



Using the InterSystems SQL Gateway

Version 2023.3
2024-05-16

Using the InterSystems SQL Gateway

InterSystems IRIS Data Platform Version 2023.3 2024-05-16

Copyright © 2024 InterSystems Corporation

All rights reserved.

InterSystems®, HealthShare Care Community®, HealthShare Unified Care Record®, IntegratedML®, InterSystems Caché®, InterSystems Ensemble®, InterSystems HealthShare®, InterSystems IRIS®, and TrakCare are registered trademarks of InterSystems Corporation. HealthShare® CMS Solution Pack™ HealthShare® Health Connect Cloud™, InterSystems IRIS for Health™, InterSystems Supply Chain Orchestrator™, and InterSystems TotalView™ For Asset Management are trademarks of InterSystems Corporation. TrakCare is a registered trademark in Australia and the European Union.

All other brand or product names used herein are trademarks or registered trademarks of their respective companies or organizations.

This document contains trade secret and confidential information which is the property of InterSystems Corporation, One Memorial Drive, Cambridge, MA 02142, or its affiliates, and is furnished for the sole purpose of the operation and maintenance of the products of InterSystems Corporation. No part of this publication is to be used for any other purpose, and this publication is not to be reproduced, copied, disclosed, transmitted, stored in a retrieval system or translated into any human or computer language, in any form, by any means, in whole or in part, without the express prior written consent of InterSystems Corporation.

The copying, use and disposition of this document and the software programs described herein is prohibited except to the limited extent set forth in the standard software license agreement(s) of InterSystems Corporation covering such programs and related documentation. InterSystems Corporation makes no representations and warranties concerning such software programs other than those set forth in such standard software license agreement(s). In addition, the liability of InterSystems Corporation for any losses or damages relating to or arising out of the use of such software programs is limited in the manner set forth in such standard software license agreement(s).

THE FOREGOING IS A GENERAL SUMMARY OF THE RESTRICTIONS AND LIMITATIONS IMPOSED BY INTERSYSTEMS CORPORATION ON THE USE OF, AND LIABILITY ARISING FROM, ITS COMPUTER SOFTWARE. FOR COMPLETE INFORMATION REFERENCE SHOULD BE MADE TO THE STANDARD SOFTWARE LICENSE AGREEMENT(S) OF INTERSYSTEMS CORPORATION, COPIES OF WHICH WILL BE MADE AVAILABLE UPON REQUEST.

InterSystems Corporation disclaims responsibility for errors which may appear in this document, and it reserves the right, in its sole discretion and without notice, to make substitutions and modifications in the products and practices described in this document.

For Support questions about any InterSystems products, contact:

InterSystems Worldwide Response Center (WRC)

Tel: +1-617-621-0700

Tel: +44 (0) 844 854 2917

Email: support@InterSystems.com

Table of Contents

1 SQL Gateway Overview	1
2 Accessing a Database with the SQL Gateway	3
2.1 Architecture of the InterSystems SQL Gateway	3
2.1.1 Persisting External Tables in InterSystems IRIS	4
2.1.2 Restrictions on SQL Gateway Queries	4
2.2 Creating SQL Gateway Connections for External Sources	4
2.3 The Link Table Wizard: Linking to a Table or View	5
2.3.1 Using the Link Table Wizard	5
2.3.2 Limitations When Using a Linked Table	7
2.4 The Link Procedure Wizard: Linking to a Stored Procedure	8
2.5 Controlling SQL Gateway Connections	9
3 Connecting the SQL Gateway via JDBC	11
3.1 Defining a Logical Connection in the Management Portal	11
3.2 Creating a Connection between Namespaces	12
3.2.1 Using the SQL Gateway as a JDBC Data Source	12
3.3 Implementation-specific JDBC Connection Options	13
3.4 SQL Gateway Logging	14
4 Connecting the SQL Gateway via ODBC	17
4.1 Creating Connections for External Sources	17
4.1.1 Defining a Logical Connection in the Management Portal	17
4.1.2 Using the SQL Gateway as an ODBC Data Source	18
4.1.3 Implementation-specific ODBC Connection Options	19
4.2 Using the Data Migration Wizard	20
4.2.1 Microsoft Access and Foreign Key Constraints	22
5 Using the SQL Gateway Programmatically	23
5.1 FetchSamples Example	23
5.2 Creating and Using an External Data Set	24
5.3 Calling ODBC Functions Directly	25
5.4 Quick Reference for %SQLGatewayConnection	26
5.4.1 Overview of the %SQLGatewayConnection API	26
5.4.2 %SQLGatewayConnection Methods and Properties	27
5.4.3 Supported ODBC Function Calls	30

List of Tables

Table 5–1: Calling ODBC Functions from %SQLGatewayConnection 30

1

SQL Gateway Overview

See the [Table of Contents](#) for a detailed listing of the subjects covered in this document.

The InterSystems SQL Gateway provides access from InterSystems IRIS® data platform to external databases. You can use various wizards to create links to tables, views, or stored procedures in external sources, allowing you to access the data in the same way you access any InterSystems IRIS object:

- Access data stored in third-party relational databases within InterSystems IRIS applications using objects and/or SQL queries.
- Store persistent InterSystems IRIS objects in external relational databases.
- Create class methods that perform the same actions as corresponding external stored procedures.
- Connect through either the InterSystems JDBC driver or the InterSystems ODBC driver.

See the following topics for more information:

- [Accessing a Database with the SQL Gateway](#) gives an overview of the SQL Gateway and describes how to link to external sources.
- [Connecting the SQL Gateway via JDBC](#) describes how to create a JDBC logical connection definition for the SQL Gateway.
- [Connecting the SQL Gateway via ODBC](#) describes how to create an ODBC logical connection definition for the SQL Gateway.
- [Using the SQL Gateway Programmatically](#) describes how to use the %SQLGatewayConnection class to call ODBC functions from ObjectScript.

Related Documents

The following documents contain related material:

- [Using InterSystems SQL](#) — describes how to use InterSystems SQL, which provides standard relational access to data stored in an InterSystems IRIS database.
- [Using Java with InterSystems Software](#) — provides an overview of all InterSystems Java technologies enabled by the InterSystems JDBC driver, and describes how to use the driver to access data sources via SQL.
- [Using the InterSystems ODBC Driver](#) — describes how to connect to InterSystems IRIS from an external application via InterSystems ODBC, and how to access external ODBC data sources from InterSystems IRIS.

2

Accessing a Database with the SQL Gateway

The InterSystems SQL Gateway provides access from InterSystems IRIS® data platform to external databases via JDBC and ODBC, as described in the following topics:

- [Architecture of the InterSystems SQL Gateway](#) — describes the internal structure and constraints of the SQL Gateway
- [Creating SQL Gateway Connections for External Sources](#) — gives an overview of *logical connection definitions*, which are used by the SQL Gateway wizards to identify the external databases.
- [The Link Table Wizard: Linking to a Table or View](#) — describes the procedure for linking to tables or views in external sources so that you can access the data in the same way you access any InterSystems IRIS object.
- [The Link Procedure Wizard: Linking to a Stored Procedure](#) — describes the procedure for linking to stored procedures in external sources.
- [Controlling SQL Gateway Connections](#) — describes methods used to manage SQL Gateway connections.

