to a list of database servers (primary and alternate). The list of alternate servers is specified by the <a href="#">AlternateServers</a> property.</p> <p>If set to true, client load balancing is used and the driver attempts to connect to the list of database servers (primary and alternate servers) in random order.</p> <p>If set to false, client load balancing is not used and the driver connects to each server based on their sequential order (primary server first, then, alternate servers in the order they are specified).</p> <p>The default is false.</p> <p>For example, in the case where the following properties are specified:</p> <pre>AlternateServers=(server2:4100,server3:4100,server4:4100)</pre> <p>and</p> <pre>LoadBalancing=true</pre> <p>The driver randomly selects from the list of primary and alternate servers which server to connect to first. If that connection fails, the driver again randomly selects from this list of servers until all servers in the list have been tried or a connection is successfully established.</p> <p>See <a href="#">“Connection Failover with the Sybase Driver”</a> on page 6-15 for more information about specifying connection information for primary and alternate servers.</p>
LoginTimeout OPTIONAL	<p>The maximum time in seconds that attempts to create a database connection will wait. A value of 0 specifies that the timeout is the default system timeout if there is one; otherwise it specifies that there is no timeout.</p>
Password	<p>The case-sensitive password used to connect to your Sybase database. A password is required only if security is enabled on your database. If so, contact your system administrator to get your password.</p>
PortNumber	<p>The TCP port of the primary database server that is listening for connections to the Sybase database.</p> <p>The default varies depending on operating system.</p>

Table 6-1 Sybase Connection Properties

Property	Description
PrepareMethod OPTIONAL	<p>{StoredProc   StoredProcIfParam   Direct}. Determines whether stored procedures are created on the server for prepared statements.</p> <p>If set to StoredProc, a stored procedure is created when the statement is prepared and is executed when the prepared statement is executed.</p> <p>If set to StoredProcIfParam, a stored procedure is created only if the prepared statement contains one or multiple parameter markers. In this case, it is created when the statement is prepared and is executed when the prepared statement is executed. If the statement does not contain parameter markers, a stored procedure is not created and the statement is executed directly.</p> <p>If set to Direct, a stored procedure is not created for the prepared statement and the statement is executed directly. A stored procedure may be created if parameter metadata is requested.</p> <p>The default is StoredProcIfParam.</p> <p>Setting this property to StoredProc or StoredProcIfParam can improve performance if your application executes prepared statements multiple times because, once created, executing a stored procedure is faster than executing a single SQL statement. If a prepared statement is only executed once or is never executed, performance can decrease because creating a stored procedure incurs more overhead on the server than simply executing a single SQL statement. Setting this property to Direct should be used if your application does not execute prepared statements multiple times.</p>

**Table 6-1 Sybase Connection Properties**

Property	Description
SelectMethod OPTIONAL	<p data-bbox="542 388 1228 531">{Direct   Cursor}. A hint to the driver that determines whether the driver requests a database cursor for Select statements. Performance and behavior of the driver are affected by this property, which is defined as a hint because the driver may not always be able to satisfy the requested method.</p> <p data-bbox="542 548 1228 808">Direct—When the driver uses the Direct method, the database server sends the complete result set in a single response to the driver when responding to a query. A server-side database cursor is not created. Typically, responses are not cached by the driver. Using this method, the driver must process all the response to a query before another query is submitted. If another query is submitted (using a different statement on the same connection, for example), the driver caches the response to the first query before submitting the second query. Typically, the Direct method performs better than the Cursor method.</p> <p data-bbox="542 826 1228 1173">Cursor—When the driver uses the Cursor method, a server-side database cursor is requested. The rows are retrieved from the server in blocks when returning forward-only result sets. The JDBC Statement method <code>setFetchSize</code> can be used to control the number of rows that are retrieved for each request. Performance tests show that the value of <code>setFetchSize</code> significantly impacts performance when the Cursor method is used. There is no simple rule for determining the <code>setFetchSize</code> value that you should use. We recommend that you experiment with different <code>setFetchSize</code> values to find out which value gives the best performance for your application. The Cursor method is useful for queries that produce a large amount of data, particularly if multiple open result sets are used.</p> <p data-bbox="542 1190 744 1216">The default is Direct.</p>
ServerName	Specifies either the IP address or the server name (if your network supports named servers) of the primary database server. For example, 122.23.15.12 or SybaseServer.
User	The case-insensitive user name used to connect to your Sybase database. A user name is required only if security is enabled on your database. If so, contact your system administrator to get your user name.

# Sample Data Source Configuration

[Table 6-2](#) lists configuration attributes for a sample WebLogic Server data source that uses the non-XA version of the WebLogic Type 4 Sybase JDBC driver. [Table 6-3](#) lists configuration attributes for a sample WebLogic Server data source that uses the XA version of the driver.

**Table 6-2 Data Source Attributes Using the Non- XA WebLogic Type 4 Sybase JDBC Driver**

Attribute	Value
URL	<code>jdbc:bea:sybase://host:port</code>
Driver Class Name	<code>weblogic.jdbc.sybase.SybaseDriver</code>
Properties	<code>user=username</code> <code>PortNumber=port</code> <code>url=jdbc:bea:sybase://host:port</code> <code>ServerName=host</code> <code>DatabaseName=dbname</code>
Password	<code>password</code>
Target	<code>server or cluster name</code>

**Table 6-3 Data Source Attributes Using the XA WebLogic Type 4 Sybase JDBC Driver**

Attribute	Value
URL	<code>jdbc:bea:sybase://host:port</code>
Driver Class Name	<code>weblogic.jdbcx.sybase.SybaseDataSource</code>
Properties	<code>user=username</code> <code>PortNumber=port</code> <code>url=jdbc:bea:sybase://host:port</code> <code>ServerName=host</code> <code>DatabaseName=dbname</code>
SupportsLocalTransaction	<code>true</code> (required only for local transactions)
Password	<code>password</code>
Target	<code>server or cluster name</code>



## Data Types

[Table 6-4](#) lists the data types supported by the Sybase driver and how they are mapped to JDBC data types.

BETA

**Table 6-4 Sybase Data Types**

<b>Sybase Database</b>	<b>Sybase Data Type</b>	<b>JDBC Data Type</b>
Sybase 11.5 and higher	binary	BINARY
	bit	BIT
	char	CHAR
	datetime	TIMESTAMP
	decimal	DECIMAL
	float	FLOAT
	image	LONGVARBINARY
	int	INTEGER
	money	DECIMAL
	nchar	CHAR
	numeric	NUMERIC
	nvarchar	VARCHAR
	real	REAL
	smalldatetime	TIMESTAMP
	smallint	SMALLINT
	smallmoney	DECIMAL
	sysname	VARCHAR
	text	LONGVARCHAR
	timestamp	VARBINARY
	tinyint	TINYINT
	varbinary	VARBINARY
	varchar	VARCHAR

**Table 6-4 Sybase Data Types**

Sybase Database	Sybase Data Type	JDBC Data Type
Sybase 12.5 and 12.5.1 only	date	DATE
	time	TIME
	unichar	CHAR
	univarchar	VARCHAR

**Note:** FOR USERS OF ADAPTIVE SERVER 12.5 AND 12.5.1: The Sybase driver supports extended new limits (XNL) for character and binary columns—columns with lengths greater than 255. Refer to your Sybase documentation for more information about XNL for character and binary columns.

See [Appendix B, “GetTypeInfo”](#) for more information about data types.

## SQL Escape Sequences

See [Appendix C, “SQL Escape Sequences for JDBC”](#) for information about the SQL escape sequences supported by the Sybase driver.

## Isolation Levels

The Sybase driver supports the Read Committed, Read Uncommitted, Repeatable Read, and Serializable isolation levels. The default is Read Committed.

## Using Scrollable Cursors

The Sybase driver supports scroll-sensitive result sets only on result sets returned from tables created with an identity column. The Sybase driver also supports scroll-insensitive result sets and updatable result sets.

**Note:** When the Sybase driver cannot support the requested result set type or concurrency, it automatically downgrades the cursor and generates one or more SQLWarnings with detailed information.

## Large Object (LOB) Support

Although Sybase does not define a Blob or Clob data type, the Sybase driver allows you to retrieve and update long data, specifically LONGVARBINARY and LONGVARCHAR data, using JDBC methods designed for Blobs and Clobs. When using these methods to update long data as Blobs or Clobs, the updates are made to the local copy of the data contained in the Blob or Clob object.

Retrieving and updating long data using JDBC methods designed for Blobs and Clobs provides some of the same advantages as retrieving and updating Blobs and Clobs. For example, using Blobs and Clobs:

- Provides random access to data
- Allows searching for patterns in the data, such as retrieving long data that begins with a specific character string

To provide these advantages of Blobs and Clobs, data must be cached. Because data is cached, you will incur a performance penalty, particularly if the data is read once sequentially. This performance penalty can be severe if the size of the long data is larger than available memory.

## Batch Inserts and Updates

The Sybase driver provides the following batch mechanisms:

- A JDBC 3.0-compliant mechanism that uses code in the driver to execute batch operations. This is the default mechanism used by the Sybase driver.
- A mechanism that uses the Sybase native batch functionality. This mechanism may be faster than the standard mechanism, particularly when performance-expensive network roundtrips are an issue. Be aware that if the execution of the batch results in an error, the driver cannot determine which statement in the batch caused the error. In addition, if the batch contained a statement that called a stored procedure or executed a trigger, multiple update counts for each batch statement or parameter set are generated.

To use the Sybase native batch mechanism, set the BatchPerformanceWorkaround connection property to true. For more information about specifying connection properties, see [“Sybase Connection Properties” on page 6-2](#).

## Parameter Metadata Support

The Sybase driver supports returning parameter metadata for all types of SQL statements.

## Auto-Generated Keys Support

The Sybase driver supports retrieving the values of auto-generated keys. An auto-generated key returned by the Sybase driver is the value of an identity column

How you retrieve the values of auto-generated keys depends on whether the Insert statement you are using contains parameters:

- When using an Insert statement that contains no parameters, the Sybase driver supports the following form of the `Statement.execute` and `Statement.executeUpdate` methods to inform the driver to return the values of auto-generated keys:
  - `Statement.execute (String sql, int autoGeneratedKeys)`
  - `Statement.executeUpdate (String sql, int autoGeneratedKeys)`
- When using an Insert statement that contains parameters, the Sybase driver supports the following form of the `Connection.prepareStatement` method to inform the driver to return the values of auto-generated keys:
  - `Connection.prepareStatement (String sql, int autoGeneratedKeys)`

The application fetches the values of generated keys from the driver using the `Statement.getGeneratedKeys()` method.

## Connection Failover with the Sybase Driver

The Sybase driver allows you to specify a list of alternate database servers that are tried at connection time if the primary server is not accepting connections. Connection attempts continue until a connection is successfully established or until all the database servers in the list have been tried the specified number of times.

## Specifying Primary and Alternate Servers

Connection information for primary and alternate servers can be specified using a connection URL through. For example, the following connection URL for the Sybase driver specifies connection information for the primary and alternate servers using a connection URL:

```
jdbc:bea:sybase://server1:4100;DatabaseName=TEST;User=test;
Password=secret;AlternateServers=(server2:4100;DatabaseName=TEST2,
server3:4100;DatabaseName=TEST3)
```

In this example:

```
...server1:4100;DatabaseName=TEST...
```

is the part of the connection URL that specifies connection information for the primary server. Alternate servers are specified using the `AlternateServers` property. For example:

```
...;AlternateServers=(server2:4100;DatabaseName=TEST2,  
server3:4100;DatabaseName=TEST3)
```

## Using the `AlternateServers` Property

Connection information for alternate servers is specified using the `AlternateServers` property in a connection URL. The value of the `AlternateServers` property is a string that has the format:

```
(servername1[:port1][;property=value],servername2[:port2]  
[:;property=value],...)
```

where:

*servername1* is the IP address or server name of the first alternate database server, *servername2* is the IP address or server name of the second alternate database server, and so on. The IP address or server name is required for each alternate server entry.

*port1* is the port number on which the first alternate database server is listening, *port2* is the port number on which the second alternate database server is listening, and so on. The port number is optional for each alternate server entry. If unspecified, the port number specified for the primary server is used.

*property=value* is the `DatabaseName` connection property. This property is optional for each alternate server entry. For example:

```
jdbc:bea:sybase://server1:4100;DatabaseName=TEST;User=test;  
Password=secret;AlternateServers=(server2:4100;DatabaseName=TEST2,  
server3:4100)
```

If you do not specify the `DatabaseName` connection property in an alternate server entry, the connection to that alternate server uses the property specified in the URL for the primary server. For example, if you specify `DatabaseName=TEST` for the primary server, but do not specify a database name in the alternate server entry as shown in the following URL, the driver tries to connect to the `TEST` database on the alternate server:

```
jdbc:bea:sybase://server1:4100;DatabaseName=TEST;User=test;  
Password=secret;AlternateServers=(server2:4100,server3:4100)
```

## Specifying Connection Retry

Connection retry allows the Sybase driver to retry connections to a list of database servers (primary and alternate) until a successful connection is established. You use the `ConnectionRetryCount` and `ConnectionRetryDelay` properties to enable and control how connection retry works. For example:

```
jdbc:bea:sybase://server1:4100;DatabaseName=TEST;User=test;
Password=secret;AlternateServers=(server2:4100;DatabaseName=TEST2,
server3:4100;DatabaseName=TEST3);ConnectionRetryCount=2;
ConnectionRetryDelay=5
```

In this example, if a successful connection is not established on the Sybase driver's first pass through the list of database servers (primary and alternate), the driver retries the list of servers in the same sequence twice (`ConnectionRetryCount=2`). If a successful connection is not established on the first retry pass through the list of servers, the driver makes another pass through the list of servers. Because the connection retry delay has been set to five seconds (`ConnectionRetryDelay=5`), the driver waits five seconds between retry passes.

