IBM InfoSphere DataStage and QualityStage
Version 11 Release 3

Connectivity Guide for ODBC

SC19-4265-00

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Note

Before using this information and the product that it supports, read the information in "Notices and trademarks" on page 135.

Contents

Chapter 1. Connector Migration Tool

To take advantage of the additional functionality that connectors offer, use the Connector Migration Tool to migrate jobs to use connectors instead of plug-in and operator stages.

The following table lists the stages that can be migrated to connectors and the corresponding connectors that they are migrated to:

Table 1. List of stages and corresponding connectors

Stage	Connector stage
DB2Z stage DB2 UDB API stage DB2 UDB Enterprise stage DB2 UDB Load stage	DB2 Connector
DRS Stage	DRS Connector
Java Client stage Java Transformer stage	Java Integration stage
Netezza Enterprise stage	Netezza Connector
ODBC Enterprise stage ODBC (Server) stage SQLServer Enterprise stage	ODBC Connector
Oracle OCI stage Oracle OCI Load stage Oracle Enterprise stage	Oracle Connector
Teradata API stage Teradata Enterprise stage Teradata Load stage Teradata Multiload stage	Teradata Connector
WebSphere® MQ stage	WebSphere MQ Connector

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Migrating jobs to use connectors

To migrate jobs to use the connectors, you need to run the Connector Migration Tool.

To run the Connector Migration Tool, start it from the Microsoft Windows **Programs** menu or from the command line. If you start the tool from the command line, additional options that are not provided in the user interface are available.

The user interface leads you through the process of evaluating which jobs, shared containers, and stages to migrate. You select the jobs that you want to migrate, and beside each job name, the tool displays an icon that indicates whether or not the job can be fully migrated, partially migrated, or not migrated at all. To refine the list of jobs to evaluate, you can specify that only jobs that contain specific plug-in and operator stages be listed. The tool gives you a chance to make a backup of a job before you migrate it. You can make a backup copy of the job and then migrate the backup, or you can make a backup copy of the job and then migrate the original job. Either way, your original job is never lost. The job is migrated and

placed in the same folder as the original job, and the log file `CCMigration.log`, which records the results of the migration, is created in the current directory.

The Connector Migration Tool command line options provide the same functionality as the user interface, as well as a few additional options. Using the command line, you can perform these additional tasks:

- Specify a list of job names to be considered for migration.
- Specify a list of shared container names to be considered for migration
- Specify a list of stage type names to limit the jobs that are considered for migration.
- Run a practice migration, where the actual migration does not take place but the possible results of the migration are placed in the log file. You can review the results and then refine the migration as necessary before you run the actual migration.
- Produce a report of jobs and their stages and stage types

Note:

- The Connector Migration Tool does not read environment variables at the operating system level. Environment variables are read only if they are defined within InfoSphere DataStage at the Project level or at the Job level. Project level environment variables are read first, then overwritten by Job environment variables. Environment variables with blank default values are ignored by the Connector Migration Tool. The default values of the environment variables are migrated, but the run-time values are not migrated.
- Throughout this documentation, the term "job" refers to parallel shared containers and server shared containers, as well as IBM® InfoSphere® DataStage® jobs.

Using the user interface to migrate jobs

Use the Connector Migration Tool to view which jobs and stages are eligible for migration and then migrate them to use connectors rather than plug-in and operator stages.

About this task

You use the same project connection details to connect to the Connector Migration Tool as you use to connect to the InfoSphere DataStage and QualityStage® Designer or InfoSphere DataStage and QualityStage Director Client. You must have sufficient user privileges to create and modify the jobs that you are migrating.

Procedure

1. Choose **Start** > **Programs** > **IBM InfoSphere Information Server** > **Connector Migration Tool**.
2. In the Log on window, complete these fields:
   a. In the **Host** field, enter the host name of the services tier. You can specify an optional port by separating it from the host name with a colon. The host name that you specify here is the same one that you specify when you start the Designer client, for example, mymachine:9080).
   b. In the **User name** field, enter your InfoSphere DataStage user name.
   c. In the **Password** field, enter your InfoSphere DataStage password.
   d. In the **Project** field, enter the name of the project. To access an InfoSphere DataStage server that is remote from the domain server, specify the project

name in full as *server*:[*port*]/*project*. As an alternative, you can press the button adjacent to the **Project** field to display a dialog box from which you can select the fully-qualified project name.

e. Click OK. An icon indicates the status of each job. A gray icon indicates that the job cannot be migrated. A gray icon with a question mark indicates that the job might be successfully migrated.

3. Display the jobs and stages to consider for migration:
   - Choose **View** > **View all jobs** to display all of the jobs in the project. This is the default view.
   - Choose **View** > **View all migratable jobs** to display all of the jobs that are in the project and that can be migrated to use connectors. Jobs that do not contain any stages that can be migrated are excluded from the job list.
   - Choose **View** > **View jobs by stage types** to open the Filter by stage type window.
4. Perform the following steps to analyze jobs:
   a. Highlight the job in the job list.
   b. Expand the job in the job list to view the stages in the job.
   c. Select one or more jobs, and click **Analyze**.

   After analysis, the color of the job, stage, or property icon indicates whether or not it can be migrated. A green icon indicates that the job, stage, or property can be migrated. An red icon indicates that the job or stage cannot be migrated. An orange icon indicates that a job or stage can be partially migrated and that a property in a stage has no equivalent in a connector. A gray icon indicates that the job or stage is not eligible for migration.

   Note: The Connector Migration Tool displays internal property names, rather than the names that the stages display. To view a table that contains the internal name and the corresponding display name for each property, from the IBM InfoSphere DataStage and QualityStage Designer client, open the Stage Types folder in the repository tree. Double-click the stage icon, and then click the **Properties** tab to view the stage properties.
5. Click **Preferences** and choose how to migrate the job:
   - Choose **Clone and migrate cloned job** to make a copy of the job and then migrate the copy. The original job remains intact.
   - Choose **Back up job and migrate original job** to make a copy of the job and then migrate the original job.
   - Choose **Migrate original job** to migrate the job without making a backup.
6. Select the jobs and stages to migrate, and then click **Migrate**.