See the following sections for detailed information on creating logical connection definitions:

- [Connecting the SQL Gateway via JDBC](#)
- [Connecting the SQL Gateway via ODBC](#)

SQL Gateway connections are used to access remote tables and procedures created by the [Link Table Wizard](#) and [Link Procedure Wizard](#) (respectively), programmatically, or as part of an interoperability function. The information captured in an SQL Gateway definition can also be used to create foreign tables, which is a pure SQL approach to projecting data from remote databases or files to InterSystems IRIS SQL. This page describes only how to use the Link Table Wizard to access external tables; to read more about using foreign tables, see Foreign Tables.

2.1 Architecture of the InterSystems SQL Gateway

Internally, the InterSystems SQL Gateway uses the following components:

- The *Connection Manager* maintains a list of *logical connection definitions* for InterSystems IRIS. Each definition has a logical name used in InterSystems IRIS, as well as connection details for a specific external ODBC or JDBC compliant database. The InterSystems SQL Gateway uses these logical names when it establishes connections (see “[Creating SQL Gateway Connections for External Sources](#)”).

- The *InterSystems SQL Gateway API* is a set of functions used by an InterSystems IRIS program to communicate with a third-party RDBMS. These functions are implemented by means of a shared library, which is responsible for making the ODBC or JDBC calls.
- The *External Table Query Processor* is an extension to the InterSystems SQL Query Processor that handles queries targeted at external tables.
- The *SQL Dictionary* stores a list of all defined SQL tables. A given table is marked as "external" when its data is stored in a third-party RDBMS. When the InterSystems SQL Query Processor detects that the table (or tables) referenced within an SQL query are external, it invokes the External Table Query Processor, which generates a *query execution plan* by calling the InterSystems SQL Gateway API instead of accessing data stored within InterSystems IRIS.

2.1.1 Persisting External Tables in InterSystems IRIS

All object persistence in InterSystems IRIS is provided by means of a storage class (see “Storage Definitions and Storage Classes” in *Defining and Using Classes*), which generates the code needed to save and retrieve a persistent object within a database. The SQL storage class (%Storage.SQL) provides object persistence by means of specially generated SQL queries.

A class that uses %Storage.SQL for persistence indicates that it is an "external" class by providing a value for its CONNECTION and EXTERNALTABLENAME class parameters. The class compiler creates an SQL table definition for the class, and generates the SQL queries for the object persistence code. These queries automatically make calls to the correct external database by means of the External Table Query Processor.

2.1.2 Restrictions on SQL Gateway Queries

When you use the InterSystems SQL Gateway, note the following restrictions:

- Queries that join data from heterogeneous data sources are only supported for ODBC connections. When using JDBC, all tables listed in the FROM clause of an SQL query must come from the same data source. .
- SQL queries targeted at external databases cannot use the following InterSystems SQL extensions:
 - The "->" operator.
 - The %EXACT function, or the %SYSTEM.Util **Collation()** method with the collation flag set to EXACT.
 - The inclusion of other columns within a count (*) query.
 - InterSystems IRIS-specific operators that have % as the first character of their name.

2.2 Creating SQL Gateway Connections for External Sources

InterSystems IRIS maintains a list of SQL Gateway connection definitions, which are logical names for connections to external data sources. Each connection definition consists of a logical name (for use within InterSystems IRIS), information on connecting to the data source, and a user name and password to use when establishing the connection. These connections are stored in the table %Library.sys_SQLConnection. You can export data from this table and import it into another instance of the same version of InterSystems IRIS.

Each SQL Gateway connection consists of the following details:

- A logical name for the connection. This name would be used, for example, within any InterSystems SQL queries.

- Optional login credentials to access the database.
- Optional information to control the JDBC or ODBC driver.
- Driver-specific connection details:
 - For JDBC: The full class name of the JDBC client driver, the driver class path (a list of JAR files to search when locating the JDBC driver), and the JDBC connection URL.
 - For ODBC: a DSN (data source name), defined in the usual way (see [Defining an ODBC Data Source on Windows](#) and [Defining an ODBC Data Source on UNIX®](#) in *Using the InterSystems ODBC Driver*).

Note: When creating a connection for use by the Link Table Wizard using Microsoft SQL Server DNS configuration, do not set the **Use regional settings** option. This option is intended only for applications that display data, not for applications that process data.

See the following chapters for detailed information on creating logical connection definitions:

- [Connecting the SQL Gateway via JDBC](#)
- [Connecting the SQL Gateway via ODBC](#)

2.3 The Link Table Wizard: Linking to a Table or View

The Management Portal provides a wizard that you can use to link to an external table in an ODBC- or JDBC-compliant database. When you have linked to an external table, you can:

- Access data stored in third-party relational databases within InterSystems IRIS applications using objects and/or SQL queries.
- Store persistent InterSystems IRIS objects in external relational databases.

For example, suppose you have an Employee table stored within an external relational database. You can use this table within InterSystems IRIS as an object by creating an Employee class that communicates (by executing SQL queries via JDBC or ODBC) with the external database.

From the perspective of an InterSystems IRIS application, the Employee class behaves in much the same way as any other persistent class: You can open instances, modify, and save them. If you issue SQL queries against the Employee class, they are automatically dispatched to the external database.

The use of the InterSystems SQL Gateway is independent of application logic; an application can be modified to switch between external databases and the built-in InterSystems IRIS database with minimal effort and no change to application logic.

Any class that uses the InterSystems SQL Gateway to provide object persistence is identical in usage to classes that using native persistence and can make full use of InterSystems IRIS features including Java, SQL, and Web access.

2.3.1 Using the Link Table Wizard

When you link to an external table or view, you create a persistent InterSystems IRIS class that is linked to that table or view. The new class stores and retrieves data from the external source using the SQL Gateway. You can specify information about both the InterSystems IRIS class and the corresponding SQL table in InterSystems IRIS.

Note: This wizard generates ObjectScript code with class names and class member names that you control. When you use this wizard, be sure to follow the rules for ObjectScript identifiers, including length limits (see the section on Naming Conventions in *Defining and Using Classes*).

- If you have not yet created a connection to the external database, do so before you begin (see “[Creating SQL Gateway Connections for External Sources](#)”).
- From the Management Portal select **System Explorer**, then **SQL**. Select a namespace by clicking the name of the current namespace displayed at the top of the page; this displays the list of available namespaces.

At the top of the page, click the wizards drop-down list, and select **Link Table**.

- On the first page of the wizard, select one or more table or views, as follows:
 - **Select a destination namespace** — Select the InterSystems IRIS namespace to which the data will be copied.
 - **Schema Filter** — Specify a schema (class package) name that contains the table or view. You can specify a name with wildcards to return multiple schemas, or % to return all schemas. For example, C% will return all schemas in the namespace beginning with the letter C. Use of this filter is recommended, as it will shorten the return list of schemas to select from, and thus improve loading speed. You can select multiple items. In this case, when you click **Next**, the next screen prompts you for a package name. Specify the name of the package to contain the classes and then click **Finish**.
 - **Table Filter** — Specify the table or view to link to. You can specify a name with wildcards to return multiple tables and/or views, or % to return all tables/views.
 - **Table type** — Select **TABLE**, **VIEW**, **SYSTEM TABLE**, or **ALL**. The default is **TABLE**.
 - **Select a SQL Gateway connection** — Select the SQL Gateway connection to use.
- Click **Next**.
- On the second page, specify which fields should be available as object properties in InterSystems IRIS. Make changes as follows:
 - Highlight one or more fields and click the single arrow to move it or them from one list to another; click the double arrow to move all fields (selected or not) from one list to another.
 - In the selected list, use the up and down arrows to modify the order of the fields in the table that InterSystems IRIS projects for the given class. This does not affect the order of the properties in the class definition.
- Click **Next**.
- On the third page, specify information about the properties in the generated class. For each property, you can specify all the available options:
 - **Read only** — Select this check box to make the property read-only. This controls the `ReadOnly` keyword for the property.