## Connection Failover Properties

[Table 6-5](#) summarizes the connection properties that control how connection failover works with the Sybase driver. See [Table 6-1](#) for details about configuring each property.

**Table 6-5 Connection Failover Properties for the Sybase Driver**

Property	Characteristic
AlternateServers	List of alternate database servers. An IP address or server name identifying each server is required. Port number and the DatabaseName connection property are optional. If the port number is unspecified, the port number specified for the primary server is used.
ConnectionRetryCount	Number of times the driver retries the list of database servers (primary and alternate) until a successful connection is established. The default is 0 (connection retry is not used).
ConnectionRetryDelay	Wait interval, in seconds, used between attempts to connect to a list of database servers (primary and alternate) when the ConnectionRetryCount property is set to a positive integer. The default is 3.
DatabaseName	Name of the database to which you want to connect.

**Table 6-5 Connection Failover Properties for the Sybase Driver**

Property	Characteristic
LoadBalancing	Sets whether the driver will use client load balancing in its attempts to connect to the list of database servers (primary and alternate). If client load balancing is enabled, the driver uses a random pattern instead of a sequential pattern in its attempts to connect. The default is false (client load balancing is disabled).
PortNumber	Port listening for connections on the primary database server. The default port number varies, depending on operating system.
ServerName	IP address or server name of primary database server.

See [“Connection Failover with AlternateServers” on page 1-4](#) and [“Client Load Balancing” on page 1-7](#) for overviews of connection failover and client load balancing.

## Sybase JTA Support

Before you can use the Sybase XA driver in a global transaction, you must first set up your Sybase server to support global transactions. See [“Set Up the Sybase Server for XA Support”](#) in *Programming WebLogic JTA*.



# JDBC Support

This appendix provides information about JDBC compatibility and developing JDBC applications using BEA WebLogic Type 4 JDBC drivers.

## JDBC Compatibility

[Table A-1](#) shows compatibility among the JDBC specification versions, Java Virtual Machines, and the BEA WebLogic Type 4 JDBC drivers.

**Table A-1 JDBC Compatibility**

JDBC Version	Java 2 SDK	Drivers Compatible?
3.0	5.0	Yes

**Note:** WebLogic Server 9.0 requires a Java 2 SDK version 5.0.

## Supported Functionality

The following tables list functionality supported for each JDBC object.

# Array Object

Table A-2

Array Object Methods	Version Introduced	Supported	Comments
(all)	2.0 Core	No	Array objects are not exposed or used as input.

BETA

# Blob Object

Table A-3

<b>Blob Object Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
InputStream getBinaryStream ()	2.0 Core	Yes	<p>The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The SQL Server and Sybase drivers support using with LONGVARBINARY data types.</p>
byte[] getBytes (long, int)	2.0 Core	Yes	<p>The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The SQL Server and Sybase drivers support using with LONGVARBINARY data types.</p>
long length ()	2.0 Core	Yes	<p>The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The SQL Server and Sybase drivers support using with LONGVARBINARY data types.</p>
long position (Blob, long)	2.0 Core	Yes	<p>The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The Informix driver requires that the pattern parameter (which specifies the Blob object designating the BLOB value for which to search) be less than or equal to a maximum value of 4096 bytes.</p> <p>The SQL Server and Sybase drivers support using with LONGVARBINARY data types.</p>

**Table A-3**

<b>Blob Object Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
long position (byte[], long)	2.0 Core	Yes	<p>The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The Informix driver requires that the pattern parameter (which specifies the Blob object designating the BLOB value for which to search) be less than or equal to a maximum value of 4096 bytes.</p> <p>The SQL Server and Sybase drivers support using with LONGVARBINARY data types.</p>
OutputStream setBinaryStream (long)	3.0	Yes	<p>The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The SQL Server and Sybase drivers support using with LONGVARBINARY data types.</p>
int setBytes (long, byte[])	3.0	Yes	<p>The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The SQL Server and Sybase drivers support using with LONGVARBINARY data types.</p>

**Table A-3**

<b>Blob Object Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
int setBytes (long, byte[], int, int)	3.0	Yes	<p>The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The SQL Server and Sybase drivers support using with LONGVARBINARY data types.</p>
void truncate (long)	3.0	Yes	<p>The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The SQL Server and Sybase drivers support using with LONGVARBINARY data types.</p>

## CallableStatement Object

Table A-4

CallableStatement Object Methods	Version Introduced	Supported	Comments
Array getArray (int)	2.0 Core	No	Throws “unsupported method” exception.
Array getArray (String)	3.0	No	Throws “unsupported method” exception.
BigDecimal getBigDecimal (int)	2.0 Core	Yes	
BigDecimal getBigDecimal (int, int)	1.0	Yes	
BigDecimal getBigDecimal (String)	3.0	No	Throws “unsupported method” exception.
Blob getBlob (int)	2.0 Core	Yes	The SQL Server and Sybase drivers support using with LONGVARBINARY data types.
Blob getBlob (String)	3.0	No	The SQL Server and Sybase drivers support using with LONGVARBINARY data types.
boolean getBoolean (int)	1.0	Yes	
boolean getBoolean (String)	3.0	No	Throws “unsupported method” exception.
byte getByte (int)	1.0	Yes	
byte getByte (String)	3.0	No	Throws “unsupported method” exception.
byte [] getBytes (int)	1.0	Yes	
byte [] getBytes (String)	3.0	No	Throws “unsupported method” exception.
Clob getClob (int)	2.0 Core	Yes	

Table A-4

<b>CallableStatement Object (Continued) Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
Clob getClob (String)	3.0	No	Throws “unsupported method” exception.
Date getDate (int)	1.0	Yes	
Date getDate (int, Calendar)	2.0 Core	Yes	
Date getDate (String)	3.0	No	Throws “unsupported method” exception.
Date getDate (String, Calendar)	3.0	No	Throws “unsupported method” exception.
double getDouble (int)	1.0	Yes	
double getDouble (String)	3.0	No	Throws “unsupported method” exception.
float getFloat (int)	1.0	Yes	
float getFloat (String)	3.0	No	Throws “unsupported method” exception.
int getInt (int)	1.0	Yes	
int getInt (String)	3.0	No	Throws “unsupported method” exception.
long getLong (int)	1.0	Yes	
long getLong (String)	3.0	No	Throws “unsupported method” exception.
Object getObject (int)	1.0	Yes	
Object getObject (int, Map)	2.0 Core	Yes	Map ignored.
Object getObject (String)	3.0	No	Throws “unsupported method” exception.

Table A-4

<b>CallableStatement Object (Continued) Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
Object getObject (String, Map)	3.0	No	Throws “unsupported method” exception.
Ref getRef (int)	2.0 Core	No	Throws “unsupported method” exception.
Ref getRef (String)	3.0	No	Throws “unsupported method” exception.
short getShort (int)	1.0	Yes	
short getShort (String)	3.0	No	Throws “unsupported method” exception.
String getString (int)	1.0	Yes	
String getString (String)	3.0	No	Throws “unsupported method” exception.
Time getTime (int)	1.0	Yes	
Time getTime (int, Calendar)	2.0 Core	Yes	
Time getTime (String)	3.0	No	Throws “unsupported method” exception.
Time getTime (String, Calendar)	3.0	No	Throws “unsupported method” exception.
Timestamp getTimestamp (int)	1.0	Yes	
Timestamp getTimestamp (int, Calendar)	2.0 Core	Yes	
Timestamp getTimestamp (String)	3.0	No	Throws “unsupported method” exception.
Timestamp getTimestamp (String, Calendar)	3.0	No	Throws “unsupported method” exception.



Table A-4

<b>CallableStatement Object (Continued) Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
URL getURL (int)	3.0	No	Throws “unsupported method” exception.
URL getURL (String)	3.0	No	Throws “unsupported method” exception.
void registerOutParameter (int, int)	1.0	Yes	
void registerOutParameter (int, int, int)	1.0	Yes	
void registerOutParameter (int, int, String)	2.0 Core	Yes	String/typename ignored.
void registerOutParameter (String, int)	3.0	No	Throws “unsupported method” exception.
void registerOutParameter (String, int, int)	3.0	No	Throws “unsupported method” exception.
void registerOutParameter (String, int, String)	3.0	No	Throws “unsupported method” exception.
void setArray (int, Array)	2.0 Core	No	Throws “unsupported method” exception.
void setAsciiStream (String, InputStream, int)	3.0	No	Throws “unsupported method” exception.
void setBigDecimal (String, BigDecimal)	3.0	No	Throws “unsupported method” exception.
void setBinaryStream (String, InputStream, int)	3.0	No	Throws “unsupported method” exception.
void setBoolean (String, boolean)	3.0	No	Throws “unsupported method” exception.
void setByte (String, byte)	3.0	No	Throws “unsupported method” exception.

Table A-4

<b>CallableStatement Object (Continued) Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
void setBytes (String, byte [])	3.0	No	Throws “unsupported method” exception.
void setCharacterStream (String, Reader, int)	3.0	No	Throws “unsupported method” exception.
void setDate (String, Date)	3.0	No	Throws “unsupported method” exception.
void setDate (String, Date, Calendar)	3.0	No	Throws “unsupported method” exception.
void setDouble (String, double)	3.0	No	Throws “unsupported method” exception.
void setFloat (String, float)	3.0	No	Throws “unsupported method” exception.
void setInt (String, int)	3.0	No	Throws “unsupported method” exception.
void setLong (String, long)	3.0	No	Throws “unsupported method” exception.
void setNull (String, int)	3.0	No	Throws “unsupported method” exception.
void setNull (String, int, String)	3.0	No	Throws “unsupported method” exception.
void setObject (String, Object)	3.0	No	Throws “unsupported method” exception.
void setObject (String, Object, int)	3.0	No	Throws “unsupported method” exception.
void setObject (String, Object, int, int)	3.0	No	Throws “unsupported method” exception.
void setShort (String, short)	3.0	No	Throws “unsupported method” exception.

Table A-4

<b>CallableStatement Object (Continued) Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
void setString (String, String)	3.0	No	Throws “unsupported method” exception.
void setTime (String, Time)	3.0	No	Throws “unsupported method” exception.
void setTime (String, Time, Calendar)	3.0	No	Throws “unsupported method” exception.
void setTimestamp (String, Timestamp)	3.0	No	Throws “unsupported method” exception.
void setTimestamp (String, Timestamp, Calendar)	3.0	No	Throws “unsupported method” exception.
void setURL (String, URL)	3.0	No	Throws “unsupported method” exception.
boolean wasNull ()	1.0	Yes	

## Clob Object

Table A-5

<b>Clob Object Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
InputStream getAsciiStream ()	2.0 Core	Yes	The SQL Server and Sybase drivers support using with LONGVARCHAR data types.
Reader getCharacterStream ()	2.0 Core	Yes	The SQL Server and Sybase drivers support using with LONGVARCHAR data types.
String getSubString (long, int)	2.0 Core	Yes	The SQL Server and Sybase drivers support using with LONGVARCHAR data types.
long length ()	2.0 Core	Yes	The SQL Server and Sybase drivers support using with LONGVARCHAR data types.
long position (Clob, long)	2.0 Core	Yes	The Informix driver requires that the searchStr parameter be less than or equal to a maximum value of 4096 bytes.  The SQL Server and Sybase drivers support using with LONGVARCHAR data types.
long position (String, long)	2.0 Core	Yes	The Informix driver requires that the searchStr parameter be less than or equal to a maximum value of 4096 bytes.  The SQL Server and Sybase drivers support using with LONGVARCHAR data types.
OutputStream setAsciiStream (long)	3.0 Core	Yes	The SQL Server and Sybase drivers support using with LONGVARCHAR data types.

Table A-5

<b>Clob Object (Continued) Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
Writer setCharacterStream (long)	3.0 Core	Yes	The SQL Server and Sybase drivers support using with LONGVARCHAR data types.
int setString (long, String)	3.0 Core	Yes	The SQL Server and Sybase drivers support using with LONGVARCHAR data types.
int setString (long, String, int, int)	3.0 Core	Yes	The SQL Server and Sybase drivers support using with LONGVARCHAR data types.
void truncate (long)	3.0 Core	Yes	The SQL Server and Sybase drivers support using with LONGVARCHAR data types.

## Connection Object

Table A-6

Connection Object Methods	Version Introduced	Supported	Comments
void clearWarnings ()	1.0	Yes	
void close ()	1.0	Yes	When a connection is closed while a transaction is still active, that transaction is rolled back.
void commit ()	1.0	Yes	
Statement createStatement ()	1.0	Yes	
Statement createStatement (int, int)	2.0 Core	Yes	ResultSet.TYPE_SCROLL_SENSITIVE downgraded to TYPE_SCROLL_INSENSITIVE for the DB2 driver.
Statement createStatement (int, int, int)	3.0	No	Throws “unsupported method” exception.
boolean getAutoCommit ()	1.0	Yes	
String getCatalog ()	1.0	Yes	Supported for all drivers except Oracle, which does not have the concept of a catalog. The Oracle driver returns an empty string.
int getHoldability ()	3.0	Yes	
DatabaseMetaData getMetaData ()	1.0	Yes	
int getTransactionIsolation ()	1.0	Yes	
Map getTypeMap ()	2.0 Core	Yes	Always returns empty java.util.HashMap.
SQLWarning getWarnings ()	1.0	Yes	
boolean isClosed ()	1.0	Yes	
boolean isReadOnly ()	1.0	Yes	

Table A-6

Connection Object (Continued) Methods	Version Introduced	Supported	Comments
String nativeSQL (String)	1.0	Yes	Always returns same String as passed in.
CallableStatement prepareCall (String)	1.0	Yes	
CallableStatement prepareCall (String, int, int)	2.0 Core	Yes	ResultSet.TYPE_SCROLL_SENSITIVE downgraded to TYPE_SCROLL_INSENSITIVE for the DB2 driver.
CallableStatement prepareCall (String, int, int, int)	3.0	No	Throws “unsupported method” exception.
PreparedStatement prepareStatement (String)	1.0	Yes	
PreparedStatement prepareStatement (String, int)	3.0	Yes	
PreparedStatement prepareStatement (String, int, int)	2.0 Core	Yes	ResultSet.TYPE_SCROLL_SENSITIVE downgraded to TYPE_SCROLL_INSENSITIVE for the DB2 driver.
PreparedStatement prepareStatement (String, int, int, int)	3.0	No	Throws “unsupported method” exception.
PreparedStatement prepareStatement (String, int[])	3.0	No	Throws “unsupported method” exception.
PreparedStatement prepareStatement (String, String [])	3.0	No	Throws “unsupported method” exception.
void releaseSavepoint (Savepoint)	3.0	Yes	The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.
void rollback ()	1.0	Yes	
void rollback (Savepoint)	3.0	Yes	The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.