   The jobs and stages are migrated and are placed in the same folder as the original job. If logging is enabled, a log file that contains a report of the migration task is created. After a job is successfully migrated, a green checkmark displays beside the job name in the Jobs list to indicate that the job has been migrated.

Using the command line to migrate jobs

Run the Connector Migration Tool from the command line to use additional options that are not available in the user interface.

About this task

To run the Connector Migration Tool from the command line, you specify the command **CCMigration**, followed by a series of required and optional parameters. If the Connector Migration Tool is started from the command line, its user interface will be displayed if none of the options **-C**, **-M** or **-B** are specified. If any one of these options is specified, then the migration will proceed without any further interaction with the user. The command line options described below can therefore be used whether or not the user interface is displayed.

After a job is successfully migrated, a green checkmark displays beside the job name in the Jobs list to indicate that the job has been migrated.

Procedure

1. From the IBM InfoSphere DataStage client command line, go to the `<InformationServer>\Clients\CCMigrationTool` directory.
2. Enter the command **CCMigration**, followed by the following required parameters:
   - **-h** *host:port*, where *host:port* is the host name and port of the InfoSphere DataStage server. If you do not specify a port, the *port* is 9080 by default.
   - **-u** *user name*, where *user name* is the name of the InfoSphere DataStage user.
   - **-p** *password*, where *password* is the password of the InfoSphere DataStage user
   - **-P** *project*, where *project* is the name of the project to connect to. To specify an InfoSphere DataStage server that is remote from the domain server, specify the fully qualified project name by using the format *server*:[*port*]/*project*.
   - One of the following:
     – **-M** If you specify this parameter, the original jobs are migrated, and backup jobs are not created.
     – **-B** *job name extension*, where *job name extension* is a set of alphanumeric characters and underscores. If you specify this parameter, the Connector Migration Tool creates backup jobs, names the backup jobs *source job name+job name extension*, and then migrates the original jobs. The backup jobs are saved in the same location in the repository as the source jobs.
     – **- C** *job name extension*, where *job name extension* is a set of alphanumeric characters and underscores. If you specify this parameter, the Connector Migration Tool clones the source jobs, names the cloned jobs *source job name+job name extension*, and then migrates the cloned jobs. The cloned jobs are saved in the same location in the repository as the source jobs.

   If you specify one of these options, the migration proceeds without requiring any additional user input. If you do not specify **-M**, **-B**, or **- C**, the user interface is displayed so that you can make additional choices for how to migrate the jobs.
3. Optional: Enter any of the following optional parameters:
   - **-L** *log file*, where *log file* is the file name and path for the log file that records the results of the migration.
   - **-S** *stage types*, where *stage types* is a comma-separated list of stage types. By default, the Connector Migration Tool migrates all stage types. Use this parameter to migrate only jobs that contain the specified stage types. If you specify both the **-S** and **-J** parameters, only the specified stage types within the specified jobs are migrated. If you specify the **-S** parameter and do not specify the **-C**, **-M** or **-B** parameter, only jobs that contain the specified stage

types appear in the job list that is displayed in the user interface. Limiting the jobs that are displayed can significantly reduce the startup time of the Connector Migration Tool.

- **-J** *job names*, where *job names* is a comma-separated list of jobs. By default, the Connector Migration Tool migrates all eligible jobs in the project. Use this parameter to migrate only specific jobs. If you specify the **-J** parameter and do not specify the **-C**, **-M** or **-B** parameter, only the specified jobs appear in the job list that is displayed in the user interface. Limiting the jobs that are displayed can significantly reduce the startup time of the Connector Migration Tool.
- **-c** *shared container names*, where *shared container names* is a comma-separated list of shared containers. By default, the Connector Migration Tool migrates all eligible shared containers in the project. Use this parameter to migrate only specific shared containers. If you specify the **-c** parameter and do not specify the **-C**, **-M**, or **-B** parameter, only the specified shared containers appear in the job list that displays in the user interface. Limiting the shared containers that display might significantly reduce the startup time of the Connector Migration Tool.
- **-R** If you specify this parameter, the Connector Migration Tool reports the details of the migration that would occur if the specified jobs were migrated, but does not perform an actual migration. The details are reported in the log file that is specified by using the **-L** parameter.
- **-a** *auth file*, where *auth file* is the file name that records the user name and password.
- **-A** If you specify this parameter, the Connector Migration Tool adds an annotation to the job design. The annotation describes the stages that were migrated, the job from which the stages were migrated, and the date of the migration.
- **-d***job dump file*, where *job dump file* is the file name and path for a file where a list of jobs, shared containers, and stages is written. Using a job dump file is helpful when you want to determine which jobs are suitable for migration. You can use the **-d** parameter with the **-J**, **-c**, and **-S** parameters to list particular jobs, shared containers, and stage types, respectively.
- **-V** If you specify this parameter, the Connector Migration Tool specifies the target connector variant for migrated stages. The format of the list is a comma-separated list containing *{StageTypeName=Variant}*.
- **-v** If you specify this parameter with the **-d** command, the values of stage properties will be included in the report. If omitted, the report only contains stage names and types, but not the stage properties. This option is useful to identify jobs that have stages with certain property values. If this option is specified, then **–S** is ignored.
- **-T** If you specify this parameter, the Connector Migration Tool enables the variant migration mode. All connector stages found in jobs and containers whose stage type matches those listed by the **–V** command are modified.
- **-U** If you specify this parameter, the Connector Migration Tool enables the property upgrade migration mode. All connector stages found in jobs and containers whose properties match the conditions specified in the `StageUpgrade.xml` file are upgraded.
- **-b** *stage type*, where *stage type* is the built-in stage type to be migrated. This parameter is supported only on the command line, not on the user interface. Currently, only UniData 6 stages are supported. To migrate UniData 6 stages to UniData stages, specify `-b CUDT6Stage`.