Tip: Use the `select_all` check box to select or clear all the check boxes in this column.
 - **New Property Name** — Specifies the name of the object property that will contain the data from this field.
 - **New Column Name (SQL Field Name)** — Specifies the SQL field name to use for this property. This controls the `SqlFieldName` keyword for the property.
- Click **Next**.
- On the last page, specify the following:

- **Primary Key** — Select the primary key for the new InterSystems IRIS table from the list provided. In addition to the default key provided, you can click the "Browse" button to select one or more columns. You may select multiple columns; multiple columns are returned as a composite key separated by commas. You must specify a primary key.
 - **New class name** — Specify the name of the InterSystems IRIS class to create, including the package. The default package name is nullschema.
 - **New table name** — Specify the name of the SQL table to create in InterSystems IRIS. This controls the `SqlTableName` keyword for the class.
- Click **Finish**. The wizard displays the Background Jobs page with a link to the background tasks page.
 - Click **Close**. Or click the given link to view the background tasks page. In either case, the wizard starts a background task to do the work.

The wizard stores a new class definition in the InterSystems IRIS database and compiles it. If data is present, it should be immediately visible in the external database (you can check by issuing SQL queries against the newly created InterSystems IRIS class/table). You can now use the new class as you would any other persistent class within InterSystems IRIS.

Note: **Closing the Link Table Connection**

By design, the code generated by the Link Table Wizard does not close the connections that it opens. This avoids problems such as conflicts between SQL statements that share the same connection. See “[Controlling SQL Gateway Connections](#)” for more information.

2.3.2 Limitations When Using a Linked Table

As always, it is important to be aware of the particular limitations (syntactical or otherwise) and requirements of the database to which you are connecting. The following are a few examples:

- **JDBC connections**, unlike ODBC, do not support heterogeneous INSERT...SELECT statements (involving both a local and a linked table, or two linked tables).
- **ODBC connections**, unlike JDBC, do not fill the %ROWID property.
- **Informix**: You cannot create a view inside of InterSystems SQL that is based on a linked Informix table, because the generated SQL is not valid in Informix.
- **Sybase**: As part of query processing, InterSystems SQL can transform the expression of an outer join into an equivalent canonicalized form. The SQL92-standard CROSS JOIN syntax may be required to reconstruct this form as SQL in order to access a linked table. Because Sybase does not support SQL92-standard CROSS JOIN, some queries using outer joins on linked Sybase tables will fail to execute.
- **Oracle**: the CAST must be performed around any COUNT aggregates used in Oracle sourced tables.
- **MySQL**: when accessing a stored procedure with INOUT and OUT, bound parameters are not updated correctly. Instead, the value is returned in the result set.

Before you try to use a linked table, you might want to examine the cached query that is generated for it, to ensure that the syntax is valid for the database you are using. To see the cached query for a given linked table:

- In the Management Portal, go to **System Explorer, SQL**.
- Click the namespace you are interested in.
- Select the Schema from the pull-down list.
- Click **Cached Queries** for the package that contains the table. The system displays a table of the cached queries for this package. The **Query** column displays the full query.

- Optionally click the link for the query to see more details.

2.4 The Link Procedure Wizard: Linking to a Stored Procedure

The Management Portal provides a wizard that you can use to link to a stored procedure defined in an external ODBC- or JDBC-compliant database. When you link to the procedure, the system generates a method and a class to contain the method. When you link to an stored procedure, you create a class method that does the same action that the stored procedure does. This method is marked with the `SqlProc` keyword. The class method is generated within a new class, and you can specify information such as the class and package name. This method cannot accept a variable number of arguments. Default parameters are permitted, but the signature of the stored procedure is fixed.

Note: **Closing the Link Procedure Connection**

By design, the code generated by the Link Procedure Wizard does not close the connections that it opens. This avoids problems such as conflicts between SQL statements that share the same connection. See “[Controlling SQL Gateway Connections](#)” for more information.

- If you have not yet created a connection to the external database, do so before you begin (see “[Creating SQL Gateway Connections for External Sources](#)”).
- From the Management Portal select **System Explorer**, then **SQL**. Select a namespace by clicking the name of the current namespace displayed at the top of the page; this displays the list of available namespaces.

At the top of the page, click the **Wizards** drop-down list, and select **Link Procedure**.

- On the first page of the wizard, select one or more procedures, as follows:
 - `Select a destination namespace` — Select the InterSystems IRIS namespace to which the data will be copied.
 - `Schema Filter` — Specify a schema (class package) name that contains the procedure. You can specify a name with wildcards to return multiple schemas, or % to return all schemas. For example, `C%` will return all schemas in the namespace beginning with the letter C. Use of this filter is recommended, as it will shorten the return list of schemas to select from, and thus improve loading speed.
 - `Procedure Filter` — Specify a procedure to link to. You can specify a name with wildcards to return multiple procedures, or % to return all procedures. You can select multiple procedures. In this case, when you click **Next**, the next screen prompts you for a package name. Specify the name of the package to contain the classes and then click **Finish**.
 - `Select a SQL Gateway connection` — Select the SQL Gateway connection to use.
- Click **Next**.
- On the second page, specify details about the class to generate in InterSystems IRIS:
 - `New package name` — Specify the name of the package to contain the class or classes.
 - `New class name` — Specify the name of the class to generate.
 - `New procedure name` — Specify the name of the procedure; specifically this controls the `SqlName` keyword of the method.
 - `New method name` — Specify the name of the method to generate.

- `Description` `method name` — Optionally provide a description of the method; this is used as a comment for the class definition, to be displayed in the class reference.
- Click `Finish`. The wizard displays the Background Jobs page with a link to the background tasks page.
- Click `Close`. Or click the given link to view the background tasks page. In either case, the wizard starts a background task to do the work.

The wizard stores a new class definition within the InterSystems IRIS database and compiles it.

Note: This wizard generates ObjectScript code with class names and class member names that you control. When you use this wizard, be sure to follow the rules for ObjectScript identifiers, including length limits (see the section on Naming Conventions in *Defining and Using Classes*).

2.5 Controlling SQL Gateway Connections

In some cases, it may be necessary to manage connections created by code that links external tables or stored procedures (see “[The Link Table Wizard](#)” and “[The Link Procedure Wizard](#)”). SQL Gateway connections can be managed by the `%SYSTEM.SQLGateway` class, which provides methods such as the following:

- **`DropAll()`** — drop all open connections and unload the SQL Gateway library.
- **`DropConnection()`** — disconnect the specified JDBC or ODBC connection.
- **`TestConnection()`** — test a previously defined SQL Gateway connection (see “[Creating SQL Gateway Connections for External Sources](#)”) and write diagnostic output to the current device.
- Various methods for opening connections and controlling transactions. See the `%SYSTEM.SQLGateway` class documentation for full details.

These methods can be called with the special `$SYSTEM` object. For example, the following command would close a previously defined SQL Gateway connection named `"MyConnectionName"`:

```
do $system.SQLGateway.DropConnection("MyConnectionName")
```

SQL Gateway connection names are case-sensitive.

3

Connecting the SQL Gateway via JDBC

This chapter describes how to create a JDBC logical connection definition for the SQL Gateway. See [Using Java with InterSystems Software](#) for more information on the InterSystems JDBC driver.