Table A-6

Connection Object (Continued) Methods	Version Introduced	Supported	Comments
void setAutoCommit (boolean)	1.0	Yes	
void setCatalog (String)	1.0	Yes	Supported for all drivers except Oracle, which does not have the concept of a catalog. The Oracle driver ignores any value set by the catalog parameter.
void setHoldability (int)	3.0	Yes	Holdability parameter value is ignored.
void setReadOnly (boolean)	1.0	Yes	
Savepoint setSavepoint ()	3.0	Yes	The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.
Savepoint setSavepoint (String)	3.0	Yes	The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.
void setTransactionIsolation (int)	1.0	Yes	
void setTypeMap (Map)	2.0 Core	Yes	Ignored.



## DatabaseMetaData Object

Table A-7

DatabaseMetaData Object Methods	Version Introduced	Supported	Comments
boolean allProceduresAreCallable ()	1.0	Yes	
boolean allTablesAreSelectable ()	1.0	Yes	
boolean dataDefinitionCausesTransaction Commit ()	1.0	Yes	
boolean dataDefinitionIgnoredInTransactions ()	1.0	Yes	
boolean deletesAreDetected (int)	2.0 Core	Yes	
boolean doesMaxRowSizeIncludeBlobs ()	1.0	Yes	Not supported by the SQL Server and Sybase drivers.
ResultSet getAttributes (String, String, String, String)	3.0	No	Throws “unsupported method” exception.
ResultSet getBestRowIdentifier (String, String, String, int, boolean)	1.0	Yes	
ResultSet getCatalogs ()	1.0	Yes	
String getCatalogSeparator ()	1.0	Yes	
String getCatalogTerm ()	1.0	Yes	
ResultSet getColumnPrivileges (String, String, String, String)	1.0	Yes	
ResultSet getColumns (String, String, String, String)	1.0	Yes	
Connection getConnection ()	2.0 Core	Yes	
ResultSet getCrossReference (String, String, String, String, String, String)	1.0	Yes	
int getDatabaseMajorVersion ()	3.0	Yes	
int getDatabaseMinorVersion ()	3.0	Yes	

Table A-7

DatabaseMetaData Object (Continued) Methods	Version Introduced	Supported	Comments
String getDatabaseProductName ()	1.0	Yes	For Sybase, returns “SQL Server,” which is the string returned internally by the Sybase database server. This value may not be the same return as seen with other JDBC drivers, including the Sybase JConnect JDBC drivers.
String getDatabaseProductVersion ()	1.0	Yes	
int getDefaultTransactionIsolation ()	1.0	Yes	
int getDriverMajorVersion ()	1.0	Yes	
int getDriverMinorVersion ()	1.0	Yes	
String getDriverName ()	1.0	Yes	
String getDriverVersion ()	1.0	Yes	
ResultSet getExportedKeys (String, String, String)	1.0	Yes	
String getExtraNameCharacters ()	1.0	Yes	
String getIdentifierQuoteString ()	1.0	Yes	
ResultSet getImportedKeys (String, String, String)	1.0	Yes	
ResultSet getIndexInfo (String, String, String, boolean, boolean)	1.0	Yes	
int getJDBCMinorVersion ()	3.0	Yes	
int getJDBCMajorVersion ()	3.0	Yes	
int getMaxBinaryLiteralLength ()	1.0	Yes	

Table A-7

DatabaseMetaData Object (Continued) Methods	Version Introduced	Supported	Comments
int getMaxCatalogNameLength ()	1.0	Yes	
int getMaxCharLiteralLength ()	1.0	Yes	
int getMaxColumnNameLength ()	1.0	Yes	
int getMaxColumnsInGroupBy ()	1.0	Yes	
int getMaxColumnsInIndex ()	1.0	Yes	
int getMaxColumnsInOrderBy ()	1.0	Yes	
int getMaxColumnsInSelect ()	1.0	Yes	
int getMaxColumnsInTable ()	1.0	Yes	
int getMaxConnections ()	1.0	Yes	
int getMaxCursorNameLength ()	1.0	Yes	
int getMaxIndexLength ()	1.0	Yes	
int getMaxProcedureNameLength ()	1.0	Yes	
int getMaxRowSize ()	1.0	Yes	
int getMaxSchemaNameLength ()	1.0	Yes	
int getMaxStatementLength ()	1.0	Yes	
int getMaxStatements ()	1.0	Yes	
int getMaxTableNameLength ()	1.0	Yes	
int getMaxTablesInSelect ()	1.0	Yes	
int getMaxUserNameLength ()	1.0	Yes	
String getNumericFunctions ()	1.0	Yes	
ResultSet getPrimaryKeys (String, String, String)	1.0	Yes	

Table A-7

DatabaseMetaData Object (Continued) Methods	Version Introduced	Supported	Comments
ResultSet getProcedureColumns (String, String, String, String)	1.0	Yes	
ResultSet getProcedures (String, String, String)	1.0	Yes	
String getProcedureTerm ()	1.0	Yes	
int getResultSetHoldability ()	3.0	Yes	
ResultSet getSchemas ()	1.0	Yes	
String getSchemaTerm ()	1.0	Yes	
String getSearchStringEscape ()	1.0	Yes	
String getSQLKeywords ()	1.0	Yes	
int getSQLStateType ()	3.0	Yes	
String getStringFunctions ()	1.0	Yes	
ResultSet getSuperTables (String, String, String)	3.0	No	Throws “unsupported method” exception.
ResultSet getSuperTypes (String, String, String)	3.0	No	Throws “unsupported method” exception.
String getSystemFunctions ()	1.0	Yes	
ResultSet getTablePrivileges (String, String, String)	1.0	Yes	
ResultSet getTables (String, String, String, String [])	1.0	Yes	
ResultSet getTableTypes ()	1.0	Yes	
String getTimeDateFunctions ()	1.0	Yes	
ResultSet getTypeInfo ()	1.0	Yes	
ResultSet getUDTs (String, String, String, int [])	2.0 Core	No	Always returns empty ResultSet.
String getURL ()	1.0	Yes	

Table A-7

DatabaseMetaData Object (Continued) Methods	Version Introduced	Supported	Comments
String getUserName ()	1.0	Yes	
ResultSet getVersionColumns (String, String, String)	1.0	Yes	
boolean insertsAreDetected (int)	2.0 Core	Yes	
boolean isCatalogAtStart ()	1.0	Yes	
boolean isReadOnly ()	1.0	Yes	
boolean locatorsUpdateCopy ()	3.0	Yes	
boolean nullPlusNonNullIsNull ()	1.0	Yes	
boolean nullsAreSortedAtEnd ()	1.0	Yes	
boolean nullsAreSortedAtStart ()	1.0	Yes	
boolean nullsAreSortedHigh ()	1.0	Yes	
boolean nullsAreSortedLow ()	1.0	Yes	
boolean othersDeletesAreVisible (int)	2.0 Core	Yes	
boolean othersInsertsAreVisible (int)	2.0 Core	Yes	
boolean othersUpdatesAreVisible (int)	2.0 Core	Yes	
boolean ownDeletesAreVisible (int)	2.0 Core	Yes	
boolean ownInsertsAreVisible (int)	2.0 Core	Yes	
boolean ownUpdatesAreVisible (int)	2.0 Core	Yes	
boolean storesLowerCaseIdentifiers ()	1.0	Yes	
boolean storesLowerCaseQuoted Identifiers ()	1.0	Yes	
boolean storesMixedCaseIdentifiers ()	1.0	Yes	
boolean storesMixedCaseQuoted Identifiers ()	1.0	Yes	

Table A-7

Database MetaData Object (Continued) Methods	Version Introduced	Supported	Comments
boolean storesUpperCaseIdentifiers ()	1.0	Yes	
boolean storesUpperCaseQuoted Identifiers ()	1.0	Yes	
boolean supportsAlterTableWith AddColumn ()	1.0	Yes	
boolean supportsAlterTableWith DropColumn ()	1.0	Yes	
boolean supportsANSI92EntryLevelSQL ()	1.0	Yes	
boolean supportsANSI92FullSQL ()	1.0	Yes	
boolean supportsANSI92Intermediate SQL ()	1.0	Yes	
boolean supportsBatchUpdates ()	2.0 Core	Yes	
boolean supportsCatalogsInData Manipulation ()	1.0	Yes	
boolean supportsCatalogsInIndex Definitions ()	1.0	Yes	
boolean supportsCatalogsInPrivilege Definitions ()	1.0	Yes	
boolean supportsCatalogsInProcedure Calls ()	1.0	Yes	
boolean supportsCatalogsInTable Definitions ()	1.0	Yes	
boolean supportsColumnAliasing ()	1.0	Yes	
boolean supportsConvert ()	1.0	Yes	
boolean supportsConvert (int, int)	1.0	Yes	
boolean supportsCoreSQLGrammar ()	1.0	Yes	

Table A-7

DatabaseMetaData Object (Continued) Methods	Version Introduced	Supported	Comments
boolean supportsCorrelatedSubqueries ()	1.0	Yes	
boolean supportsDataDefinitionAndData ManipulationTransactions ()	1.0	Yes	
boolean supportsDataManipulation TransactionsOnly ()	1.0	Yes	
boolean supportsDifferentTableCorrelation Names ()	1.0	Yes	
boolean supportsExpressionsIn OrderBy ()	1.0	Yes	
boolean supportsExtendedSQLGrammar ()	1.0	Yes	
boolean supportsFullOuterJoins ()	1.0	Yes	
boolean supportsGetGeneratedKeys ()	3.0	Yes	
boolean supportsGroupBy ()	1.0	Yes	
boolean supportsGroupByBeyondSelect ()	1.0	Yes	
boolean supportsGroupByUnrelated ()	1.0	Yes	
boolean supportsIntegrityEnhancement Facility ()	1.0	Yes	
boolean supportsLikeEscapeClause ()	1.0	Yes	
boolean supportsLimitedOuterJoins ()	1.0	Yes	
boolean supportsMinimumSQLGrammar ()	1.0	Yes	
boolean supportsMixedCaseIdentifiers ()	1.0	Yes	
boolean supportsMixedCaseQuoted Identifiers ()	1.0	Yes	
boolean supportsMultipleOpenResults ()	3.0	Yes	
boolean supportsMultipleResultSets ()	1.0	Yes	

Table A-7

Database MetaData Object (Continued) Methods	Version Introduced	Supported	Comments
boolean supportsMultipleTransactions ()	1.0	Yes	
boolean supportsNamedParameters ()	3.0	Yes	
boolean supportsNonNullableColumns ()	1.0	Yes	
boolean supportsOpenCursorsAcross Commit ()	1.0	Yes	
boolean supportsOpenCursorsAcross Rollback ()	1.0	Yes	
boolean supportsOpenStatementsAcross Commit ()	1.0	Yes	
boolean supportsOpenStatementsAcross Rollback ()	1.0	Yes	
boolean supportsOrderByUnrelated ()	1.0	Yes	
boolean supportsOuterJoins ()	1.0	Yes	
boolean supportsPositionedDelete ()	1.0	Yes	
boolean supportsPositionedUpdate ()	1.0	Yes	
boolean supportsResultSetConcurrency (int, int)	2.0 Core	Yes	
boolean supportsResultSetHoldability (int)	3.0	Yes	
boolean supportsResultSetType (int)	2.0 Core	Yes	
boolean supportsSavePoints ()	3.0	Yes	
boolean supportsSchemasInData Manipulation ()	1.0	Yes	
boolean supportsSchemasInIndex Definitions ()	1.0	Yes	
boolean supportsSchemasIn PrivilegeDefinitions ()	1.0	Yes	



Table A-7

<b>DatabaseMetaData Object (Continued) Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
boolean supportsSchemasInProcedure Calls ()	1.0	Yes	
boolean supportsSchemasInTable Definitions ()	1.0	Yes	
boolean supportsSelectForUpdate ()	1.0	Yes	
boolean supportsStoredProcedures ()	1.0	Yes	
boolean supportsSubqueriesIn Comparisons ()	1.0	Yes	
boolean supportsSubqueriesInExists ()	1.0	Yes	
boolean supportsSubqueriesInIns ()	1.0	Yes	
boolean supportsSubqueriesIn Quantifieds ()	1.0	Yes	
boolean supportsTableCorrelationNames ()	1.0	Yes	
boolean supportsTransactionIsolationLevel (int)	1.0	Yes	
boolean supportsTransactions ()	1.0	Yes	
boolean supportsUnion ()	1.0	Yes	
boolean supportsUnionAll ()	1.0	Yes	
boolean updatesAreDetected (int)	2.0 Core	Yes	
boolean usesLocalFilePerTable ()	1.0	Yes	
boolean usesLocalFiles ()	1.0	Yes	

## Driver Object

**Table A-8**

<b>Driver Object Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
boolean acceptsURL (String)	1.0	Yes	
Connection connect (String, Properties)	1.0	Yes	
int getMajorVersion ()	1.0	Yes	
int getMinorVersion ()	1.0	Yes	
DriverPropertyInfo [] getPropertyInfo (String, Properties)	1.0	Yes	