Example

The following command starts the Connector Migration Tool, connects to the project billsproject on the server dsserver as user billg, and migrates the jobs db2write and db2upsert:

```
CCMigration -h dsserver:9080 -u billg -p padd0ck
-P billsproject -J db2write,db2upsert -M
```

Deprecated stages

Connectors, which offer better functionality and performance, replace some stages, which were deprecated and removed from the palette. However, you can still use the deprecated stages in jobs and add them back to the palette.

The following stage types were removed from palette for the parallel job canvas:

- DB2Z
- DB2® UDB API
- DB2 UDB Load
- DRS
- Dynamic RDBMS
- Java Client
- Java Transformer
- Netezza Enterprise
- ODBC Enterprise
- Oracle 7 Load
- Oracle OCI Load
- Oracle Enterprise
- Teradata API
- Teradata Enterprise
- Teradata Load
- Teradata Multiload
- WebSphere MQ

The following stage type was removed from the palette for the server job canvas:

- Dynamic RDBMS

When you create new jobs, consider using connectors instead of the deprecated stages. The following table describes the connector to use in place of the deprecated stages:

Table 2. Stages and corresponding connectors

Deprecated stage	Connector stage
DB2Z DB2 UDB API DB2 UDB Enterprise DB2 UDB Load	DB2 Connector
DRS	DRS Connector
Dynamic RDBMS	DB2 Connector Oracle Connector ODBC Connector

Table 2. Stages and corresponding connectors (continued)

Deprecated stage	Connector stage
Java Client Java Transformer	Java Integration stage
Netezza Enterprise	Netezza Connector
ODBC Enterprise	ODBC Connector
Oracle 7 Load Oracle OCI Load Oracle Enterprise	Oracle Connector
Teradata API Teradata Enterprise Teradata Load Teradata Multiload	Teradata Connector
WebSphere MQ	WebSphere MQ Connector

To use any of the deprecated stage types in new jobs, drag the stage type from the repository tree to the canvas or to the palette. From the repository tree, expand **Stage Types**. Under **Stage Types**, expand **Parallel** or **Server**depending on the stage that you want to use. Drag the stage type to the job canvas or to the palette.

Chapter 2. ODBC sources

When you use IBM InfoSphere DataStage to access the ODBC application programming interface (API), you can choose from a collection of connectivity options. For most new jobs, use the ODBC connector, which offers better functionality and performance.

A connector is a component that provides data connectivity and metadata integration for external data sources, such as relational databases or messaging software. A connector typically includes a stage that is specific to the external data source.

The ODBC connector is one of several different stages that access external data sources in database management systems (DBMS). In addition to the ODBC Connector stage, the following stages are available:

- ODBC Enterprise stage, which is available only for parallel jobs
- ODBC stage, which is available only for server jobs

If you have jobs that use the older stages and want to use the connector, use the Connector Migration Tool to migrate jobs to use connector.

The ODBC connector provides some ease-of-use benefits to you:

- View data in a design-time environment.
- Create job parameters directly from the connector without having to define the parameters first.
- Save connection information that you specify in the stage as a data connection object, which means that you can reuse the object.
- Configure rules for reconciling data types between the source and target schemas to avoid runtime errors.
- Receive immediate feedback about any invalid values for properties on the Properties page.
- Reset a property value to its default value.
- View error messages that are generated when your jobs run.

The following table lists the scenarios where you might want to use one of the stages other than the ODBC Connector stage.

Table 3. Scenarios where you might use a stage other than the ODBC Connector stage

Goal	**Stage to use instead of the ODBC Connector stage**
Use stored procedures.	• Stored Procedure (preferred) • ODBC
In a lookup operation, return more than one result on the reference link for each input row.	ODBC (server jobs)

Chapter 3. Prerequisites for the ODBC connector

The ODBC connector has no special installation requirements. However, there are configuration prerequisites that are specific to the ODBC connector.

Before you can use the ODBC connector in a job, you need to configure database drivers, driver managers, and data source names.

Database drivers

You must install and configure database drivers and at least one driver manager before you can use the ODBC connector.

Supported drivers are included with the installation of this product. For information about the supported drivers and how to configure them, refer to the *IBM InfoSphere Information Server Planning, Installation, and Configuration Guide*.

The following drivers have limitations or special configuration requirements when you use them with the ODBC connector:

IBM Text File Driver

- Supported data types. Only Numeric, Date, and VarChar are supported.
- Unsupported runtime data types. The following runtime data types are not supported:
  - Bit
  - Binary
  - LongNVarChar
  - LongVarBinary
  - LongVarChar
  - NChar
  - NVarChar
  - Time
  - Timestamp

SQL Server driver

- Large objects (LOBs) by reference. You cannot pass them by reference with this driver. You must transfer them inline.

SQL Server native driver

- Transfer large objects (LOBs) by reference. You cannot pass them by reference with this driver. You must transfer them inline.

SQL Server wire driver

- Transfer large objects (LOBs) by reference. You cannot pass them by reference with this driver. You must transfer them inline.
- View design-time data. To view design-time data that contains spaces, you must select the quoted identifiers check box on the **Advanced** tab of the driver setup window.

Supported data sources

A data source is a repository of data that can contain relational databases, XML files, and table-structured files.

To be a supported data source, the ODBC connector must be able to perform read, write, and lookup SQL statements and to exchange data between external data sources and the IBM InfoSphere DataStage data sets.

For information about the supported data sources, see *IBM InfoSphere Information Server Planning, Installation, and Configuration Guide*.