InterSystems IRIS maintains a list of SQL Gateway connection definitions, which are logical names for connections to external data sources. Each connection definition consists of a logical name (for use within InterSystems IRIS), information on connecting to the data source, and a username and password to use when establishing the connection. These connections are stored in the table %Library.sys_SQLConnection. You can export data from this table and import it into another instance of the same version of InterSystems IRIS.

Note: **Controlling SQL Gateway Logging and Other JDBC Settings**

To monitor problems when connected via JDBC, you can enable JDBC logging for the SQL Gateway connection (see “[SQL Gateway Logging](#)”). The same dialog also allows you to specify JAVAHOME and other JDBC settings.

3.1 Defining a Logical Connection in the Management Portal

To define a SQL Gateway connection for a JDBC-compliant data source, perform the following steps:

1. In the Management Portal, go to the System Administration > Configuration > Connectivity > SQL Gateway Connections page.
2. Click **Create New Connection**.
3. On the **SQL Gateway Connection** page, enter or choose values for the following fields:
 - For **Type**, choose **JDBC**.
 - **Connection Name** — Specify an identifier for the connection, for use within InterSystems IRIS.
 - **User** — Specify the name for the account to serve as the default for establishing connections, if needed.
 - **Password** — Specify the password associated with the default account.
 - **Driver name** — Full class name of the JDBC client driver.
 - **URL** — Connection URL for the data source, in the format required by the JDBC client driver that you are using.
 - **Class path** — Specifies a comma-separated list of additional JAR files to load.

- **Properties** — Optional string that specifies vendor-specific connection properties. If specified, this string should be of the following form:

property= value; property= value;...

See [InterSystems JDBC Connection Properties](#) for more information on connection properties.

For example, a typical connection might use the following values:

Setting	Value
Type	JDBC
Connection Name	ConnectionJDBC1
User	JDBCUser
Password	JDBCPassword
Driver name	oracle.jdbc.driver.OracleDriver
URL	jdbc:oracle:thin:@//oraserver:1521/SID
Class path	/fill/path/to/ojdbc14.jar
Properties	oracle.jdbc.V8Compatibility=true; includeSynonyms=false;restrictGetTables=true

For the other options, see “[Implementation-specific JDBC Connection Options](#).”

- Optionally test if the values are valid. To do so, click the **Test Connection** button. The screen will display a message indicating whether the values you have entered allow for a valid connection.
- To create the named connection, click **Save**.
- Click **Close**.

3.2 Creating a Connection between Namespaces

InterSystems IRIS provides JDBC drivers and can be used as a JDBC data source. That is, an InterSystems IRIS instance can connect to itself or to another InterSystems IRIS instance via JDBC and the SQL Gateway. Specifically, the connection is from a namespace in one InterSystems IRIS to a namespace in the other InterSystems IRIS. To connect in this way, you need the same information that you need for any other external database: the connection details for the database driver that you want to use. This section provides the basic information.

3.2.1 Using the SQL Gateway as a JDBC Data Source

To configure one InterSystems IRIS instance (IrisDB-1) to use another separate instance (IrisDB-2) as a JDBC data source, do the following:

- Within IrisDB-1, use the SQL Gateway to create a JDBC connection to the namespace in IrisDB-2 that you want to use.
 - For **Type**, choose **JDBC**.
 - **Connection Name** — Specify an identifier for the connection, for use within IrisDB-1.
 - **User** — Specify the username needed to access IrisDB-2, if needed.

- **Password** — Specify the password for this user.
- **Driver name** — Use `com.intersystems.jdbc.IRISDriver`
- **URL** — Connection URL for the data source, in the following format:

```
jdbc:IRIS://IP_address:port/namespace
```

Here *IP_address:port* is the IP address and TCP port where IrisDB-2 is running, and *namespace* is the namespace to which you want to connect (see “[Defining a JDBC Connection URL](#)”).

For example, a typical connection might use the following values:

Setting	Value
Type	JDBC
Connection Name	ConnectUser
User	__SYSTEM
Password	SYS
Driver name	<code>com.intersystems.jdbc.IRISDriver</code>
URL	<code>jdbc:IRIS://127.0.0.1:1972/User</code>

- Class path — Leave this blank.
- Properties — Optional string that specifies connection properties supported by the InterSystems JDBC drivers. If specified, this string should be of the following form:

```
property= value; property= value;...
```

For the other options, see “[Implementation-specific JDBC Connection Options](#)” later in this section.

2. Click **Save**.
3. Click **Close**.

3.3 Implementation-specific JDBC Connection Options

Before you define an SQL Gateway connection, you should make sure that you understand the requirements of the external database and of the database driver, because these requirements affect how you define the connection.

Do Not Use Delimited Identifiers by Default

The **Do not use delimited identifiers by default** option controls the format of identifiers in the generated routines.

Select this check box if you are using a database that does not support delimited SQL identifiers. This currently includes the following databases:

- Sybase
- Informix
- MS SQL Server

Clear the check box if you are using any other database. All SQL identifiers will be delimited.

Use COALESCE

The **Use COALESCE** option controls how a query is handled when it includes a parameter (?), and it has an effect only when a query parameter equals null.

- If you do not select **Use COALESCE** and if a query parameter equals null, the query returns only records that have null for the corresponding value. For example, consider a query of the following form:

```
SELECT ID, Name from LinkedTables.Table WHERE Name %STARTSWITH ?
```

If the provided parameter is null, the query would return only rows with null-valued names.

- If you select **Use COALESCE**, the query wraps each parameter within a COALESCE function call, which controls how null values are handled.

Then, if a query parameter equals null, the query essentially treats the parameter as a wildcard. In the previous example, if the provided parameter is null, this query returns all rows.

Whether you select this option depends on your preferences and on whether the external database supports the COALESCE function.

To find out whether the external database supports the COALESCE function, consult the documentation for that database.

Conversion in Composite Row IDs

The **Conversion in composite Row IDs** option controls how non-character values are treated when forming a composite ID. Choose an option that is supported by your database:

- **Do not convert non-character values** — This option performs no conversion. This option is suitable only if your database supports concatenating non-character values to character values.
- **Use CAST** — This option uses CAST to convert non-character values to character values.
- **Use {fn convert ...}** — This option uses {fn convert ...} to convert non-character values to character values.

In all cases, the IDs are concatenated with || between the IDs (or transformed IDs).

Consult the documentation for the external database to find out which option or options it supports.

3.4 SQL Gateway Logging

A log can be generated for the SQL Gateway when it is using a JDBC connection. To enable this logging:

- In the Management Portal, go to System Administration > Configuration > External Language Servers.
- Select the **%JDBC_Server** link to bring up the Edit dialog (*caution*: do not select the **%Java_Server** link, which is completely different).
- At the bottom of the Edit dialog, select the Advanced Settings **Show** link if advanced settings are not already displayed.
- Specify a name for **LogFile** (for example, jdbcSqlGateway.log) to record the interaction between the SQL Gateway and the database. If you do not specify a fully qualified path, the log file will be in the current directory from when the JDBC SQL Gateway was initially started (probably the /mgr or /mgr/namespace directory).
- Select the Save button at the top of the dialog.

- On the External Server main page, shut down and restart the *%JDBC_Server* connection to enable the new settings.

You can also specify the Java version (JAVAHOME) to be used with the SQL Gateway by setting the **Java Home Directory** field in the edit dialog. See %JDBC Server in the *Configuration Parameter File Reference* for more information about these settings.

Note: Enable logging only when you need to perform troubleshooting. You should not enable logging during normal operation, because it will dramatically slow down performance.