## ParameterMetaData Object

Table A-9

ParameterMetaData Object Methods	Version Introduced	Supported	Comments
String getParameterClassName (int)	3.0	Yes	<p>The DB2 driver only supports for all types of SQL statements with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The Informix driver does not support for Select statements or stored procedures.</p> <p>The Sybase driver supports for all types of SQL statements.</p> <p>All other drivers support for simple Insert and Update SQL statements only. See the appropriate driver chapter for more information.</p>
int getParameterCount ()	3.0	Yes	
int getParameterMode (int)	3.0	Yes	<p>The DB2 driver only supports for all types of SQL statements with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The Informix driver does not support for Select statements or stored procedures.</p> <p>The Sybase driver supports for all types of SQL statements.</p> <p>All other drivers support for simple Insert and Update SQL statements only. See the appropriate driver chapter for more information.</p>

Table A-9

ParameterMetaData Object (Continued)	Version Introduced	Supported	Comments
int getParameterType (int)	3.0	Yes	<p>The DB2 driver only supports for all types of SQL statements with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The Informix driver does not support for Select statements or stored procedures.</p> <p>The Sybase driver supports for all types of SQL statements.</p> <p>All other drivers support for simple Insert and Update SQL statements only. See the appropriate driver chapter for more information.</p>
String getParameterTypeName (int)	3.0	Yes	<p>The DB2 driver only supports for all types of SQL statements with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The Informix driver does not support for Select statements or stored procedures.</p> <p>The Sybase driver supports for all types of SQL statements.</p> <p>All other drivers support for simple Insert and Update SQL statements only. See the appropriate driver chapter for more information.</p>

Table A-9

ParameterMetaData Object (Continued)	Version Introduced	Supported	Comments
int getPrecision (int)	3.0	Yes	<p>The DB2 driver only supports for all types of SQL statements with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The Informix driver does not support for Select statements or stored procedures.</p> <p>The Sybase driver supports for all types of SQL statements.</p> <p>All other drivers support for simple Insert and Update SQL statements only. See the appropriate driver chapter for more information.</p>
int getScale (int)	3.0	Yes	<p>The DB2 driver only supports for all types of SQL statements with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The Informix driver does not support for Select statements or stored procedures.</p> <p>The Sybase driver supports for all types of SQL statements.</p> <p>All other drivers support for simple Insert and Update SQL statements only. See the appropriate driver chapter for more information.</p>

Table A-9

ParameterMetaData Object (Continued)	Version Introduced	Supported	Comments
int isNullable (int)	3.0	Yes	<p>The DB2 driver only supports for all types of SQL statements with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The Informix driver does not support for Select statements or stored procedures.</p> <p>The Sybase driver supports for all types of SQL statements.</p> <p>All other drivers support for simple Insert and Update SQL statements only. See the appropriate driver chapter for more information.</p>
boolean isSigned (int)	3.0	Yes	<p>The DB2 driver only supports for all types of SQL statements with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.</p> <p>The Informix driver does not support for Select statements or stored procedures.</p> <p>The Sybase driver supports for all types of SQL statements.</p> <p>All other drivers support for simple Insert and Update SQL statements only. See the appropriate driver chapter for more information.</p>
boolean jdbcCompliant ()	1.0	Yes	

## PreparedStatement Object

Table A-10

PreparedStatement Object Methods	Version Introduced	Supported	Comments
void addBatch ()	2.0 Core	Yes	
void clearParameters ()	1.0	Yes	
boolean execute ()	1.0	Yes	
ResultSet executeQuery ()	1.0	Yes	
int executeUpdate ()	1.0	Yes	
ResultSetMetaData getMetaData ()	2.0 Core	Yes	
ParameterMetaData getParameterMetaData ()	3.0	Yes	
void setArray (int, Array)	2.0 Core	No	Throws “unsupported method” exception.
void setAsciiStream (int, InputStream, int)	1.0	Yes	
void setBigDecimal (int, BigDecimal)	1.0	Yes	
void setBinaryStream (int, InputStream, int)	1.0	Yes	When used with Blobs, the DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.
void setBlob (int, Blob)	2.0 Core	Yes	The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.  The SQL Server and Sybase drivers support using with LONGVARBINARY data types.
void setBoolean (int, boolean)	1.0	Yes	
void setByte (int, byte)	1.0	Yes	

Table A-10

PreparedStatement Object (Continued) Methods	Version Introduced	Supported	Comments
void setBytes (int, byte [])	1.0	Yes	When used with Blobs, the DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.
void setCharacterStream (int, Reader, int)	2.0 Core	Yes	
void setClob (int, Clob)	2.0 Core	Yes	The SQL Server and Sybase drivers support using with LONGVARCHAR data types.
void setDate (int, Date)	1.0	Yes	
void setDate (int, Date, Calendar)	2.0 Core	Yes	
void setDouble (int, double)	1.0	Yes	
void setFloat (int, float)	1.0	Yes	
void setInt (int, int)	1.0	Yes	
void setLong (int, long)	1.0	Yes	
void setNull (int, int)	1.0	Yes	
void setNull (int, int, String)	2.0 Core	Yes	
void setObject (int, Object)	1.0	Yes	
void setObject (int, Object, int)	1.0	Yes	
void setObject (int, Object, int, int)	1.0	Yes	
void setQueryTimeout (int)	1.0	Yes	Throws “unsupported method” exception for DB2 and Informix.
void setRef (int, Ref)	2.0 Core	No	Throws “unsupported method” exception.
void setShort (int, short)	1.0	Yes	
void setString (int, String)	1.0	Yes	



**Table A-10**

<b>PreparedStatement Object (Continued) Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
void setTime (int, Time)	1.0	Yes	
void setTime (int, Time, Calendar)	2.0 Core	Yes	
void setTimestamp (int, Timestamp)	1.0	Yes	
void setTimestamp (int, Timestamp, Calendar)	2.0 Core	Yes	
void setUnicodeStream (int, InputStream, int)	1.0	No	Throws “unsupported method” exception. This method was deprecated in JDBC 2.0.
void setURL (int, URL)	3.0	No	Throws “unsupported method” exception.

# Ref Object

Table A-11

Ref Object Methods	Version Introduced	Supported	Comments
(all)	2.0 Core	No	

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## ResultSet Object

Table A-12

ResultSet Object Methods	Version Introduced	Supported	Comments
boolean absolute (int)	2.0 Core	Yes	
void afterLast ()	2.0 Core	Yes	
void beforeFirst ()	2.0 Core	Yes	
void cancelRowUpdates ()	2.0 Core	Yes	
void clearWarnings ()	1.0	Yes	
void close ()	1.0	Yes	
void deleteRow ()	2.0 Core	Yes	
int findColumn (String)	1.0	Yes	
boolean first ()	2.0 Core	Yes	
Array getArray (int)	2.0 Core	No	Throws “unsupported method” exception.
Array getArray (String)	2.0 Core	No	Throws “unsupported method” exception.
InputStream getAsciiStream (int)	1.0	Yes	
InputStream getAsciiStream (String)	1.0	Yes	
BigDecimal getBigDecimal (int)	2.0 Core	Yes	
BigDecimal getBigDecimal (int, int)	1.0	Yes	
BigDecimal getBigDecimal (String)	2.0 Core	Yes	
BigDecimal getBigDecimal (String, int)	1.0	Yes	

Table A-12

ResultSet Object (Continued) Methods	Version Introduced	Supported	Comments
InputStream getBinaryStream (int)	1.0	Yes	The DB2 driver supports for all DB2 versions when retrieving BINARY, VARBINARY, and LONGVARBINARY data. The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2 when retrieving BLOB data.
InputStream getBinaryStream (String)	1.0	Yes	The DB2 driver supports for all DB2 versions when retrieving BINARY, VARBINARY, and LONGVARBINARY data. The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2 when retrieving BLOB data.
Blob getBlob (int)	2.0 Core	Yes	The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.  The SQL Server and Sybase drivers support using with LONGVARBINARY data types.
Blob getBlob (String)	2.0 Core	Yes	The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.  The SQL Server and Sybase drivers support using with LONGVARBINARY data types.
boolean getBoolean (int)	1.0	Yes	
boolean getBoolean (String)	1.0	Yes	
byte getByte (int)	1.0	Yes	
byte getByte (String)	1.0	Yes	

Table A-12

ResultSet Object (Continued) Methods	Version Introduced	Supported	Comments
byte [] getBytes (int)	1.0	Yes	The DB2 driver supports for all DB2 versions when retrieving BINARY, VARBINARY, and LONGVARBINARY data. The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2 when retrieving BLOB data.
byte [] getBytes (String)	1.0	Yes	The DB2 driver supports for all DB2 versions when retrieving BINARY, VARBINARY, and LONGVARBINARY data. The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2 when retrieving BLOB data.
Reader getCharacterStream (int)	2.0 Core	Yes	
Reader getCharacterStream (String)	2.0 Core	Yes	
Clob getClob (int)	2.0 Core	Yes	The SQL Server and Sybase drivers support using with LONGVARCHAR data types.
Clob getClob (String)	2.0 Core	Yes	The SQL Server and Sybase drivers support using with LONGVARCHAR data types.
int getConcurrency ()	2.0 Core	Yes	
String getCursorName ()	1.0	No	Throws “unsupported method” exception.
Date getDate (int)	1.0	Yes	
Date getDate (int, Calendar)	2.0 Core	Yes	
Date getDate (String)	1.0	Yes	
Date getDate (String, Calendar)	2.0 Core	Yes	
double getDouble (int)	1.0	Yes	

Table A-12

<b>ResultSet Object (Continued) Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
double getDouble (String)	1.0	Yes	
int getFetchDirection ()	2.0 Core	Yes	
int getFetchSize ()	2.0 Core	Yes	
float getFloat (int)	1.0	Yes	
float getFloat (String)	1.0	Yes	
int getInt (int)	1.0	Yes	
int getInt (String)	1.0	Yes	
long getLong (int)	1.0	Yes	
long getLong (String)	1.0	Yes	
ResultSetMetaData getMetaData ()	1.0	Yes	
Object getObject (int)	1.0	Yes	
Object getObject (int, Map)	2.0 Core	Yes	Map ignored.
Object getObject (String)	1.0	Yes	
Object getObject (String, Map)	2.0 Core	Yes	Map ignored.
Ref getRef (int)	2.0 Core	No	Throws “unsupported method” exception.
Ref getRef (String)	2.0 Core	No	Throws “unsupported method” exception.
int getRow ()	2.0 Core	Yes	
short getShort (int)	1.0	Yes	
short getShort (String)	1.0	Yes	
Statement getStatement ()	2.0 Core	Yes	
String getString (int)	1.0	Yes	

Table A-12

<b>ResultSet Object (Continued) Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
String getString (String)	1.0	Yes	
Time getTime (int)	1.0	Yes	
Time getTime (int, Calendar)	2.0 Core	Yes	
Time getTime (String)	1.0	Yes	
Time getTime (String, Calendar)	2.0 Core	Yes	
Timestamp getTimestamp (int)	1.0	Yes	
Timestamp getTimestamp (int, Calendar)	2.0 Core	Yes	
Timestamp getTimestamp (String)	1.0	Yes	
Timestamp getTimestamp (String, Calendar)	2.0 Core	Yes	
int getType ()	2.0 Core	Yes	
InputStream getUnicodeStream (int)	1.0	No	Throws “unsupported method” exception. This method was deprecated in JDBC 2.0.
InputStream getUnicodeStream (String)	1.0	No	Throws “unsupported method” exception. This method was deprecated in JDBC 2.0.
URL getURL (int)	3.0	No	Throws “unsupported method” exception.
URL getURL (String)	3.0	No	Throws “unsupported method” exception.
SQLWarning getWarnings ()	1.0	Yes	
void insertRow ()	2.0 Core	Yes	
boolean isAfterLast ()	2.0 Core	Yes	
boolean isBeforeFirst ()	2.0 Core	Yes	

Table A-12

<b>ResultSet Object (Continued) Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
boolean isFirst ()	2.0 Core	Yes	
boolean isLast ()	2.0 Core	Yes	
boolean last ()	2.0 Core	Yes	
void moveToCurrentRow ()	2.0 Core	Yes	
void moveToInsertRow ()	2.0 Core	Yes	
boolean next ()	1.0	Yes	
boolean previous ()	2.0 Core	Yes	
void refreshRow ()	2.0 Core	Yes	
boolean relative (int)	2.0 Core	Yes	
boolean rowDeleted ()	2.0 Core	Yes	
boolean rowInserted ()	2.0 Core	Yes	
boolean rowUpdated ()	2.0 Core	Yes	
void setFetchDirection (int)	2.0 Core	Yes	
void setFetchSize (int)	2.0 Core	Yes	
void updateArray (int, Array)	3.0	No	Throws “unsupported method” exception.
void updateArray (String, Array)	3.0	No	Throws “unsupported method” exception.
void updateAsciiStream (int, InputStream, int)	2.0 Core	Yes	
void updateAsciiStream (String, InputStream, int)	2.0 Core	Yes	
void updateBigDecimal (int, BigDecimal)	2.0 Core	Yes	



Table A-12

ResultSet Object (Continued) Methods	Version Introduced	Supported	Comments
void updateBigDecimal (String, BigDecimal)	2.0 Core	Yes	
void updateBinaryStream (int, InputStream, int)	2.0 Core	Yes	
void updateBinaryStream (String, InputStream, int)	2.0 Core	Yes	
void updateBlob (int, Blob)	3.0	No	The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.  The SQL Server and Sybase drivers support using with LONGVARBINARY data types.
void updateBlob (String, Blob)	3.0	No	The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.  The SQL Server and Sybase drivers support using with LONGVARBINARY data types.
void updateBoolean (int, boolean)	2.0 Core	Yes	
void updateBoolean (String, boolean)	2.0 Core	Yes	
void updateByte (int, byte)	2.0 Core	Yes	
void updateByte (String, byte)	2.0 Core	Yes	
void updateBytes (int, byte [])	2.0 Core	Yes	
void updateBytes (String, byte [])	2.0 Core	Yes	
void updateCharacterStream (int, Reader, int)	2.0 Core	Yes	
void updateCharacterStream (String, Reader, int)	2.0 Core	Yes	