Data source prerequisites

Use the ODBC connector to connect to relational database management systems (DBMSs), files, and any other ODBC-supported data sources.

Before the connector can open a table or file to read and write data, a connection must be defined to the data source that contains that table or file.

For the ODBC connector, the ODBC driver manager establishes the connection. To establish your data sources correctly, the following requirements must be met:

- The driver and driver manager must be installed on the same local system where the connector is installed and running. The data source can be on a remote system, and you can also connect to multiple data sources.
- For parallel jobs, the driver and driver manager must be installed on every node where the connector runs.

You can also connect to only one ODBC driver manager at a time.

When you configure the driver manager and you are logged into the Designer client, you can see a list of data source names in the **Data source** property by clicking the **Data source** button. This button is available only when you click inside the property. If you are working in a design environment that is not connected to the server, you can type a value in the **Data source** property.

Data source names

You must define names for each data source that are specific to the operating system, driver manager, and driver.

For more information, see the topics about configuring ODBC access in the configuring product modules section of the IBM InfoSphere Information Server Planning, Installation, and Configuration Guide.

Chapter 4. ODBC connector

You can use the ODBC connector in your jobs to read data, write data, look up data, and filter data.

ODBC connector jobs

You can use the ODBC connector in your jobs to read data, write data, look up data, and filter data.

The role of the connector is determined by the links that are attached to it in the job and how the connector is configured. The following links can be used with the ODBC connector:

Input links
The connector receives data.

Output links
The connector sends data.

Reference links
The connector participates in normal or sparse lookups.

Reject links
The connector filters rows of data that meet your specified criteria and passes the rows that meet this criteria to another stage.

You can use one input link or one output link or one reference link. Additionally, you can use a reject link with an input link.

Example link configurations

Here are some example link configurations for the ODBC connector:

- Input link to ODBC connector
- Output link to ODBC connector
- Input link to ODBC connector to reject link
- Output link to ODBC connector to reject link

Job design and the ODBC connector

You can use the ODBC connector in your jobs to perform different types of tasks, such as testing your connection to the data source, performing lookup operations, defining rejected record criteria, and as a source or a target of data.

After you add the connector to your job, you can specify links and other stages to define the role of the connector in the job.

Job execution order and its effect on job design

At run time, the ODBC connector uses the properties that you specify at design time to define how the Data Definition Language (DDL) statements and Data Manipulation Language (DML) statements are executed and how errors are handled.

The ODBC connector reads the property information in the following order:

1. Schema reconciliation

   You determine the levels of schema reconciliation that the connector performs between your design-time schema and your external schema by using the properties in the **Schema reconciliation** property group and any other associated properties.
2. Table action

   You can specify any of the following operations:

   - Create a table.
   - Replace a table.
   - Truncate a table.
   - Append to a table.

   You can also specify the DDL statement for the action, or you can specify that the DDL statement is generated automatically.
3. Before SQL

   If you set the **Before/After SQL** property to `Yes` and specify an SQL statement in the **Before SQL** property, the connector runs the statement. If you specify multiple statements in the **Before SQL** property, the connector runs each additional statement in sequence.
4. Before SQL (node)

   If you set the **Before/After SQL** property to `Yes` and specify an SQL statement in the **Before SQL (node)** property, the connector runs the statement on each processor node.
5. Write mode

   The connector performs all of the data manipulation that you specify in the **Write mode** property. The connector runs all of the SQL statements that are related to the **Write mode** property value. For example, if you set the **Write mode** property to `Insert then Update`, the connector runs the SQL statement that you specify in the **Insert statement** property and then the SQL statement that you specify in the **Update statement** property.
6. After SQL (node)

   If you set the **Before/After SQL** property to `Yes` and specify an SQL statement in the **After SQL (node)** property, the connector runs the statement on each processor node.
7. After SQL

   If you set the **Before/After SQL** property to `Yes` and specify an SQL statement in the **After SQL** property, the connector runs the statement. If you specify multiple statements in the **After SQL** property, the connector runs each additional statement in sequence.

Note: There are certain data types that the ODBC connector cannot generate a DDL for at design time or at run time. When designing a job, you are warned if you define such a data type. At run time, the connector inserts the nearest matching data type and does not issue a warning. The workaround is to specify the DDL yourself rather than have the connector do it automatically.

Configuring the connector as a source

To configure the connector as a source, you must define the connection to a ODBC data source, specify the properties for the output link, and define columns for the data that the connector must read.

About this task

In the source context, the connector extracts or reads data from an external ODBC data source.

Restriction: Only one connection is valid from a single thread. If your transaction involves SEBridge running both the WebSphere MQ plug-in and WebSphere MQ connector on the same thread, a warning message at MQCLOSE and a unrecoverable error at MQCMIT occurs alerting you that the connection is shared and transactions are overlapped between the two MQ stages. To work around these errors, you can add an interprocess stage between the transformer and MQCC to run the plug-in and connector separately.

Procedure

1. In the job canvas, add the connector to the job.
2. Add the stage that follows the connector in the job flow.
3. Add the output link from the connector to the next stage. Right-click the connector and then drag it on the next stage. The connector now has an output link that connects it to the next stage in the job flow.
4. Double-click the connector to open the stage editor.
5. On the Properties tab, define the connection properties for the ODBC data source.
6. Optional: On the Advanced tab, specify the custom processing settings.
7. Specify information about the output link:
   a. On the Output tab, select the output link.
   b. On the Properties tab, define the usage properties for the link.
   c. On the Columns tab, define the column metadata for the link.
   d. Optional: On the Advanced tab, you can specify custom buffering settings for the link.
8. Click **OK** to save your changes and to close the stage editor.

Configuring the connector as a target

To configure the connector as a target, you must define the connection to a ODBC data source, specify the properties for the input link, and define columns for the data that the connector will write.

About this task

In the target context, the connector connects to the external ODBC data source and inserts, updates, or deletes data.