4

Connecting the SQL Gateway via ODBC

This chapter describes how to create an ODBC logical connection definition for the SQL Gateway, and how to use the Data Migration Wizard. See [Using the InterSystems ODBC Driver](#) for complete information on how to use InterSystems ODBC.

The following topics are discussed:

- [Creating Connections for External Sources](#) — describes how to create an ODBC logical connection definition for the SQL Gateway.
- [Using the Data Migration Wizard](#) — describes how to migrate data from external ODBC sources and create an appropriate InterSystems IRIS class definition to store the data.

4.1 Creating Connections for External Sources

InterSystems IRIS maintains a list of SQL Gateway connection definitions, which are logical names for connections to external data sources. Each connection definition consists of a logical name (for use within InterSystems IRIS), information on connecting to the data source, and a username and password to use when establishing the connection. These connections are stored in the table %Library.sys_SQLConnection. You can export data from this table and import it into another instance of the same version of InterSystems IRIS.

The following topics are discussed in this section:

- [Defining a Logical Connection in the Management Portal](#)
- [Using the SQL Gateway as an ODBC Data Source](#)
- [Implementation-specific ODBC Connection Options](#)

Note: For OS-specific instructions on how to create a DSN, see the following sections in [Using the InterSystems ODBC Driver](#):

- [“Defining an ODBC Data Source on Windows”](#)
- [“Defining an ODBC Data Source on UNIX®”](#)

4.1.1 Defining a Logical Connection in the Management Portal

To define a connection for an ODBC-compliant data source, perform the following steps:

1. Define an ODBC data source name (DSN) for the external database (the procedure is probably described in the documentation for that database).
2. In the Management Portal, go to the **System Administration > Configuration > Connectivity > SQL Gateway Connections** page.
3. Click **Create New Connection**.
4. On the **Gateway Connection** page, enter or choose values for the following fields:
 - For **Type of connection**, choose **ODBC**.
 - **Connection Name** — Specify an identifier for the connection, for use within InterSystems IRIS.
 - **Select an existing DSN** — Choose the DSN that you previously created. You must use a DSN, since the ODBC SQL Gateway does not support connections without a DSN.
 - **User** — Specify the name for the account to serve as the default for establishing connections, if needed.
 - **Password** — Specify the password associated with the default account.

For example, a typical connection might use the following values:

Setting	Value
Type	ODBC
Connection Name	ConnectionODBC1
Select an existing DSN	MyAccessPlayground
User	DBOwner
Password	DBPassword

For the other options, see “[Implementation-specific ODBC Connection Options](#)” later in this section.

5. Optionally test if the values are valid. To do so, click the **Test Connection** button. The screen will display a message indicating whether the values you have entered in the previous step allow for a valid connection.
6. To create the named connection, click **Save**.
7. Click **Close**.

4.1.2 Using the SQL Gateway as an ODBC Data Source

InterSystems IRIS provides ODBC drivers and thus can be used as an ODBC data source. That is, an InterSystems IRIS instance can connect to itself or to another InterSystems IRIS instance via ODBC and the SQL Gateway. Specifically, the connection is from a namespace in one InterSystems IRIS to a namespace in the other InterSystems IRIS. To connect in this way, you need the same information that you need for any other external database: the connection details for the database driver that you want to use. This section provides the basic information.

To configure an InterSystems IRIS instance (*InterSystems IRIS_A*) to use another InterSystems IRIS instance (*InterSystems IRIS_B*) as an ODBC data source, do the following:

1. On the machine that is running *InterSystems IRIS_A*, create a DSN that represents the namespace in *InterSystems IRIS_B* that you want to use.

Tip: If *InterSystems IRIS_B* is installed on this machine, a suitable DSN might already be available, because when you install InterSystems IRIS, the installer automatically creates DSNs.

2. Within *InterSystems IRIS_A*, use the SQL Gateway to create an ODBC connection that uses that DSN. Provide the following details:
 - For **Type**, choose **ODBC**.
 - **Connection Name** — Specify an identifier for the connection, for use within *InterSystems IRIS_A*.
 - **Select an existing DSN** — Choose the DSN that you previously created for *InterSystems IRIS_B*.

For example, a typical connection might use the following values:

Setting	Value
Type	ODBC
Connection Name	TestConnection
Select an existing DSN	TestConnection

Tip: You do not need to specify **User** and **Password** because that information is part of the DSN itself.

3. Click **Save**.
4. Click **Close**.

4.1.3 Implementation-specific ODBC Connection Options

Before you define an SQL Gateway connection, you should make sure that you understand the requirements of the external database and of the database driver, because these requirements affect how you define the connection. The following options do not apply to all driver implementations.

Legacy Outer Join

The **Enable legacy outer join syntax (Sybase)** option controls whether the connection will enable you to use legacy outer joins. Legacy outer joins use SQL syntax that predates the SQL-92 standard. To find out whether the external database supports such joins, consult the documentation for that database.

Needs Long Data Length

The **Needs long data length** option controls how the connection will bind data. The value of this option should agree with the `SQL_NEED_LONG_DATA_LEN` setting of the database driver. To find the value of this setting, use the ODBC **SQLGetInfo** function. If `SQL_NEED_LONG_DATA_LEN` equals Y, then select the **Needs long data length** option; otherwise clear it.

Supports Unicode Streams

The **Supports Unicode streams** option controls whether the connection supports Unicode data in streams, which are fields of type `LONGVARCHAR` or `LONGVARBINARY`.

- Clear this check box for Sybase. If you are using a Sybase database, all fields you access via the SQL Gateway should include only UTF-8 data.
- Select this check box for other databases.

Do Not Use Delimited Identifiers by Default

The **Do not use delimited identifiers by default** option controls the format of identifiers in the generated routines.

Select this check box if you are using a database that does not support delimited SQL identifiers. This currently includes the following databases:

- Sybase
- Informix
- MS SQL Server

Clear the check box if you are using any other database. All SQL identifiers will be delimited.

Use COALESCE

The **Use COALESCE** option controls how a query is handled when it includes a parameter (?), and it has an effect only when a query parameter equals null.

- If you do not select **Use COALESCE** and if a query parameter equals null, the query returns only records that have null for the corresponding value. For example, consider a query of the following form:

```
SELECT ID, Name from LinkedTables.Table WHERE Name %STARTSWITH ?
```

If the provided parameter is null, the query would return only rows with null-valued names.

- If you select **Use COALESCE**, the query wraps each parameter within a COALESCE function call, which controls how null values are handled.

Then, if a query parameter equals null, the query essentially treats the parameter as a wildcard. In the previous example, if the provided parameter is null, this query returns all rows, which is consistent with the behavior of typical ODBC clients.

Whether you select this option depends on your preferences and on whether the external database supports the COALESCE function.

To find out whether the external database supports the COALESCE function, consult the documentation for that database.

Conversion in Composite Row IDs

The **Conversion in composite Row IDs** option controls how non-character values are treated when forming a composite ID. Choose an option that is supported by your database:

- **Do not convert non-character values** — This option performs no conversion. This option is suitable only if your database supports concatenating non-character values to character values.
- **Use CAST** — This option uses CAST to convert non-character values to character values.
- **Use {fn convert ...}** — This option uses {fn convert ...} to convert non-character values to character values.

In all cases, the IDs are concatenated with | | between the IDs (or transformed IDs).

Consult the documentation for the external database to find out which option or options it supports.

4.2 Using the Data Migration Wizard

The Management Portal provides a wizard that you can use to migrate data from an external table or view.