Table A-12

<b>ResultSet Object (Continued) Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
void updateClob (int, Clob)	3.0	Yes	
void updateClob (String, Clob)	3.0	Yes	
void updateDate (int, Date)	2.0 Core	Yes	
void updateDate (String, Date)	2.0 Core	Yes	
void updateDouble (int, double)	2.0 Core	Yes	
void updateDouble (String, double)	2.0 Core	Yes	
void updateFloat (int, float)	2.0 Core	Yes	
void updateFloat (String, float)	2.0 Core	Yes	
void updateInt (int, int)	2.0 Core	Yes	
void updateInt (String, int)	2.0 Core	Yes	
void updateLong (int, long)	2.0 Core	Yes	
void updateLong (String, long)	2.0 Core	Yes	
void updateNull (int)	2.0 Core	Yes	
void updateNull (String)	2.0 Core	Yes	
void updateObject (int, Object)	2.0 Core	Yes	
void updateObject (int, Object, int)	2.0 Core	Yes	
void updateObject (String, Object)	2.0 Core	Yes	
void updateObject (String, Object, int)	2.0 Core	Yes	
void updateRef (int, Ref)	3.0	No	Throws “unsupported method” exception.
void updateRef (String, Ref)	3.0	No	Throws “unsupported method” exception.
void updateRow ()	2.0 Core	Yes	

**Table A-12**

<b>ResultSet Object (Continued) Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
void updateShort (int, short)	2.0 Core	Yes	
void updateShort (String, short)	2.0 Core	Yes	
void updateString (int, String)	2.0 Core	Yes	
void updateString (String, String)	2.0 Core	Yes	
void updateTime (int, Time)	2.0 Core	Yes	
void updateTime (String, Time)	2.0 Core	Yes	
void updateTimestamp (int, Timestamp)	2.0 Core	Yes	
void updateTimestamp (String, Timestamp)	2.0 Core	Yes	
boolean wasNull ()	1.0	Yes	

## ResultSetMetaData Object

Table A-13

<b>ResultSetMetaData Object Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
String getCatalogName (int)	1.0	Yes	
String getColumnClassName (int)	2.0 Core	Yes	
int getColumnCount ()	1.0	Yes	
int getColumnDisplaySize (int)	1.0	Yes	
String getColumnLabel (int)	1.0	Yes	
String getColumnName (int)	1.0	Yes	
int getColumnType (int)	1.0	Yes	
String getColumnTypeName (int)	1.0	Yes	
int getPrecision (int)	1.0	Yes	
int getScale (int)	1.0	Yes	
String getSchemaName (int)	1.0	Yes	
String getTableName (int)	1.0	Yes	
boolean isAutoIncrement (int)	1.0	Yes	
boolean isCaseSensitive (int)	1.0	Yes	
boolean isCurrency (int)	1.0	Yes	
boolean isDefinitelyWritable (int)	1.0	Yes	
int isNullable (int)	1.0	Yes	
boolean isReadOnly (int)	1.0	Yes	
boolean isSearchable (int)	1.0	Yes	

**Table A-13**

<b>ResultSetMetaData Object (Continued)</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
boolean isSigned (int)	1.0	Yes	
boolean isWritable (int)	1.0	Yes	

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# SavePoint Object

Table A-14

SavePoint Object Methods	Version Introduced	Supported	Comments
(all)	3.0	Yes	The DB2 driver only supports with DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.

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# Statement Object

Table A-15

Statement Object Methods	Version Introduced	Supported	Comments
void addBatch (String)	2.0 Core	Yes	Throws "invalid method call" exception for PreparedStatement and CallableStatement.
void cancel ()	1.0	Yes	Throws "unsupported method" exception for DB2 (except for DB2 UDB 8.1) and Informix.
void clearBatch ()	2.0 Core	Yes	
void clearWarnings ()	1.0	Yes	
void close ()	1.0	Yes	
boolean execute (String)	1.0	Yes	Throws "invalid method call" exception for PreparedStatement and CallableStatement.
boolean execute (String, int)	3.0	Yes	
boolean execute (String, int [])	3.0	No	Throws "unsupported method" exception.
boolean execute (String, String [])	3.0	No	Throws "unsupported method" exception.
int [] executeBatch ()	2.0 Core	Yes	
ResultSet executeQuery (String)	1.0	Yes	Throws "invalid method call" exception for PreparedStatement and CallableStatement.
int executeUpdate (String)	1.0	Yes	Throws "invalid method call" exception for PreparedStatement and CallableStatement.
int executeUpdate (String, int)	3.0	Yes	

Table A-15

Statement Object (Continued) Methods	Version Introduced	Supported	Comments
int executeUpdate (String, int [])	3.0	No	Throws "unsupported method" exception.
int executeUpdate (String, String [])	3.0	No	Throws "unsupported method" exception.
Connection getConnection ()	2.0 Core	Yes	
int getFetchDirection ()	2.0 Core	Yes	
int getFetchSize ()	2.0 Core	Yes	
ResultSet getGeneratedKeys ()	3.0	Yes	<p>The DB2, SQL Server, and Sybase drivers return the last value inserted into an identity column. If no identity column exists in the table, these drivers return an empty result set.</p> <p>The Informix driver returns the last value inserted into a Serial or Serial8 column. If no Serial or Serial8 column exists in the table, the driver returns an empty result set.</p> <p>The Oracle driver returns the ROWID of the last row inserted.</p>
int getMaxFieldSize ()	1.0	Yes	
int getMaxRows ()	1.0	Yes	
boolean getMoreResults ()	1.0	Yes	
boolean getMoreResults (int)	3.0	Yes	
int getQueryTimeout ()	1.0	Yes	Returns 0 for DB2 (except for DB2 UDB 8.1) and Informix.
ResultSet getResultSet ()	1.0	Yes	
int getResultSetConcurrency ()	2.0 Core	Yes	



Table A-15

Statement Object (Continued) Methods	Version Introduced	Supported	Comments
int getResultSetHoldability ()	3.0	No	Throws "unsupported method" exception.
int getResultSetType ()	2.0 Core	Yes	
int getUpdateCount ()	1.0	Yes	
SQLWarning getWarnings ()	1.0	Yes	
void setCursorName (String)	1.0	No	Throws "unsupported method" exception.
void setEscapeProcessing (boolean)	1.0	Yes	Ignored.
void setFetchDirection (int)	2.0 Core	Yes	
void setFetchSize (int)	2.0 Core	Yes	
void setMaxFieldSize (int)	1.0	Yes	
void setMaxRows (int)	1.0	Yes	
void setQueryTimeout (int)	1.0	Yes	Throws "unsupported method" exception for DB2 (except for DB2 UDB 8.1) and Informix.

# Struct Object

Table A-16

Statement Object Methods	Version Introduced	Supported	Comments
(all)	2.0	No	

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## XAConnection Object

**Table A-17**

<b>XAConnection Object Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
(all)	2.0 Optional	Yes	Support for all drivers except for DB2 UDB 7.x, DB2 OS/390 7.x and z/OS, and DB2 iSeries.

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# XADatasource Object

Table A-18

XADatasource Object Methods	Version Introduced	Supported	Comments
(all)	2.0 Optional	Yes	Support for all drivers except for DB2 UDB 7.x, DB2 OS/390 7.x and z/OS, and DB2 iSeries.

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## XAResource Object

**Table A-19**

<b>XAResource Object Methods</b>	<b>Version Introduced</b>	<b>Supported</b>	<b>Comments</b>
(all)	2.0 Optional	Yes	Support for all drivers except for DB2 UDB 7.x, DB2 OS/390 7.x and z/OS, and DB2 iSeries.

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# GetTypeInfo

The following tables provide results returned from the `DataBaseMetaData.getTypeInfo` method for all of the BEA WebLogic Type 4 JDBC drivers. The `getTypeInfo` method retrieves information about data types supported by a particular database. These tables are organized by driver, and within each table, the results are organized alphabetically for each `TYPE_NAME` column.

- [“DB2 Driver” on page B-1](#)
- [“Informix Driver” on page B-8](#)
- [“Oracle Driver” on page B-17](#)
- [“SQL Server Driver” on page B-24](#)
- [“Sybase Driver” on page B-35](#)

## DB2 Driver

[Table B-1](#) provides `getTypeInfo` results for all DB2 databases supported by the DB2 driver (see Chapter 2, “The DB2 Driver.”).

**Table B-1   getTypeInfo for DB2**

<b>TYPE_NAME = bigint *</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -5 (BIGINT)	PRECISION = 19
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = bigint	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	
* Supported only for DB2 UDB on Windows and UNIX.	
<b>TYPE_NAME = blob *</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = length	NUM_PREC_RADIX = NULL
DATA_TYPE = 2004 (BLOB)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 1
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = BLOB	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
* Supported only for DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries V5R2.	
<b>TYPE_NAME = char</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = length	NUM_PREC_RADIX = NULL
DATA_TYPE = 1 (CHAR)	PRECISION = 254
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = char	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	



**Table B-1** getTypeInfo for DB2

<b>TYPE_NAME = char for bit data</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = length	NUM_PREC_RADIX = NULL
DATA_TYPE = -2 (BINARY)	PRECISION = 254
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = X'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = char for bit data	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = clob</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = length	NUM_PREC_RADIX = NULL
DATA_TYPE = 2005 (CLOB)	PRECISION = 32700
FIXED_PREC_SCALE = false	SEARCHABLE = 1
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = clob	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = date</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 91 (DATE)	PRECISION = 10
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = {d'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '}	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = date	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

**Table B-1** `getTypeInfo` for DB2

<b>TYPE_NAME = dbclob *</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = length	NUM_PREC_RADIX = NULL
DATA_TYPE = 2005 (DBCLOB)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 1
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = dbclob	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
* Supported only for DB2 UDB 8.1, DB2 OS/390, and DB2 iSeries.	
<b>TYPE NAME = decimal</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = precision,scale	NUM_PREC_RADIX = 10
DATA_TYPE = 3 (DECIMAL)	PRECISION = 31
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = decimal	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 31	
<b>TYPE NAME = double</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 8 (DOUBLE)	PRECISION = 15
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = double	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = NULL	

**Table B-1** getTypeInfo for DB2**TYPE\_NAME = float**

AUTO_INCREMENT = false	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 6 (FLOAT)	PRECISION = 15
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = float	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = NULL	

**TYPE\_NAME = integer**

AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 4 (INTEGER)	PRECISION = 10
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = integer	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	

**TYPE\_NAME = long varchar**

AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -1 (LONGVARCHAR)	PRECISION = 32700 (UDB), 32704 (OS/390) *
FIXED_PREC_SCALE = false	SEARCHABLE = 1
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = long varchar	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

\* Precision depends on several factors, such as the number of columns in the table and whether the columns allow NULL values. Refer to your IBM documentation for more information.

Table B-1 getTypeInfo for DB2

<b>TYPE_NAME = long varchar for bit data</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -4 (LONGVARIABLE)	PRECISION = 32700 (UDB), 32698 (OS/390)
FIXED_PREC_SCALE = false	SEARCHABLE = 1
LITERAL_PREFIX = X'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = long varchar for bit data	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = numeric</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = precision, scale	NUM_PREC_RADIX = 10
DATA_TYPE = 2 (NUMERIC)	PRECISION = 31
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = numeric	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 31	
<b>TYPE_NAME = real</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 7 (REAL)	PRECISION = 7
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = float(4)	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = NULL	

**Table B-1 getTypeInfo for DB2****TYPE\_NAME = rowid \***

AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 0
CREATE_PARAMS = not null generated always	NUM_PREC_RADIX = NULL
DATA_TYPE = -2 (Binary)	PRECISION = 40
FIXED_PREC_SCALE = false	SEARCHABLE = 2 **
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = ROWID	UNSIGNED_ATTRIBUTE = true
MAXIMUM_SCALE = 0	

\*Supported only for DB2 iSeries V5R2.

\*\*Supported except for WHERE ... LIKE.

**TYPE\_NAME = smallint**

AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 5 (SMALLINT)	PRECISION = 5
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = smallint	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	

**TYPE\_NAME = time**

AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 92 (TIME)	PRECISION = 8
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = {t'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '}	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = time	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

**Table B-1** `getTypeInfo` for DB2

<b>TYPE_NAME = timestamp</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = 6
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 93 (TIMESTAMP)	PRECISION = 26
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = {ts'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '}	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = timestamp	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = 6	
<b>TYPE_NAME = varchar</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = max length	NUM_PREC_RADIX = NULL
DATA_TYPE = 12 (VARCHAR)	PRECISION = 32704 (UDB) 32698 (OS/390)
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = varchar	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = varchar for bit data</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = max length	NUM_PREC_RADIX = NULL
DATA_TYPE = -3 (VARBINARY)	PRECISION = 32704 (UDB) 32698 (OS/390)
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = 'X'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = varchar for bit data	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

## Informix Driver

Table B-2 provides `getTypeInfo` results for all Informix databases supported by the Informix driver (see [Chapter 3, “The Informix Driver.”](#)).