Procedure

1. In the job canvas, add the connector to the job.
2. Add the input link from the previous stage in the job flow to the connector. Right-click the previous stage and then drag it on the connector. The connector now has an input link that connects it to the previous stage in the job flow.
3. Double-click the connector to open the stage editor.
4. On the Properties tab, define the connection properties for the ODBC data source.
5. Optional: On the Advanced tab, specify custom processing settings.
6. Specify information about the input link:

a. On the Input tab, select the input link.
b. On the Properties tab, define the usage properties for the link.
c. On the Columns tab, define the column metadata for the link.
d. Optional: On the Advanced tab, you can specify custom buffering settings for the link.
e. Optional: On the Partitioning tab, you can specify custom partitioning settings for the link.

7. If the connector has a reject link, specify how to send data to this link:
   a. On the Reject tab, select the reject link, then define the reject conditions for the link.
   b. Optional: On the Advanced tab, specify custom buffering settings for the link.
8. Click **OK** to save your changes and to close the stage editor.

Record ordering:

If the connector has multiple input links, you can control the processing order of input data across links. You can specify the order by input link or by record.

Specifying the order of input data by input link:

When the connector uses multiple input links, you can control the sequence in which records are processed by ordering the links.

About this task

The order in which you specify the links on the **Link Ordering** tab determines the order in which the records in the links are processed for each unit of work.

Procedure

1. From the stage editor, select an input link.
2. Click the **Link Ordering** tab.
3. Click a link that you want to reorder, and use the arrow buttons to move the link up or down.

Specifying the order for records:

If a connector has multiple input links, you can control the order of record processing by specifying the order for the records.

Procedure

1. Double-click the connector stage icon to open the connector properties.
2. Set **Record ordering** to one of the following:
   - **All records** specifies that all records are processed from each link in order.
   - **First record** specifies that one record is processed from each link, in turn, until all records from all links have been processed.
   - **Ordered** specifies that records are processed from each link in an order you specify by using the **Key column**, **Null order**, and **Case-sensitive** properties.
3. If you choose **Ordered**, complete these additional properties:
   a. **Key column** – Specify the name of the column to use as the sort key.
   b. **Sort order** – Specify **Ascending** or **Descending**.

c. **Null order** – Specify where to sort null values in the sort order. The choices are **Before** or **After**.
d. **Case sensitive** – Specify whether or not text comparisons are case-sensitive. The choices are **Yes** or **No**.

Rejecting records that contain errors

When the connector includes a reject link, records that meet specified reject criteria are automatically routed to the target stage of the reject link, and processing continues for the remaining records.

Before you begin

- Create a job that includes the connector and required links.
- Define a connection to the database.
- Set up column definitions on the links.
- Specify the write mode and the target table.

About this task

When you configure a reject link, you select one or more conditions that control when to reject a record and send it to the target stage that receives the rejected records. You can also choose to include the error code and error message that is generated when a record fails. If you do not define a reject link or if you define a reject link but a failed record does not match any of the specified reject criteria, the connector reports a Fatal error and stops the job.

If the connector has multiple input links, you can specify multiple reject links. You use the **Reject from link** field to specify the input link to associate with the reject link.

Procedure

1. Configure a target stage to receive the rejected records.
2. Right-click the connector and drag to create a link from the connector to the target stage.
3. If the link is the first link for the connector, right-click the link and choose **Convert to reject**. If the connector already has an input link, the new link automatically displays as a reject link.
4. Double-click the connector to open the stage editor.
5. Click the **Reject** tab.
6. If the connector has multiple reject links, in the **Reject from link** field, select the input link to associate with the reject link.
7. In the **Reject rows based on selected conditions** list, select one or more conditions to use to reject records.

   Note: If you do not choose any conditions, none of the rows are rejected. In this case, any error that occurs while the records are being written to the target table results in job failure.
8. Use one of the following methods to specify when to stop a job because of too many rejected rows:
   - In the **Abort when** field, select **Percent**. Then in the **Abort when (%)** field, enter the percentage of rejected rows that will cause the job to stop. In the **Start count after (rows)** field, specify the number of input rows to process before calculating the percentage of rejected rows.

- In the **Abort when** field, select **Rows**. Then in the **Abort after (rows) field**, specify the maximum number of reject rows allowed before the job stops.

9. In the **Add to reject row** list, select additional columns to include in the rejected data. For example, if you are using the Oracle connector, you might select the ERRORCODE and ERRORMESSAGE columns, which contain information about why a row is rejected.

Lookup operations with the ODBC connector

The ODBC connector with the Lookup stage can perform a join operation between one or more external data source tables and an IBM InfoSphere DataStage input resource.

An example of an input resource is a data set or a sequential file. The output result of the join is an InfoSphere DataStage data set.

With normal lookup and sparse lookup jobs, the ODBC connector is connected to a Lookup stage. In both lookup types, the key column values determine how the data from two different sources is joined together. These two lookup types differ in the location in which the rows of data are processed. You must specify a WHERE clause and the specific columns that are used in a sparse lookup. Both lookup types look the same on the job canvas.

Creating a lookup operation with a connector:

You can use the ODBC connector to create a lookup operation.

Before you begin

You must create a job first.