When you migrate data from a table or view in an external source, the system generates a persistent class to store data of that table or view and then copies the data. This wizard assumes that the class should have the same name as the table or view from which it comes; similarly, the property names are the same as in the table or view. After the class has been generated, it does not have any connection to external data source.

- If you have not yet created an SQL Gateway connection to the external database, do so before you begin (see “[Creating SQL Gateway Connections for External Sources](#)”).
- From the Management Portal select **System Explorer**, then **SQL**. If necessary, change namespaces by clicking the current namespace displayed at the top of the page; this displays the list of available namespaces.

At the top of the page, click the Wizards drop-down list, and select **Data Migration**.

- On the first page of the wizard, select the table or view, as follows:
 - `Select a destination namespace` — Select the InterSystems IRIS namespace to which the data will be copied.
 - `Schema Filter` — Specify a schema (class package) name that contains the table or view. You can specify a name with wildcards to return multiple schemas, or % to return all schemas. For example, C% will return all schemas in the namespace beginning with the letter C. Use of this filter is recommended, as it will shorten the return list of schemas to select from, and thus improve loading speed.
 - `Table Filter` — Specify a table or view name. You can specify a name with wildcards to return multiple tables and/or views, or % to return all tables/views.
 - `Table type` — Select TABLE, VIEW, SYSTEM TABLE, or ALL. The default is TABLE.
 - `Select a SQL Gateway connection` — Select the SQL Gateway connection to use.
- Click Next.
- On the next page, you can optionally specify the following information for each class:
 - `New Schema` — Specify the package to contain the class or classes. Be sure to follow the rules for ObjectScript identifiers, including length limits (see the section on [Naming Conventions](#) in *Defining and Using Classes*).

Tip: To change the package name for all classes, type a value at the top of this column and then click Change all.

 - `Copy Definition` — Select this check box to generate this class, based on the table definition in the external source. If you have already generated the class, you can clear this check box.
 - `Copy Data` — Select this check box to copy the data for this class from the external source. When you copy data, the wizard overwrites any existing data in the InterSystems IRIS class.
- Click Next. The wizard displays the following optional settings:
 - `Disable validation` — If checked, data will be imported with %NOCHECK specified in the *restriction* parameter of the **INSERT** command.
 - `Disable journaling for the importing process` — If checked, journaling will be disabled for the process performing the data migration (not system-wide). This can make the migration faster, at the cost of potentially leaving the migrated data in an indeterminate state if the migration is interrupted by a system failure. Journaling is re-enabled at the end of the run, successful or not.
 - `Defer indices` — If checked, indices are built after the data is inserted. The wizard calls the class' **%SortBegin()** method prior to inserting the data in the table. This causes the index entries to be written to a temporary location for sorting. They are written to the actual index location when the wizard calls the **%SortEnd()** method after all rows have been inserted. Do not use Defer Indices if there are Unique indices defined in the table and you want

the migration to catch any unique constraint violations. A unique constraint violation will not be caught if `Defer Indices` is used.

- `Disable triggers` — If checked, data will be imported with `%NOTRIGGER` specified in the *restriction* parameter of the `INSERT` command.
- `Delete existing data from table before importing` — If checked, existing data will be deleted rather than merged with the new data.
- Click `Finish`. The wizard opens a new window and displays the `Background Jobs` page with a link to the `background tasks` page. Click `Close` to start the import immediately, or click the given link to view the `background tasks` page. In either case, the wizard starts the import as a background task.
- In the `Data Migration Wizard` window, click `Done` to go back to the home page of the `Management Portal`.

Note: The `%SQL.Migration.Import` class contains wrappers around the `Data Migration Wizard`. See the class library documentation for details.

4.2.1 Microsoft Access and Foreign Key Constraints

When you use the `Data Migration Wizard` with Microsoft Access, the wizard tries to copy any foreign key constraints defined on the Access tables. To do this, it queries the `MSysRelationships` table in Access. By default, this table is hidden and does not provide read access. If the wizard can't access `MSysRelationships`, it migrates the data table definitions to InterSystems SQL without any foreign key constraints.

If you want the utility to migrate the foreign key constraints along with the table definitions, set Microsoft Access to provide read access for `MSysRelationships`, as follows:

- In Microsoft Access, make sure that system objects are displayed.
- Click `Tools > Options` and select the setting on the `View` tab.
- Click `Tools > Security > User and Group Permissions`. Then select the `Read` check box next to the table name.

5

Using the SQL Gateway Programmatically

Note: This section assumes that you have significant experience using ODBC API calls — it is not intended to provide details on how to use ODBC functions. If you encounter any problems, you can monitor the SQL Gateway by enabling logging for both InterSystems IRIS and ODBC (see the “[Logging and Environment Variables](#)” chapter in *Using the InterSystems ODBC Driver*).

If you require options that are not provided by the standard SQL Gateway wizards, you can use the %Library.SQLGatewayConnection class to call ODBC functions from ObjectScript. You can either execute a dynamic query (obtaining a result set) or you can perform low-level ODBC programming. The following topics are discussed in this chapter:

- [FetchSamples Example](#) — lists a simple program that opens a connection, runs a query, and accesses the result set.
- [Creating and Using an External Data Set](#) — demonstrates using %SQL.Statement methods to run queries and access data sets.
- [Calling ODBC Functions Directly](#) — demonstrates how to call ODBC query functions directly, rather than through %SQL.Statement.
- [Quick Reference for %SQLGatewayConnection](#) — provides details about the supported methods and properties.

In the rest of this chapter, %Library.SQLGatewayConnection is referred to by its abbreviated name, %SQLGatewayConnection.

5.1 FetchSamples Example

The following example provides a simple demonstration of how to open a connection, prepare and execute a query, and access the resulting data set. See the entries in “[Quick Reference for %SQLGatewayConnection](#)” for information on [Connect\(\)](#), [Disconnect\(\)](#), [ConnectionHandle](#), and [sqlcode](#). See the Quick Reference section on “[Supported ODBC Function Calls](#)” for a list of supported ODBC functions and the %SQLGatewayConnection methods that call them.

ClassMethod FetchSamples

Class Member

```
ClassMethod FetchSamples()  
{  
    #include %occInclude  
    //Create new SQL Gateway connection object  
    set gc=##class(%SQLGatewayConnection).%New()  
    if gc=$$NULLORREF quit $$$ERROR($$$GeneralError,"Cannot create %SQLGatewayConnection.")  
  
    //Make connection to target DSN
```

```

set pDSN="Cache Samples"
set usr="_system"
set pwd="SYS"
set sc=gc.Connect(pDSN,usr,pwd,0)
if $$$ISERR(sc) quit sc
if gc.ConnectionHandle="" quit $$$ERROR($$$GeneralError,"Connection failed")

set sc=gc.AllocateStatement(.hstmt)
if $$$ISERR(sc) quit sc

//Prepare statement for execution
set pQuery= "select * from Sample.Person"
set sc=gc.Prepare(hstmt,pQuery)
if $$$ISERR(sc) quit sc
//Execute statement
set sc=gc.Execute(hstmt)
if $$$ISERR(sc) quit sc
//Get list of columns returned by query
set sc=gc.DescribeColumns(hstmt, .columnlist)
if $$$ISERR(sc) quit sc

//display column headers delimited by ":"
set numcols=$listlength(columnlist)-1 //get number of columns
for colnum=2:1:numcols+1 {
    Write $listget($listget(columnlist,colnum),1),":"
}
write !

//Return first 200 rows
set sc=gc.Fetch(hstmt)
if $$$ISERR(sc) quit sc
set rownum=1
while((gc.sqlcode'=100) && (rownum<=200)) {
    for ii=1:1:numcols {
        set sc=gc.GetData(hstmt, ii, 1, .val)
        write " "_val
        if $$$ISERR(sc) break
    }
    set rownum=rownum+1
    write !
    set sc=gc.Fetch(hstmt)
    if $$$ISERR(sc) break
}

//Close cursor and then disconnect
set sc=gc.CloseCursor(hstmt)
if $$$ISERR(sc) quit sc

set sc=gc.Disconnect()
quit sc
}

```

5.2 Creating and Using an External Data Set

To create and use a data set that queries an external database, do the following:

1. Create an instance of %SQLGatewayConnection via the %New() method.
2. Call the [Connect\(\)](#) method of that instance, passing arguments that specify the ODBC data source name, as well as the username and password that are needed to log in to that source, if necessary.