**Table B-2** getTypeInfo for Informix

<b>TYPE_NAME = blob</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 2004 (BLOB)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 0
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = blob	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = boolean</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = -7 (BIT)	PRECISION = 1
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = boolean	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = byte</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -4 (LONGVARIABLE)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 0
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = byte	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

**Table B-2** getTypeInfo for Informix

<b>TYPE_NAME = char</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = length	NUM_PREC_RADIX = NULL
DATA_TYPE = 1 (CHAR)	PRECISION = 32766
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = char	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = clob</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 2005 (CLOB)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 0
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = clob	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = date</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 91 (DATE)	PRECISION = 10
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = {d'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = ' }	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = date	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	



**Table B-2 getTypeInfo for Informix**

<b>TYPE_NAME = datetime hour to second</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 92 (TIME)	PRECISION = 8
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = {t'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '}	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = datetime hour to second	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = datetime year to day</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 91 (DATE)	PRECISION = 10
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = {d'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '}	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = datetime year to day	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = datetime year to fraction(5)</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = 5
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 93 (TIMESTAMP)	PRECISION = 25
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = {ts'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '}	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = datetime hour to fraction(5)	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = 5	

Table B-2 getTypeInfo for Informix

<b>TYPE_NAME = datetime year to second</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 93 (TIMESTAMP)	PRECISION = 19
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = {ts'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '}	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = datetime hour to second	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = decimal</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = precision, scale	NUM_PREC_RADIX = 10
DATA_TYPE = 3 (DECIMAL)	PRECISION = 32
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = decimal	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 32	
<b>TYPE_NAME = float</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 6 (FLOAT)	PRECISION = 15
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = float	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = NULL	

**Table B-2** getTypeInfo for Informix

<b>TYPE_NAME = int8</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = -5 (BIGINT)	PRECISION = 19
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = int8	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = integer</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 4 (INTEGER)	PRECISION = 10
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = integer	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = lvarchar</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 12 (VARCHAR)	PRECISION = 2048 (Informix 9.2, 9.3), 'max length' (Informix 9.4)
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = lvarchar	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

Table B-2 getTypeInfo for Informix

<b>TYPE_NAME = money</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = precision,scale	NUM_PREC_RADIX = 10
DATA_TYPE = 3 (DECIMAL)	PRECISION = 32
FIXED_PREC_SCALE = true	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = money	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 32	
<b>TYPE_NAME = nchar</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = length	NUM_PREC_RADIX = NULL
DATA_TYPE = 1 (CHAR)	PRECISION = 32766
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = ' '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = ' '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = nchar	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = nvarchar</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = max length	NUM_PREC_RADIX = NULL
DATA_TYPE = 12 (VARCHAR)	PRECISION = 254
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = ' '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = ' '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = nvarchar	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

**Table B-2** getTypeInfo for Informix

<b>TYPE_NAME = serial</b>	
AUTO_INCREMENT = true	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = start	NUM_PREC_RADIX = 10
DATA_TYPE = 4 (INTEGER)	PRECISION = 10
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = serial	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = serial8</b>	
AUTO_INCREMENT = true	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = -5 (BIGINT)	PRECISION = 19
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = serial8	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = smallfloat</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 7 (REAL)	PRECISION = 7
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = smallfloat	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = NULL	

Table B-2 getTypeInfo for Informix

<b>TYPE_NAME = smallint</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 5 (SMALLINT)	PRECISION = 5
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = smallint	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = text</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -1 (LONGVARCHAR)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 0
LITERAL_PREFIX = ' '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = ' '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = text	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = varchar</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = max length	NUM_PREC_RADIX = NULL
DATA_TYPE = 12 (VARCHAR)	PRECISION = 254
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = ' '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = ' '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = varchar	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

## Oracle Driver

[Table B-3](#) provides getTypeInfo results for Oracle8i, Oracle9i, and Oracle10g. [Table B-4](#) provides additional results for Oracle9i. [Table B-5](#) provides additional results for Oracle10g.

**Table B-3 getTypeInfo for Oracle (Oracle8i, 9i, and 10g)**

<b>TYPE_NAME = bfile</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 2004 (BLOB)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 0
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = bfile	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = blob</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 2004 (BLOB)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 0
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = blob	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = char</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = length	NUM_PREC_RADIX = NULL
DATA_TYPE = 1 (CHAR)	PRECISION = 2000
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = char	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

**Table B-3** `getTypeInfo` for Oracle (Oracle8i, 9i, and 10g)

<b>TYPE_NAME = clob</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 2005 (CLOB)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 0
LITERAL_PREFIX = ' '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = ' '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = clob	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = date</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 93 (TIMESTAMP)	PRECISION = 19
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = {ts' }	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = ' }	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = date	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = long</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -1 (LONGVARCHAR)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 0
LITERAL_PREFIX = ' '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = ' '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = long	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	



**Table B-3** getTypeInfo for Oracle (Oracle8i, 9i, and 10g)

<b>TYPE_NAME = long raw</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -4 (LONGVARIABLE)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 0
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = long raw	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = nchar</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = length	NUM_PREC_RADIX = NULL
DATA_TYPE = 1 (CHAR)	PRECISION = 2000
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = 'N'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = nchar	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = nclob</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 2005 (CLOB)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 0
LITERAL_PREFIX = 'N'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = nclob	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

**Table B-3** `getTypeInfo` for Oracle (Oracle8i, 9i, and 10g)

<b>TYPE_NAME = number (p, s)</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = -84
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = precision, scale	NUM_PREC_RADIX = 10
DATA_TYPE = 3 (DECIMAL)	PRECISION = 38
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = number	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 127	
<b>TYPE_NAME = number</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = -84
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 3 (FLOAT)	PRECISION = 38
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = number	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 127	
<b>TYPE_NAME = nvarchar2</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = max length	NUM_PREC_RADIX = NULL
DATA_TYPE = 12 (VARCHAR)	PRECISION = 4000
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = N'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = nvarchar2	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

**Table B-3** getTypeInfo for Oracle (Oracle8i, 9i, and 10g)

<b>TYPE_NAME = raw</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = max length	NUM_PREC_RADIX = NULL
DATA_TYPE = -3 (VARBINARY)	PRECISION = 2000
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = raw	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = varchar2</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = max length	NUM_PREC_RADIX = NULL
DATA_TYPE = 12 (VARCHAR)	PRECISION = 4000
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = varchar2	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

# Oracle9i Only

Table B-4 getTypeInfo for Oracle (Oracle9i Only)

<b>TYPE_NAME = timestamp</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = fractional_seconds_precision	NUM_PREC_RADIX = NULL
DATA_TYPE = 93 (TIMESTAMP)	PRECISION = 19
FIXED_PREC_SCALE = false	SEARCHABLE = 2 *
LITERAL_PREFIX = {ts '}	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '}	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = timestamp	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = 9	
* Supported except for WHERE ... LIKE.	
<b>TYPE_NAME = timestamp with local time zone</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = fractional_seconds_precision	NUM_PREC_RADIX = NULL
DATA_TYPE = 93 (TIMESTAMP)	PRECISION = 19
FIXED_PREC_SCALE = false	SEARCHABLE = 2 *
LITERAL_PREFIX = {ts '}	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '}	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = timestamp with local time zone	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = 9	
* Supported except for WHERE ... LIKE.	

**Table B-4 getTypeInfo for Oracle (Oracle9i Only)****TYPE\_NAME = timestamp with time zone**

AUTO_INCREMENT = NULL	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = fractional_seconds_precision	NUM_PREC_RADIX = NULL
DATA_TYPE = 93 (TIMESTAMP)	PRECISION = 19
FIXED_PREC_SCALE = false	SEARCHABLE = 2 *
LITERAL_PREFIX = {ts '}	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '}	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = timestamp with time zone	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = 9	

\* Supported except for WHERE ... LIKE.

**TYPE\_NAME = XMLTYPE**

AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 2005 (CLOB)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 0
LITERAL_PREFIX = xmltype('	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = ')	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = XMLTYPE	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

# Oracle10g Only

Table B-5 getTypeInfo for Oracle (Oracle10g Only)

<b>TYPE_NAME = binary_float</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 7 (REAL)	PRECISION = 7
FIXED_PREC_SCALE = false	SEARCHABLE = 2 *
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = binary_float	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = NULL	
* Supported except for WHERE ... LIKE.	
<b>TYPE_NAME = binary_double</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 8 (DOUBLE)	PRECISION = 15
FIXED_PREC_SCALE = false	SEARCHABLE = 2*
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = binary_double	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = NULL	
* Supported except for WHERE ... LIKE.	

## SQL Server Driver

Table B-6 provides getTypeInfo results for Microsoft SQL Server 7 and Microsoft SQL Server 2000. Table B-7 provides additional results for Microsoft SQL Server 2000 only.

**Table B-6** getTypeInfo for SQL Server (Microsoft SQL Server 7 and 2000)

<b>TYPE_NAME = binary</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = length	NUM_PREC_RADIX = NULL
DATA_TYPE = -2 (BINARY)	PRECISION = 8000
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = 0x	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = binary	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = bit</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -7 (BIT)	PRECISION = 1
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = bit	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = char</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = length	NUM_PREC_RADIX = NULL
DATA_TYPE = 1 (CHAR)	PRECISION = 8000
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = char	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

**Table B-6** `getTypeInfo` for SQL Server (Microsoft SQL Server 7 and 2000)

<b>TYPE_NAME = datetime</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = 3
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 93 (TIMESTAMP)	PRECISION = 23
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = ' '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = ' '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = datetime	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = 3	
<b>TYPE_NAME = decimal</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = precision,scale	NUM_PREC_RADIX = 10
DATA_TYPE = 3 (DECIMAL)	PRECISION = 28 (SQL Server 7), 38 (SQL Server 2000)
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = decimal	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 28 (SQL Server 7), 38 (SQL Server 2000) *	
* Configurable server option for Microsoft SQL Server 2000.	
<b>TYPE_NAME = decimal() identity</b>	
AUTO_INCREMENT = true	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 0
CREATE_PARAMS = precision	NUM_PREC_RADIX = 10
DATA_TYPE = 3 (DECIMAL)	PRECISION = 38
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = decimal() identity	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	



**Table B-6** getTypeInfo for SQL Server (Microsoft SQL Server 7 and 2000)

<b>TYPE_NAME = float</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 2
DATA_TYPE = 6 (FLOAT)	PRECISION = 53
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = float	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = image</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -4 (LONGVARBINARY)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 0
LITERAL_PREFIX = 0x	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = image	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = int</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 4 (INTEGER)	PRECISION = 10
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = int	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	

**Table B-6** getTypeInfo for SQL Server (Microsoft SQL Server 7 and 2000)

<b>TYPE_NAME = int identity</b>	
AUTO_INCREMENT = true	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 0
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 4 (INTEGER)	PRECISION = 10
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = int identity	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = money</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 4
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 3 (DECIMAL)	PRECISION = 19
FIXED_PREC_SCALE = true	SEARCHABLE = 2
LITERAL_PREFIX = \$	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = money	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 4	
<b>TYPE_NAME = nchar</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = length	NUM_PREC_RADIX = NULL
DATA_TYPE = 1 (CHAR)	PRECISION = 4000
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = N'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = nchar	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

**Table B-6** getTypeInfo for SQL Server (Microsoft SQL Server 7 and 2000)

<b>TYPE_NAME = ntext</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -1 (LONGVARCHAR)	PRECISION = 1073741823
FIXED_PREC_SCALE = false	SEARCHABLE = 1
LITERAL_PREFIX = N'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = ntext	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = numeric</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = precision,scale	NUM_PREC_RADIX = 10
DATA_TYPE = 2 (NUMERIC)	PRECISION = 28 (SQL Server 7),
FIXED_PREC_SCALE = false	38 (SQL Server 2000) *
LITERAL_PREFIX = NULL	SEARCHABLE = 2
LITERAL_SUFFIX = NULL	SQL_DATA_TYPE = NULL
LOCAL_TYPE_NAME = numeric	SQL_DATETIME_SUB = NULL
MAXIMUM_SCALE = 28 (SQL Server 7),	UNSIGNED_ATTRIBUTE = false
38 (SQL Server 2000) *	
* Configurable server option for Microsoft SQL Server 2000.	
<b>TYPE_NAME = numeric() identity</b>	
AUTO_INCREMENT = true	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 0
CREATE_PARAMS = precision	NUM_PREC_RADIX = 10
DATA_TYPE = 2 (NUMERIC)	PRECISION = 38
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = numeric() identity	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	

**Table B-6** `getTypeInfo` for SQL Server (Microsoft SQL Server 7 and 2000)

<b>TYPE_NAME = nvarchar</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = max length	NUM_PREC_RADIX = NULL
DATA_TYPE = 12 (VARCHAR)	PRECISION = 4000
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = N'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = nvarchar	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = real</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 2
DATA_TYPE = 7 (REAL)	PRECISION = 24
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = real	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = smalldatetime</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 93 (TIMESTAMP)	PRECISION = 16
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = smalldatetime	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = 0	

**Table B-6** getTypeInfo for SQL Server (Microsoft SQL Server 7 and 2000)

<b>TYPE_NAME = smallint</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 5 (SMALLINT)	PRECISION = 5
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = smallint	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = smallint identity</b>	
AUTO_INCREMENT = true	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 0
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 5 (SMALLINT)	PRECISION = 5
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = smallint identity	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = smallmoney</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 4
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 3 (DECIMAL)	PRECISION = 10
FIXED_PREC_SCALE = true	SEARCHABLE = 2
LITERAL_PREFIX = \$	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = smallmoney	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 4	

**Table B-6** `getTypeInfo` for SQL Server (Microsoft SQL Server 7 and 2000)

<b>TYPE_NAME = sysname</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 0
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 12 (VARCHAR)	PRECISION = 128
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = N'	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = sysname	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = text</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -1 (LONGVARCHAR)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 1
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = text	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = timestamp</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 0
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -2 (BINARY)	PRECISION = 8
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = 0x	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = timestamp	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

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**Table B-6   getTypeInfo for SQL Server (Microsoft SQL Server 7 and 2000)**

<b>TYPE_NAME = varbinary</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = max length	NUM_PREC_RADIX = NULL
DATA_TYPE = -3 (VARBINARY)	PRECISION = 8000
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = 0x	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = varbinary	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = varchar</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = max length	NUM_PREC_RADIX = NULL
DATA_TYPE = 12 (VARCHAR)	PRECISION = 8000
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = varchar	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	



## Microsoft SQL Server 2000 Only

**Table B-7** getTypeInfo for SQL Server (Microsoft SQL Server 2000 Only)

<b>TYPE_NAME = bigint</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = -5 (BIGINT)	PRECISION = 19
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = bigint	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = bigint identity</b>	
AUTO_INCREMENT = true	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 0
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = -5 (BIGINT)	PRECISION = 19
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = bigint identity	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = sql_variant</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 12 (VARCHAR)	PRECISION = 8000
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = sql_variant	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = 0	

## Sybase Driver

**Table B-8** provides getTypeInfo results for all Sybase databases supported by the Sybase driver (see [Chapter 6, “The Sybase Driver”](#)).