About this task

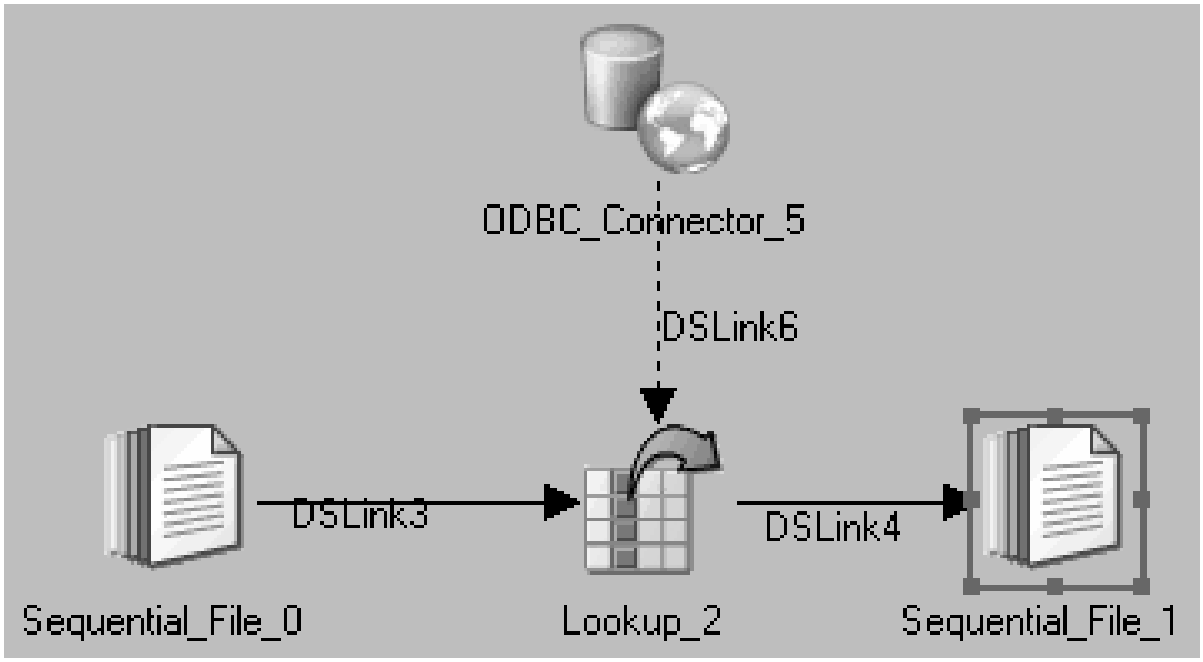
After you create the lookup job, how you configure it determines whether it is a normal lookup or a sparse lookup.

Procedure

1. Add an input resource stage such as a Data set stage or a Sequential File stage to the job canvas.
2. Add a Lookup stage as the output stage to the input resource stage.
3. Add an output resource stage, such as a Data set stage or a Sequential File stage, after the Lookup stage. This stage serves as an output stage to the Lookup Stage.
4. Add the ODBC connector directly above the Lookup stage.
5. Connect the connector to the Lookup stage with a reference link.
6. Save the job.

Example

This example shows the result of this procedure.



What to do next

Now, you are ready to configure this job to perform a normal lookup operation or a sparse lookup operation.

Configuring the connector for normal lookup operations:

You can use the ODBC connector to perform a normal lookup operation. In this lookup operation, the connector retrieves all of the records and allows the Lookup stage to process the records.

Before you begin

You must create a lookup operation job first. You also must define your columns in the input stage for the Lookup stage and the output stage for the Lookup stage. For information about how to define the columns in these stages, refer to the stage-specific documentation.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.
2. On the Output tab, select the reference link.
3. Configure the properties on the **Properties** tab.
   a. Set **Lookup type** to `normal`.
   b. Define and test your connection properties in the **`Connection`** section.
   c. Type your SELECT statement in the **`Select statement`** property by using the following format: `select * from` *`table_name`*. Note that this syntax means that many records are retrieved as opposed to the records that are retrieved in a sparse lookup operation.
   d. Optional: Configure any other properties on the **Properties** tab.
4. Define your columns on the **Columns** tab of the connector stage editor.
   a. In the stage editor, click the **Columns** tab.

b. Define the columns that you want to use from the database to which the connector is connected.

5. Click **OK** to save the changes to the connector.
6. Double-click the Lookup stage to open the stage editor.
   a. Map the required columns from your data input link to the output link. You can drag them or copy and paste them.
   b. Map the required columns from your lookup table to the output link.
   c. Specify the key column or columns for the lookup. Drag or copy the key column from the data link to the **Key Expression** field in the lookup table link. Only key columns can be used for key expressions.
   d. Define any conditions for a lookup failure by clicking the **Constraint** icon in the menu.
   e. Select the appropriate value for the **Lookup Failure** column and click **OK**. If you select `Reject`, you must have a reject link and target stage in your job configuration to capture these records.
7. In the Lookup Stage stage editor, click **OK**.
8. Save, compile, and run the job.

What to do next

For more information about this topic, refer to the Parallel Job Developer's Guide

Configuring the connector for sparse lookup operations:

You can use the ODBC connector to perform a sparse lookup operation.

Before you begin

You must create a lookup operation job first. You must define your columns in the input stage for the Lookup stage and the output stage for the Lookup stage. For information about how to define the columns in these stages, refer to the stage-specific documentation.

About this task

In this lookup operation, the connector receives the records from the input stage, and then the connector performs the lookup operation directly on the external resource. The connector then generates the output records.

You can use the sparse lookup method only in parallel jobs.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.
2. On the Output tab, select the reference link .
3. Configure the properties on the **Properties** tab.
   a. Set **Lookup type** to `sparse`.
   b. Define and test your connection properties in the **`Connection`** section.
   c. In the **`Select statement`** property, in the select part of the SELECT statement, the asterisk wildcard (*) does not work in a sparse lookup. Therefore, specify every column in the database and delimit the columns by commas. You must specify all columns, even if you do not use them in this

lookup. The following syntax is an example of the first part of the SELECT statement: `select Field001,Field002,Field003`.

d. After your table name, specify a WHERE clause. Key columns that follow the WHERE clause must have the word ORCHESTRATE and a period added to the beginning of the column name. ORCHESTRATE can be capitalized or lowercase letters. An example of this is the following column name: `ORCHESTRATE.Field001`. The following SELECT statement is an example of proper syntax: `select Field001,Field002,Field003 from MY_TABLE where ORCHESTRATE.Field001 = Field001`.

e. Optional: Configure any other properties on the **Properties** tab.