The **Connect()** method has the following signature:

```
method Connect(dsn, usr, pwd, timeout) as %Status
```

Here *dsn* is the DSN for the data source, *usr* is a user who can log in to that data source, *pwd* is the corresponding password, and *timeout* specifies how long to wait for a connection.

3. Create an instance of %ResultSet via the %New() method, providing the string argument "%DynamicQueryGW:SQLGW".

Note: This is slightly different from the argument that you use with a typical dynamic query (`"%DynamicQuery:SQL"`).

4. Invoke the **Prepare()** method of the result set. The first argument should be a string that consists of a SQL query, the second argument should be omitted, and the third argument should be the instance of `%SQLGatewayConnection`.
5. Call the **Execute()** method of the result set, optionally providing any arguments in the order expected by the query. This method returns a status, which should be checked.

To use the result set, you generally examine it one row at a time. You use methods of `%ResultSet` to retrieve information such as the value in a given column. Typically you iterate through all the rows using **Next()**, as demonstrated in the following example:

Example

Class Member

```
ClassMethod SelectAndWrite() as %Status
{
    Set conn=##class(%SQLGatewayConnection).%New()
    Set sc=conn.Connect("AccessPlayground","", "")
    If $$$ISERR(sc) do $System.Status.DisplayError(sc) quit

    Set res=##class(%ResultSet).%New("%DynamicQueryGW:SQLGW")
    Set sc=res.Prepare("SELECT * FROM PEOPLE", conn)
    If $$$ISERR(sc) do $System.Status.DisplayError(sc) quit

    Set sc=res.Execute()
    If $$$ISERR(sc) do $System.Status.DisplayError(sc) quit

    While res.Next()
    { Write !,res.GetData(1)," ",res.GetData(2)," ",res.GetData(3)
    }
    Set sc=conn.Disconnect()
    Quit sc
}
```

For more information on `%ResultSet`, see the chapter “[Using Dynamic SQL](#)” in *Using InterSystems SQL*. Also see the class documentation for `%ResultSet`.

5.3 Calling ODBC Functions Directly

If `%SQL.Statement` does not provide enough control, you can use the `%SQLGatewayConnection` class to access ODBC directly. It provides a set of methods that correspond to ODBC functions (see “[Supported ODBC Function Calls](#)”), as well as other utility functions. You can connect to and use an ODBC-compliant database and then perform low-level ODBC programming. The overall procedure is as follows:

1. Create an instance of `%SQLGatewayConnection` via the **%New()** method.
2. Call the **Connect()** method of that instance, passing arguments that specify the ODBC data source name, as well as the username and password that are needed to log in to that source, if necessary.
3. Call the **AllocateStatement()** method and receive (by reference) a statement handle.
4. Call other methods of the SQL Gateway instance, using that statement handle as an argument. Most of these methods call ODBC functions.

The following simple example demonstrates this procedure. It is similar to the example in the previous section, but it uses the `%SQLGatewayConnection` versions of **Prepare()** and **Execute()** to call ODBC query functions **SQLPrepare()** and **SQLExecute()** directly, rather than using the `%SQL.Statement` methods:

Executing a query using %SQLGatewayConnection methods

Class Member

```
ClassMethod ExecuteQuery(mTable As %String)
{
    set mDSN="DSNtest"
    set mUserName="SYSDBA"
    set mUserPwd="masterkey"

    // Create an instance and connect
    set gateway=##class(%SQLGatewayConnection).%New()
    set status=gateway.Connect(mDSN,mUserName,mUserPwd)
    if $$$ISERR(status) do $System.Status.DisplayError(status) quit $$$ERROR()
    set hstmt=""

    // Allocate a statement
    set status=gateway.AllocateStatement(.hstmt)
    if $$$ISERR(status) do $System.Status.DisplayError(status) quit $$$ERROR()

    // Use %SQLGatewayConnection to call ODBC query functions directly
    set status=gateway.Prepare(hstmt,"SELECT * FROM "_mTable)
    if $$$ISERR(status) do $System.Status.DisplayError(status) quit $$$ERROR()
    set status=gateway.Execute(hstmt)

    if $$$ISERR(status) do $System.Status.DisplayError(status) quit $$$ERROR()
    quit gateway.Disconnect()
}
```

Note: Null Values and Empty Strings

When you use the methods described in this chapter, remember that InterSystems IRIS and SQL have the following important differences:

- In SQL, " " represents an empty string.
- In InterSystems IRIS, " " equals null.
- In InterSystems IRIS, \$char(0) equals an empty string.

5.4 Quick Reference for %SQLGatewayConnection

- [Overview of the %SQLGatewayConnection API](#)
- [%SQLGatewayConnection Methods and Properties](#)
- [Supported ODBC Function Calls](#)

5.4.1 Overview of the %SQLGatewayConnection API

The %SQLGatewayConnection class provides properties and methods that you can use to manage the connection to the external data source, check status information, and get information about the ODBC shared library. The methods and properties covered in this reference are listed below, organized by usage (see “[Supported ODBC Function Calls](#)” for methods not listed here):

Managing the Connection

The %SQLGatewayConnection class provides properties and methods that you can use to manage the connection to the external data source.

- **DSN** — (%String property) Data source name of the ODBC-compliant data source to which you want to connect.

- **User** — (%String property) Username to log in to the data source.
- **Password** — (%String property) Associated password
- **ConnectionHandle** — (%Binary property) The current connection handle to the ODBC-compliant data source.
- **Connect()** — Establishes a connection to a DSN.
- **GetConnection()** — Establishes a connection using configuration settings to determine the DSN, username, and password.
- **SetConnectOption()** — Invokes the ODBC function **SQLSetConnectAttr**.
- **Disconnect()** — Closes the connection.

Status and Query Methods

Most of the methods of %SQLGatewayConnection return a status, which you should check. Status information is also available via the following properties and methods:

- **sqlcode** — (%Integer property) Contains the SQL code return by the last call (if any).
- **GatewayStatus** — (%Integer property) Indicates the status of the last call.
- **GetLastSQLCode()** — Returns an SQL code for the last call if this call does not return an SQL code.
- **GatewayStatusGet()** — Returns an error code for the last call.

The following methods get rows from the result set:

- **FetchRows()** — Returns (by reference) a specified number of rows for the given connection handle.
- **GetOneRow()** — Returns (by reference) the next row for the given connection handle.

The following methods get and set the values of bound query parameters:

- **GetParameter()** — Returns (by reference) the current value of the indicated parameter.
- **SetParameter()** — Sets the value of a previously bound parameter.

Using the Shared Library

The %SQLGatewayConnection class provides properties and methods that you can call to get information about the shared library used by the ODBC SQL Gateway.