<b>TYPE_NAME = binary</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = length	NUM_PREC_RADIX = NULL
DATA_TYPE = -2 (BINARY)	PRECISION = 2048
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = 0x	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = binary	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<hr/>	
<b>TYPE_NAME = bit</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 0
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -7 (BIT)	PRECISION = 1
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = bit	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = 0	
<hr/>	
<b>TYPE_NAME = char</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = length	NUM_PREC_RADIX = NULL
DATA_TYPE = 1 (CHAR)	PRECISION = 2048
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = char	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

**Table B-8 getTypeInfo for Sybase****TYPE\_NAME = date \***

AUTO\_INCREMENT = NULL  
CASE\_SENSITIVE = false  
CREATE\_PARAMS = NULL  
DATA\_TYPE = 91 (DATE)  
FIXED\_PREC\_SCALE = false  
LITERAL\_PREFIX = '  
LITERAL\_SUFFIX = '  
LOCAL\_TYPE\_NAME = date  
MAXIMUM\_SCALE = NULL

MINIMUM\_SCALE = 6  
NULLABLE = 1  
NUM\_PREC\_RADIX = NULL  
PRECISION = 10  
SEARCHABLE = 3  
SQL\_DATA\_TYPE = NULL  
SQL\_DATETIME\_SUB = NULL  
UNSIGNED\_ATTRIBUTE = NULL

\* Supported only for Sybase 12.5.1.

**TYPE\_NAME = datetime**

AUTO\_INCREMENT = NULL  
CASE\_SENSITIVE = false  
CREATE\_PARAMS = NULL  
DATA\_TYPE = 93 (TIMESTAMP)  
FIXED\_PREC\_SCALE = false  
LITERAL\_PREFIX = '  
LITERAL\_SUFFIX = '  
LOCAL\_TYPE\_NAME = datetime  
MAXIMUM\_SCALE = 6

MINIMUM\_SCALE = 6  
NULLABLE = 1  
NUM\_PREC\_RADIX = NULL  
PRECISION = 23  
SEARCHABLE = 3  
SQL\_DATA\_TYPE = NULL  
SQL\_DATETIME\_SUB = NULL  
UNSIGNED\_ATTRIBUTE = NULL

**TYPE\_NAME = decimal**

AUTO\_INCREMENT = false  
CASE\_SENSITIVE = false  
CREATE\_PARAMS = precision,scale  
DATA\_TYPE = 3 (DECIMAL)  
FIXED\_PREC\_SCALE = false  
LITERAL\_PREFIX = NULL  
LITERAL\_SUFFIX = NULL  
LOCAL\_TYPE\_NAME = decimal  
MAXIMUM\_SCALE = 38

MINIMUM\_SCALE = 0  
NULLABLE = 1  
NUM\_PREC\_RADIX = NULL  
PRECISION = 38  
SEARCHABLE = 2  
SQL\_DATA\_TYPE = NULL  
SQL\_DATETIME\_SUB = NULL  
UNSIGNED\_ATTRIBUTE = false

Table B-8 getTypeInfo for Sybase

<b>TYPE_NAME = float</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 6 (FLOAT)	PRECISION = 15
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = float	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = image</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -4 (LONGVARBINARY)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 1
LITERAL_PREFIX = 0x	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = image	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = int</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 4 (INTEGER)	PRECISION = 10
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = int	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	

**Table B-8 getTypeInfo for Sybase**

<b>TYPE_NAME = money</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 4
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 3 (DECIMAL)	PRECISION = 19
FIXED_PREC_SCALE = true	SEARCHABLE = 2
LITERAL_PREFIX = \$	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = money	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 4	
<b>TYPE_NAME = nchar</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 1 (CHAR)	PRECISION = 2048
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = nchar	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = numeric</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = precision,scale	NUM_PREC_RADIX = NULL
DATA_TYPE = 2 (NUMERIC)	PRECISION = 38
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = numeric	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 38	

Table B-8 getTypeInfo for Sybase

<b>TYPE_NAME = nvarchar</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 12 (VARCHAR)	PRECISION = 2048
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = nvarchar	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = real</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = 10
DATA_TYPE = 7 (REAL)	PRECISION = 7
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = real	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = smalldatetime</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = 3
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 93 (TIMESTAMP)	PRECISION = 16
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = smalldatetime	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = 3	

**Table B-8 getTypeInfo for Sybase**

<b>TYPE_NAME = smallint</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 0
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 5 (SMALLINT)	PRECISION = 5
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = NULL	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = smallint	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 0	
<b>TYPE_NAME = smallmoney</b>	
AUTO_INCREMENT = false	MINIMUM_SCALE = 4
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 3 (DECIMAL)	PRECISION = 10
FIXED_PREC_SCALE = true	SEARCHABLE = 2
LITERAL_PREFIX = \$	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = smallmoney	UNSIGNED_ATTRIBUTE = false
MAXIMUM_SCALE = 4	
<b>TYPE_NAME = sysname</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = max length	NUM_PREC_RADIX = NULL
DATA_TYPE = 12 (VARCHAR)	PRECISION = 30
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = sysname	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

Table B-8 getTypeInfo for Sybase

<b>TYPE_NAME = text</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -1 (LONGVARCHAR)	PRECISION = 2147483647
FIXED_PREC_SCALE = false	SEARCHABLE = 1
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = text	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = time *</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = 6
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = 92 (TIME)	PRECISION = 10
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = time	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
* Supported only for Sybase 12.5.1.	
<b>TYPE_NAME = timestamp</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = NULL	NUM_PREC_RADIX = NULL
DATA_TYPE = -3 (VARBINARY)	PRECISION = 8
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX =0x	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = timestamp	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	



**Table B-8 getTypeInfo for Sybase****TYPE\_NAME = tinyint**

AUTO\_INCREMENT = false  
CASE\_SENSITIVE = false  
CREATE\_PARAMS = NULL  
DATA\_TYPE = -6 (TINYINT)  
FIXED\_PREC\_SCALE = false  
LITERAL\_PREFIX = NULL  
LITERAL\_SUFFIX = NULL  
LOCAL\_TYPE\_NAME = tinyint  
MAXIMUM\_SCALE = 0

MINIMUM\_SCALE = 0  
NULLABLE = 1  
NUM\_PREC\_RADIX = NULL  
PRECISION = 3  
SEARCHABLE = 2  
SQL\_DATA\_TYPE = NULL  
SQL\_DATETIME\_SUB = NULL  
UNSIGNED\_ATTRIBUTE = true

**TYPE\_NAME = unichar \***

AUTO\_INCREMENT = NULL  
CASE\_SENSITIVE = true  
CREATE\_PARAMS = length  
DATA\_TYPE = 1 (CHAR)  
FIXED\_PREC\_SCALE = false  
LITERAL\_PREFIX = '  
LITERAL\_SUFFIX = '  
LOCAL\_TYPE\_NAME = unichar  
MAXIMUM\_SCALE = NULL

MINIMUM\_SCALE = NULL  
NULLABLE = 1  
NUM\_PREC\_RADIX = NULL  
PRECISION = 2048  
SEARCHABLE = 3  
SQL\_DATA\_TYPE = NULL  
SQL\_DATETIME\_SUB = NULL  
UNSIGNED\_ATTRIBUTE = NULL

\* Supported only for Sybase 12.5 and 12.5.1.

**TYPE\_NAME = univarchar \***

AUTO\_INCREMENT = NULL  
CASE\_SENSITIVE = true  
CREATE\_PARAMS = max length  
DATA\_TYPE = 12 (VARCHAR)  
FIXED\_PREC\_SCALE = false  
LITERAL\_PREFIX = '  
LITERAL\_SUFFIX = '  
LOCAL\_TYPE\_NAME = univarchar  
MAXIMUM\_SCALE = NULL

MINIMUM\_SCALE = NULL  
NULLABLE = 1  
NUM\_PREC\_RADIX = NULL  
PRECISION = 2048  
SEARCHABLE = 3  
SQL\_DATA\_TYPE = NULL  
SQL\_DATETIME\_SUB = NULL  
UNSIGNED\_ATTRIBUTE = NULL

\* Supported only for Sybase 12.5 and 12.5.1.

Table B-8 getTypeInfo for Sybase

<b>TYPE_NAME = varbinary</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = false	NULLABLE = 1
CREATE_PARAMS = max length	NUM_PREC_RADIX = NULL
DATA_TYPE = -3 (VARBINARY)	PRECISION = 2048
FIXED_PREC_SCALE = false	SEARCHABLE = 2
LITERAL_PREFIX = 0x	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = NULL	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = varbinary	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	
<b>TYPE_NAME = varchar</b>	
AUTO_INCREMENT = NULL	MINIMUM_SCALE = NULL
CASE_SENSITIVE = true	NULLABLE = 1
CREATE_PARAMS = max length	NUM_PREC_RADIX = NULL
DATA_TYPE = 12 (VARCHAR)	PRECISION = 2048
FIXED_PREC_SCALE = false	SEARCHABLE = 3
LITERAL_PREFIX = '	SQL_DATA_TYPE = NULL
LITERAL_SUFFIX = '	SQL_DATETIME_SUB = NULL
LOCAL_TYPE_NAME = varchar	UNSIGNED_ATTRIBUTE = NULL
MAXIMUM_SCALE = NULL	

# SQL Escape Sequences for JDBC

Language features, such as outer joins and scalar function calls, are commonly implemented by database systems. The syntax for these features is often database-specific, even when a standard syntax has been defined. JDBC defines escape sequences that contain standard syntaxes for the following language features:

- Date, time, and timestamp literals
- Scalar functions such as numeric, string, and data type conversion functions
- Outer joins
- Procedure calls

The escape sequence used by JDBC is:

```
{extension}
```

The escape sequence is recognized and parsed by the BEA WebLogic Type 4 JDBC drivers, which replace the escape sequences with data store-specific grammar.

# Date, Time, and Timestamp Escape Sequences

The escape sequence for date, time, and timestamp literals is:

`{literal-type 'value'}`

where *literal-type* is one of the following:

**Table C-1 Literal Types for Date, Time, and Timestamp Escape Sequences**

literal-type	Description	Value Format
d	Date	yyyy-mm-dd
t	Time	hh:mm:ss [1]
ts	Timestamp	yyyy-mm-dd hh:mm:ss[.f...]

**Example:**

```
UPDATE Orders SET OpenDate={d '1995-01-15'}
WHERE OrderID=1023
```

# Scalar Functions

You can use scalar functions in SQL statements with the following syntax:

`{fn scalar-function}`

where *scalar-function* is a scalar function supported by the BEA WebLogic Type 4 JDBC drivers, as listed in [Table C-2](#).

**Example:**

```
SELECT id, name FROM emp WHERE name LIKE {fn UCASE('Smith')}
```

Table C-2 Scalar Functions Supported

Data Store	String Functions	Numeric Functions	Timedate Functions	System Functions
DB2	ASCII	ABS or	DATE	COALESCE
	BLOB	ABSVAL	DAY	DEREF
	CHAR	ACOS	DAYNAME	DLCOMMENT
	CHR	ASIN	DAYOFWEEK	DLLINKTYPE
	CLOB	ATAN	DAYOFYEAR	DLURLCOMPLETE
	CONCAT	ATANH	DAYS	DLURLPATH
	DBCLOB	ATAN2	HOURL	DLURLPATHONLY
	DIFFERENCE	BIGINT	JULIAN_DAY	DLURLSCHEME
	GRAPHIC	CEILING	MICROSECOND	DLURLSERVER
	HEX	or CEIL	MIDNIGHT_SECONDS	DLVALUE
	INSERT	COS	MINUTE	EVENT_MON_STATE
	LCASE or LOWER	COSH	MONTH	GENERATE_UNIQUE
	LCASE	COT	MONTHNAME	NODENUMBER
	(SYSFUN schema)	DECIMAL	QUARTER	NULLIF
	LEFT	DEGREES	SECOND	PARTITION
	LENGTH	DIGITS	TIME	RAISE_ERROR
	LOCATE	DOUBLE	TIMESTAMP	TABLE_NAME
	LONG_VARCHAR	EXP	TIMESTAMP_ISO	TABLE_SCHEMA
	LONG_VARGRAPHIC	FLOAT	TIMESTAMPDIFF	TRANSLATE
	LTRIM	FLOOR	WEEK	TYPE_ID
	LTRIM	INTEGER	YEAR	TYPE_NAME
	(SYSFUN schema)	LN		TYPE_SCHEMA
	POSSTR	LOG		VALUE
	REPEAT	LOG10		
	REPLACE	MOD		
	RIGHT	POWER		
	RTRIM	RADIANS		
	RTRIM	RAND		
	(SYSFUN schema)	REAL		

Table C-2 Scalar Functions Supported

Data Store	String Functions	Numeric Functions	Timedate Functions	System Functions
DB2 (continued)	SOUNDEX	ROUND		
	SPACE	SIGN		
	SUBSTR	SIN		
	TRUNCATE or TRUNC	SINH		
	UCASE or UPPER	SMALLINT		
	VARCHAR	SQRT		
	VARGRAPHIC	TAN		
		TANH		
		TRUNCATE		
Informix	CONCAT	ABS	CURDATE	DATABASE
	LEFT	ACOS	CURTIME	USER
	LENGTH	ASIN	DAYOFMONTH	
	LTRIM	ATAN	DAYOFWEEK	
	REPLACE	ATAN2	MONTH	
	RTRIM	COS	NOW	
	SUBSTRING	COT	TIMESTAMPADD	
		EXP	TIMESTAMPDIFF	
		FLOOR	YEAR	
		LOG		
		LOG10		
		MOD		
		PI		
		POWER		
		ROUND		
		SIN		
		SQRT		
		TAN		
		TRUNCATE		