4. Define your columns on the **Columns** tab of the connector stage editor.
   a. In the stage editor, click the **Columns** tab.
   b. Define the columns that you want to use from the database to which the connector is connected.
5. Click **OK** to save the changes to the connector.
6. Double-click the Lookup stage to open the stage editor.
   a. Map the required columns from your data input link to the output link. You can drag them or copy and paste them.
   b. Map the required columns from your lookup table to the output link.
   c. Define any conditions for a lookup failure by clicking the **Constraint** icon in the menu.
   d. Select the appropriate value for the **Lookup Failure** column and click **OK**. I you select `Reject`, you must have a reject link and target stage in your job configuration to capture these records.
7. In the Lookup Stage stage editor, click **OK**.
8. Save, compile, and run the job.

What to do next

For more information about this topic, see IBM InfoSphere DataStage and QualityStage Parallel Job Developer's Guide.

Changing the lookup operation type in the connector:

You can change from a normal lookup to a sparse lookup or from a sparse lookup to a normal lookup. You must edit your SELECT statement in the **`Select statement`** property.

Before you begin

You must create a job first where the connector is defined in a lookup operation.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.
2. On the Output tab, select the reference link.
3. Change the value of the **Lookup type** field from `normal` to `sparse` or from `sparse` to `normal`.
4. Make edits to the SQL statement in the **`Select statement`** property:
   - To change from a normal lookup operation to a sparse lookup operation:

a. Optional. You can replace the wildcard asterisk (*) for the column names in your normal lookup SELECT statement by specifying each column name that is delimited by commas.

   For example, the `select *` syntax for a normal lookup now becomes `select Field001,Field002,Field003` for a sparse lookup.

b. Add a WHERE clause to your SELECT statement and then specify the key field column from the source stage. You must add the word ORCHESTRATE, followed by a period (.), in front of any field that resides in an external resource. You can type the ORCHESTRATE in uppercase or lowercase letters.

   An example of this is the following column name: `ORCHESTRATE.Field001`.

c. Establish the relationship between the key field column in the source stage with the database table field. Type the following information: a space after the key field name, an equal sign (=), another space, and then the database table field name.

   The following example is a sparse lookup statement:

   ```
   select Field001,Field002,Field003 from MY_TABLE where
   ORCHESTRATE.Field001 = Field001
   ```

   In this example, `Field001` is not preceded by the word ORCHESTRATE because it is a field in MY_TABLE.

- To change from a sparse lookup operation to a normal lookup operation:
  a. Double-click the connector to open the stage editor.
  b. On the Output tab, select the reference link.
  c. Change **Lookup type** from `sparse` to `normal`.
  d. Optional. You can replace the columns at the beginning of the SELECT statement with a wildcard asterisk (*).
  e. Delete everything in the statement beginning with the word WHERE to the end of the statement.

5. Make any other changes in theconnector stage editor that you need.

Option	Action
No column changes	Click **OK** to save your changes. If you are configuring a normal lookup, skip to step 7.
Column changes	Go to the next step.

6. Optional: Click the **Columns** tab and make your changes. Click **OK** to save your changes.
7. Required: For normal lookup operations only, open the Lookup stage. In the left side of the stage editor for the Lookup stage, draw a connection between the primary key fields on the left side.

Configuring the connector to connect to the data source

Use the properties in the **Connection** section on the **Properties** tab to configure the connection of the data source for the connector.

Before you begin

You must create a job and add the connector to it first.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.

2. Configure the values for the properties in the **Connection** section on the **Properties** tab.

What to do next

Now, you can test the connection.

Testing the connector connection to the data source

You can test the connection to your data source in the stage editor before you compile and run your job.

Before you begin

You must configure the properties in the **Connection** section of the stage editor first.

Procedure

1. In the **Connection** section, click **Test**.

Result	Description
The connection values are correct.	The connection is made and a confirmation message is displayed. You have completed this procedure.
The connection values are incorrect.	An error message is displayed. Go to the next step.

2. Edit the connection property values.
3. Repeat steps 1 and 2.

What to do next

Now, you can save this connection information, along with additional connector information, for reuse.

Information reuse and the ODBC connector

The ODBC connector provides ways for you to save and reuse information such as connection specifications and property values in a data connection object, metadata, and job parameters.

The following topics describe how to work with these information pieces:

- Data connection objects
  - "Saving connection information as data connection objects"
- Metadata
  - "Saving metadata in the connector" on page 28
  - "Selecting a job parameter in a connector property" on page 25

Saving connection information as data connection objects

You can save your connection information as a data connection object. The object can then be reused by other stages.

Before you begin

You must configure the connection to the data source in the **Connection** section of the stage editor.

Procedure

1. In the **Connection** section, click **Save**. The Data Connection window is displayed, including the existing connection values.
2. Complete the remaining fields in this window, including the name of the data connection object, a description of the object, and the folder in which to save this object.
3. To save the object, click **OK**. The following text is added to the **Connection** section to specify the newly saved object:

   (Associated data connection: *connection_object_name***)**

Reusing data connection objects in your connector job

Data connection objects that are stored in the repository can be loaded into a stage definition. You can create a data connection object once and then reuse the object in your job design whenever you need access to the same external resource.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.
2. Select the data connection object and click **OK**. All of the settings in the data connection object are inserted into the stage editor. The following text is added to the **Connection** section to specify the selected object:

   (Associated data connection: *connection_object_name***)**

Creating job parameters in the connector properties

You can create new job parameters in a connector property without having to define them first. Job parameters allow you to define flexible, reusable jobs.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.
2. Click a property value for which you want to create a job parameter. If you can create a parameter for that property, you see the job parameter button  .
3. Click the button and select **New Parameter**.
4. Specify the parameter that you want to add.
   a. Accept the default value for the **Parameter name** field or type a new value.
   b. Accept the default value for the **Prompt** field or type a new value.
   c. Select the value for the **Type** field from the list.
   d. In the **Default Value** field, type the value that you want the job to use at run time. If you want to be prompted at run time for this value, leave this value blank. If you select `Encrypted` as the **Type**, a separate window is displayed. You must type the encrypted value, then type it again for confirmation, and then click **OK**.
   e. Optional: In the **HelpText** field, type any description.
   f. Click **OK**.