- **DLLHandle** — (%Binary property) Handle for the shared library, as currently in use. This is set when you connect.
- **DLLName** — (%String property) Name of the shared library currently in use. This is set when you connect.
- **GetGTWVersion()** — Returns the current version of the shared library.
- **GetUV()** — Returns (by reference) whether the shared library was built as Unicode. Note that this method always returns a status of \$\$\$OK.
- **UnloadDLL()** — Unloads the shared library from the process memory.

5.4.2 %SQLGatewayConnection Methods and Properties

This is an alphabetical listing of selected methods and properties. See “[Supported ODBC Function Calls](#)” for methods not listed here.

AllocateStatement()

Invokes ODBC function **SQLAllocHandle()** and creates the corresponding structures in the SQL Gateway.

```
method AllocateStatement(ByRef hstmt) as %Status
```

Connect()

Establishes a connection to a DSN.

```
method Connect(dsn, usr, pwd, timeout) as %Status
```

If username and password are both empty, this method calls the ODBC function **SQLDriverConnect()**. If that call is unsuccessful or username/password are specified, the method calls the ODBC function **SQLConnect()**.

If the timeout parameter is not 0, **SQLSetConnectAttr()** is first called to set `SQL_ATTR_LOGIN_TIMEOUT`.

ConnectionHandle property

%Binary property that provides the current connection handle to the ODBC-compliant data source.

Disconnect()

Closes the connection.

```
method Disconnect() as %Status
```

DLLHandle property

%Binary property that provides the handle for the shared library, as currently in use. This is set when you connect.

DLLName property

%String property that provides the name of the shared library currently in use. This is set when you connect.

DSN property

%String property that provides the data source name of the ODBC-compliant data source to which you want to connect.

FetchRows()

Returns (by reference) a specified number of rows for the given connection handle.

```
method FetchRows(hstmt, Output rlist As %List, nrow As %Integer) as %Status
```

Here *hstmt* is the connection handle, returned (by reference) from **AllocateStatement()**. Also, *rlist* is the returned list of rows; this is an InterSystems IRIS \$list. Each item in the list contains a row. If there is no data (`SQL_CODE = 100`), fetching is assumed to be successful but the return list is empty.

CAUTION: This method is primarily useful for testing, and it truncates character fields up to 120 characters so that more fields would fit in a row. Use **GetData()** instead when you need non-truncated data.

GatewayStatus property

%String property that provides the status of the last call. Status value will be one of the following:

- 0 - success
- -1 - SQL error
- -1000 - critical error

GatewayStatusGet()

Returns an error code for the last call.

```
method GatewayStatusGet() as %Integer
```

It does not initialize the error code and can be called multiple times. See the previous notes for the `GatewayStatus` property.

GetConnection()

Establishes a connection, using configuration file entries to determine the DSN, user name, and password.

```
method GetConnection(conn, timeout) as %Status
```

GetGTWVersion()

Returns the current version of the shared library.

```
method GetGTWVersion() as %Integer
```

GetLastSQLCode()

Returns an SQL code for the last call if this call does not return an SQL code (for example, if you used `SQLGetData()`).

```
method GetLastSQLCode() as %Integer
```

GetOneRow()

Returns (by reference) the next row for the given connection handle.

```
method GetOneRow(hstmt, ByRef row) as %Status
```

Here *hstmt* is the connection handle, returned (by reference) from `AllocateStatement()`. Also, *row* is the returned row, an InterSystems IRIS \$list. Each item in the list contains a field. If there is no data (`SQL_CODE = 100`), fetching is assumed to be successful but the return list is empty.

CAUTION: This method is primarily useful for testing, and it truncates character fields up to 120 characters so that more fields would fit in a row. Use `GetData()` instead when you need non-truncated data.

GetParameter()

Returns (by reference) the current value of the indicated parameter.

```
method GetParameter(hstmt, pnbr, ByRef value) as %Status
```

Here *hstmt* is the connection handle returned (by reference) from `AllocateStatement()` and *pnbr* is the ordinal number of the parameter.

GetUV()

Returns (by reference) whether the shared library was built as Unicode.

```
method GetUV(ByRef infoval) as %Status
```

Note that this method always returns a status of \$\$\$OK.

Password property

%String property that provides the associated password.

SetConnectOption()

Invokes the ODBC function **SQLSetConnectAttr()**.

```
method SetConnectOption(opt, val) as %Status
```

Only integer values are supported. Integer values for the *opt* argument may be taken from the `sql.h` and `sqlext.h` header files.

SetParameter()

Sets the value of a previously bound parameter.

```
method SetParameter(hstmt, pvalue, pnbr) as %Status
```

Here *hstmt* is the connection handle returned (by reference) from **AllocateStatement()**, *pvalue* is the value to use, and *pnbr* is the ordinal number of the parameter. The parameters are stored in \$list format. If the allocated buffer is not sufficient, a new buffer will be allocated.

sqlcode property

%Integer property that provides the SQL code returned by the last call (if any).

UnloadDLL()

Unloads the shared library for the ODBC SQL Gateway from the process memory.

```
method UnloadDLL() as %Status
```

User property

%String property that provides the username to log in to the data source.

5.4.3 Supported ODBC Function Calls

The following table lists ODBC functions directly supported by corresponding %SQLGatewayConnection methods, and links to the class documentation for those methods. See “[Calling ODBC Functions Directly](#)” for an example that calls methods to invoke ODBC functions **SQLPrepare** and **SQLExecute**.

This chapter is not intended as a detailed reference for these methods. For details on method arguments, actions, and return values, see the InterSystems Class Library reference for %SQLGatewayConnection.

Table 5–1: Calling ODBC Functions from %SQLGatewayConnection

ODBC Function	ObjectScript methods that call the function
SQLAllocHandle	AllocateStatement()
SQLBindParameter	BindParameter() , BindParameters()
SQLCloseCursor	CloseCursor()
SQLColAttribute	DescribeColumns()
SQLColumnPrivileges	ColumnPrivileges() , ColumnPrivilegesW()
SQLColumns	Columns() , ColumnsW()

ODBC Function	ObjectScript methods that call the function
SQLDescribeCols	DescribeColumns()
SQLDescribeParam	DescribeParameters()
SQLDiagRec	GetErrorList()
SQLEndTran	Transact()
SQLExecute	Execute()
SQLFetch	Fetch()
SQLForeignKeys	ForeignKeys(), ForeignKeysW()
SQLFreeHandle	DropStatement()
SQLFreeStmt	UnbindParameters()
SQLGetData	GetData(), GetDataL(), GetDataLW(), GetDataW()
SQLGetInfo	GetInfo()
SQLGetTypeInfo	GetTypeInfo()
SQLMoreResults	MoreResults()
SQLNumParams	DescribeParameters()
SQLParamData	ParamData()
SQLPrepare	Prepare(), PrepareW()
SQLPrimaryKeys	PrimaryKeys(), PrimaryKeysW()
SQLProcedureColumns	DescribeProcedureColumns(), DescribeProcedureColumnsW()
SQLProcedures	DescribeProcedures(), DescribeProceduresW()
SQLPutData	PutData(), PutDataW()
SQLRowCount	RowCount()
SQLSetConnectAttr	SetConnectOption()
SQLSetStmtAttr	SetStmtOption()
SQLSpecialColumns	SpecialColumns(), SpecialColumnsW()
SQLStatistics	Statistics(), StatisticsW()
SQLTablePrivileges	TablePrivileges(), TablePrivilegesW()
SQLTables	Tables(), TablesW()