**Table C-2 Scalar Functions Supported**

<b>Data Store</b>	<b>String Functions</b>	<b>Numeric Functions</b>	<b>Timedate Functions</b>	<b>System Functions</b>
Oracle	ASCII	ABS	CURDATE	IFNULL
	BIT_LENGTH	ACOS	DAYNAME	USER
	CHAR	ASIN	DAYOFMONTH	
	CONCAT	ATAN	DAYOFWEEK	
	INSERT	ATAN2	DAYOFYEAR	
	LCASE	CEILING	hour	
	LEFT	COS	MINUTE	
	LENGTH	COT	MONTH	
	LOCATE	EXP	MONTHNAME	
	LOCATE2	FLOOR	NOW	
	LTRIM	LOG	QUARTER	
	OCTET_LENGTH	LOG10	SECOND	
	REPEAT	MOD	WEEK	
	REPLACE	PI	YEAR	
	RIGHT	POWER		
	RTRIM	ROUND		
	SOUNDEX	SIGN		
	SPACE	SIN		
	SUBSTRING	SQRT		
	UCASE	TAN		
		TRUNCATE		

**Table C-2 Scalar Functions Supported**

<b>Data Store</b>	<b>String Functions</b>	<b>Numeric Functions</b>	<b>Timedate Functions</b>	<b>System Functions</b>
SQL Server	ASCII	ABS	DAYNAME	DATABASE
	CHAR	ACOS	DAYOFMONTH	IFNULL
	CONCAT	ASIN	DAYOFWEEK	USER
	DIFFERENCE	ATAN	DAYOFYEAR	
	INSERT	ATAN2	EXTRACT	
	LCASE	CEILING	hour	
	LEFT	COS	MINUTE	
	LENGTH	COT	MONTH	
	LOCATE	DEGREES	MONTHNAME	
	LTRIM	EXP	NOW	
	REPEAT	FLOOR	QUARTER	
	REPLACE	LOG	SECOND	
	RIGHT	LOG10	TIMESTAMPADD	
	RTRIM	MOD	TIMESTAMPDIFF	
	SOUNDEX	PI	WEEK	
	SPACE	POWER	YEAR	
	SUBSTRING	RADIANS		
	UCASE	RAND		
		ROUND		
		SIGN		
		SIN		
		SQRT		
		TAN		
		TRUNCATE		



**Table C-2 Scalar Functions Supported**

<b>Data Store</b>	<b>String Functions</b>	<b>Numeric Functions</b>	<b>Timedate Functions</b>	<b>System Functions</b>
Sybase	ASCII	ABS	DAYNAME	DATABASE
	CHAR	ACOS	DAYOFMONTH	IFNULL
	CONCAT	ASIN	DAYOFWEEK	USER
	DIFFERENCE	ATAN	DAYOFYEAR	
	INSERT	ATAN2	HOURL	
	LCASE	CEILING	MINUTE	
	LEFT	COS	MONTH	
	LENGTH	COT	MONTHNAME	
	LOCATE	DEGREES	NOW	
	LTRIM	EXP	QUARTER	
	REPEAT	FLOOR	SECOND	
	RIGHT	LOG	TIMESTAMPADD	
	RTRIM	LOG10	TIMESTAMPDIFF	
	SOUNDEX	MOD	WEEK	
	SPACE	PI	YEAR	
	SUBSTRING	POWER		
	UCASE	RADIANS		
		RAND		
		ROUND		
		SIGN		
		SIN		
		SQRT		
		TAN		

## Outer Join Escape Sequences

JDBC supports the SQL92 left, right, and full outer join syntax. The escape sequence for outer joins is:

```
{oj outer-join}
```

where *outer-join* is:

```
table-reference {LEFT | RIGHT | FULL} OUTER JOIN  
{table-reference | outer-join} ON search-condition
```

where:

*table-reference* is a database table name.

*search-condition* is the join condition you want to use for the tables.

**Example:**

```
SELECT Customers.CustID, Customers.Name, Orders.OrderID, Orders.Status  
FROM {oj Customers LEFT OUTER JOIN  
      Orders ON Customers.CustID=Orders.CustID}  
WHERE Orders.Status='OPEN'
```

Table C-3 lists the outer join escape sequences supported by BEA WebLogic Type 4 JDBC drivers for each data store.

**Table C-3 Outer Join Escape Sequences Supported**

Data Store	Outer Join Escape Sequences
DB2	Left outer joins Right outer joins Nested outer joins
Informix	Left outer joins Right outer joins Nested outer joins
Oracle	Left outer joins Right outer joins Nested outer joins

**Table C-3 Outer Join Escape Sequences Supported (Continued)**

<b>Data Store</b>	<b>Outer Join Escape Sequences</b>
SQL Server	Left outer joins Right outer joins Full outer joins Nested outer joins
Sybase	Left outer joins Right outer joins Nested outer joins

## Procedure Call Escape Sequences

A procedure is an executable object stored in the data store. Generally, it is one or more SQL statements that have been precompiled. The escape sequence for calling a procedure is:

```
{[?]=call procedure-name[([parameter] [, parameter]...)]}
```

where:

*procedure-name* specifies the name of a stored procedure.

*parameter* specifies a stored procedure parameter.

**Note:** For DB2, a schema name cannot be used when calling a stored procedure. Also, for DB2 UDB 8.1, literal parameter values are supported for stored procedures. Other supported DB2 versions do not support literal parameter values for stored procedures.

BETA

# Tracking JDBC Calls with WebLogic

## JDBC Spy

BEA WebLogic JDBC Spy is a wrapper that wraps a BEA WebLogic Type 4 JDBC driver. It logs detailed information about JDBC calls issued by an application and then passes the calls to the wrapped WebLogic Type 4 JDBC driver. You can use the information in the logs to help troubleshoot problems in your application. WebLogic JDBC Spy provides the following advantages:

- Logging is JDBC 1.22-, JDBC 2.0-, and JDBC 3.0-compliant, including support for the JDBC 2.0 Optional Package.
- Logging works with all BEA WebLogic Type 4 JDBC drivers.
- Logging is consistent, regardless of which BEA WebLogic Type 4 JDBC driver is used.
- All parameters and function results for JDBC calls can be logged.
- Logging can be enabled without changing the application, but instead by changing the JDBC data source in your WebLogic Server configuration.

**Note:** The WebLogic JDBC Spy implements standard JDBC APIs only. It does not implement JDBC extensions implemented in other WebLogic Type 4 JDBC drivers. If your

application uses JDBC extensions, you may see errors when using the WebLogic JDBC Spy.

## Configuring WebLogic JDBC Data Sources for WebLogic JDBC Spy

To use WebLogic JDBC Spy with WebLogic Server, you add JDBC Spy attributes to the end of the URL in the JDBC data source configuration. Follow these instructions for modifying your data source configuration:

1. Before you start the server, add `WL_HOME/server/lib/wls spy.jar` to your CLASSPATH, where `WL_HOME` is the directory in which you installed the WebLogic Server software, typically `C:\bea\weblogic81`.
2. In the WebLogic Server Administration Console or in the `config.xml` file for your WebLogic domain, append the WebLogic JDBC Spy options to the data source URL. Enclose all JDBC Spy options in one set of parentheses; separate multiple options with a semi-colon.

In the Administration Console on the JDBCConnectionPool → Configuration → General tab, add the `spyAttributes` to the end of the existing URL. For example:

```
jdbc:bea:DB2://db2host:50000;user=john;spyAttributes=(log=(file)d:\spy.log;timestamp=yes)
```

Alternatively, in the `config.xml` file, update the URL in the JDBC data source entry. For example:

```
<JDBCConnectionPool Name="datasource"
Password="{3DES}0zvizFP1" Targets="myserver"
InitialCapacity="10" MaxCapacity="10"
DriverName="weblogic.jdbcx.db2.DB2DataSource"
Properties="user=john;DatabaseName=wls;PortNumber=50000;
ServerName=db2host;batchPerformanceWorkaround=true"
URL="jdbc:bea:DB2://db2host:50000;user=john;
spyAttributes=(log=(file)d:\spy.log;timestamp=yes)"
SupportsLocalTransaction="true"
KeepXAConnTillTxComplete="true"
/>
```

3. Stop and restart WebLogic Server.

## BEA WebLogic JDBC Spy URL Attributes

[Table E-1](#) lists the options available for configuring WebLogic JDBC Spy. Use these options as attributes for the spyAttributes property for an XA driver or in the URL for a non-XA driver.

**Table E-1 WebLogic JDBC Spy URL Attributes**

Key-Value Pair	Description
log=System.out	Redirects logging to the Java output standard.
log=(file) <i>filename</i>	Redirects logging to the file specified by <i>filename</i> . By default, WebLogic JDBC Spy uses the stream specified in DriverManager.setLogStream().
load= <i>classname</i>	Loads the driver specified by <i>classname</i> . For example, weblogic.jdbc.db2.DB2Driver.
linelimit= <i>numberofchars</i>	The maximum number of characters, specified by <i>numberofchars</i> , that WebLogic JDBC Spy will log on one line. The default is 0 (no maximum limit).
logIS={yes   no   nosingleread}	<p>Specifies whether WebLogic JDBC Spy logs activity on InputStream and Reader objects.</p> <p>When logIS=nosingleread, logging on InputStream and Reader objects is active; however logging of the single-byte read InputStream.read() or single-character Reader.read() is suppressed. This avoids the generation of large log files containing single-byte / single character read messages.</p> <p>The default is no.</p>
logTName={yes   no}	Specifies whether WebLogic JDBC Spy logs the name of the current thread. The default is no.
timestamp={yes   no}	Specifies whether a timestamp should be included on each line of the WebLogic JDBC Spy log.

## BEA WebLogic JDBC Spy Log Example

The superscript Numbers are note indicators. See the notes following the example for the referenced text.

## Tracking JDBC Calls with WebLogic JDBC Spy

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```
registerDriver:driver[className=weblogic.jdbcspy.SpyDriver,  
context=null,weblogic.jdbcspy.SpyDriver@1ec49f]2
```

```
*Driver.connect(jdbc:spy:{jdbc:bea:sqlserver://QANT:4003;  
databaseName=Test;})
```

```
trying driver[className=weblogic.jdbcspy.SpyDriver,  
context=null,weblogic.jdbcspy.SpyDriver@1ec49f]3
```

```
spy>> Driver.connect(String url, Properties info)  
spy>> url = jdbc:spy:{jdbc:bea:sqlserver://QANT:4003;databaseName=Test;  
OSUser=qauser;OSPassword=null12}  
spy>> info = {password=tiger, user=scott}  
spy>> OK (Connection[1])4
```

```
getConnection returning driver[className=weblogic.jdbcspy.SpyDriver,  
context=null,weblogic.jdbcspy.SpyDriver@1ec49f]5
```

```
spy>> Connection[1].getWarnings()  
spy>> OK6
```

```
spy>> Connection[1].createStatement  
spy>> OK (Statement[1])7
```

```
spy>> Statement[1].executeQuery(String sql)  
spy>> sql = select empno,ename,job from emp where empno=7369  
spy>> OK (ResultSet[1])8
```

```
spy>> ResultSet[1].getMetaData()  
spy>> OK (ResultSetMetaData[1])9
```

```
spy>> ResultSetMetaData[1].getColumnCount()  
spy>> OK (3)10
```

```
spy>> ResultSetMetaData[1].getColumnLabel(int column)  
spy>> column = 1  
spy>> OK (EMPNO)11
```

```
spy>> ResultSetMetaData[1].getColumnLabel(int column)  
spy>> column = 2  
spy>> OK (ENAME)12
```



```

spy>> ResultSetMetaData[1].getColumnLabel(int column)
spy>> column = 3
spy>> OK (JOB)13

spy>> ResultSet[1].next()
spy>> OK (true)14

spy>> ResultSet[1].getString(int columnIndex)
spy>> columnIndex = 1
spy>> OK (7369)15

spy>> ResultSet[1].getString(int columnIndex)
spy>> columnIndex = 2
spy>> OK (SMITH)16

spy>> ResultSet[1].getString(int columnIndex)
spy>> columnIndex = 3
spy>> OK (CLERK)17

spy>> ResultSet[1].next()
spy>> OK (false)18

spy>> ResultSet[1].close()
spy>> OK19

spy>> Connection[1].close()
spy>> OK20

```

#### NOTES:

<sup>1</sup> The BEA WebLogic JDBC Spy driver is registered. The spy>> prefix indicates that this line has been logged by BEA WebLogic JDBC Spy.

<sup>2</sup> The JDBC Driver Manager logs a message each time a JDBC driver is registered.

<sup>3</sup> This is the logging of the JDBC Driver Manager. It logs a message each time a JDBC application makes a connection.

<sup>4</sup> The application connects with the specified URL. The User Name and Password are specified using properties.

<sup>5</sup> This is the logging of the JDBC Driver Manager. It logs a message each time a successful connection is made.

<sup>6</sup> The application checks to see if there are any warnings. In this example, no warnings are present.

<sup>7, 8</sup> The statement “select empno,ename,job from emp where empno=7369” is created.

<sup>9, 10, 11, 12, 13</sup> Some metadata is requested.

<sup>14, 15, 16, 17</sup> The first row is fetched and its data retrieved.

<sup>18</sup> The application attempts to fetch the second row, but the database returned only one row for this query.

<sup>19</sup> After fetching all data, the result set is closed.

<sup>20</sup> The application finishes and disconnects.

BETA