Results

For more information about this topic, see IBM InfoSphere DataStage and QualityStage Designer Client Guide.

Example

You can use job parameters in jobs where a database connector connects to a database. In this example, you want to run the same job against different data sources. You define job parameters so that the connector can dynamically connect to the data source that you specify at run time. At design-time, you define job parameters for the **Data source**, **Username**, and **Password** properties. When the job runs, you are prompted with a default value if you specified one or a blank value. You can change the default value or type a new value. The connector then uses this value to connect to the data source.

Selecting a job parameter in a connector property

You can select a job parameter in any connector property that supports job parameters.

Before you begin

Job parameters must be defined for your connector type.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.
2. Click a property value for which you want to insert a job parameter. If you can use a parameter for that property, you see the job parameter button  .
3. Click the button and select the parameter from the list.

Results

The job parameter is inserted into the property value. For more information about this topic, see IBM InfoSphere DataStage and QualityStage Designer Client Guide

Removing a job parameter from a connector property

To remove a job parameter from a connector property, you must use the job parameter button.

About this task

This button is available only when you click inside the property.

Procedure

1. Click the property value that you want to change.
2. Select **Clear Parameter**.

Results

If there is a default value for that property, the default value is now displayed. Otherwise, type or select the value that you want for this property.

Metadata and the ODBC connector

When the connector has access to the runtime server in a design-time environment, you can work with metadata at the column level or at the table level.

You can import metadata from your local repository or a remote repository if the remote repository is configured to be shared in the administrator application. You can also save metadata for later reuse by the same type of connector.

Importing metadata by columns

You can import metadata by columns on the **Columns** tab of the connector stage editor.

Before you begin

The metadata must be saved in the repository first.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.
2. Click the **Columns** tab.
3. Click **Load**.
4. Select the table from the tree that contains the metadata and click **OK**.
5. Use the right arrow (>) button to move the columns that you want to load from the **Available columns** list to the **Selected columns** list. If you want to move all of the columns at once, click the double right arrow (>>). To move columns back to the **Available columns** list from the **Selected columns** list, use the left arrow (<) for one column or the double left arrow (<<) for all columns.
6. Click **OK**. The selected column metadata is loaded into the Columns tab of the stage editor.

Importing metadata for the ODBC connector by tables

You can import metadata by tables from an ODBC data source and store the data as a table definition in the repository.

About this task

You can import table definitions to your project or make them available to other projects if you configure your project to share metadata in the administrator client. You access the Import Connector Metadata wizard to import the tables.

Procedure

1. Use any of the following ways to access the Import Connector Metadata wizard:

Method	Procedure
Designer client	From the **Import** menu, select **Table Definitions** > **Start Connector Import Wizard**.
Stage type in the repository	Navigate to the connector stage type. Right-click and select **Import Meta Data**.
Table definition in the repository	Right-click on the table definition and select **Import Meta Data**.
Data connection in the repository	Right-click on the data connection and select **Import Meta Data**.

Method	Procedure
Columns tab on the ODBC connector	1. Click the **Columns** tab. 2. Click **Load**. 3. Right-click the table that you want to import and select **Import Meta Data**.

2. When the wizard is displayed, your next step depends on whether you defined a database for importing metadata yet. Also, you might not see certain windows in the wizard, depending on the way that you accessed the wizard. Follow the pages in the wizard to complete the metadata import.

Option	Description
You are a first-time user. You have not defined a location and a database for importing metadata.	Go to the next step.
You have already defined a location or database.	Skip to step 7.

3. In the Data source location page of the Import Connector Metadata wizard, click **New location**. select the system that hosts the database from **Host name where database resides**.
4. In the Shared Metadata Management window, select the location in the repository tree and then click **Add new database**.
5. In the Add new database window, type values for **Name**, **Server**, **Location**, **Vendor**, **Version**, **Short Description**, and **Long Description** as needed and click **OK**.
6. Click **Close**.
7. Select the database in **Database name** and click **Next**.
8. Select the name of the connector type from the list and click **Next**.
9. If you have DataConnection objects defined in your project that you want to use, click the **Load** link.
10. Navigate to the folder for existing data connection objects, select the object, and click **Open**. The **Database**, **Username**, and **Password** fields are populated with the corresponding data from the data connection object.
11. To ensure that you can connect to the database, click the **Test connection** link. If the test is not successful, check the connection field values. Then click **Next**.
12. Type or select the schema name in the **Schema** list. Decide whether you want to include tables and views and type the name of a search filter that you want to use when you import the metadata. Then click **Next**.
13. Select the tables and views that you want to import. You can also include primary key and foreign key information and indices.
14. Optional: Click the **View data** link to look at the actual data in the table that matches your selection criteria. Click **Close** to close the data window and to return to the wizard. Then click **Next**.
15. Review the import details, and then click **Import**.
16. Select the folder to which you want to import the metadata or table definition and click **OK**.

Results

The metadata is imported and is displayed in the selected folder with a unique table definition icon. This icon uniquely identifies that the table definition is imported into the shared area of the repository. The table definition is also now available to other projects and to other components.

For more information about this topic, see IBM InfoSphere DataStage and QualityStage Designer Client Guide.

Saving metadata in the connector

You can save your metadata to reuse it in another connector. Metadata in this context is the schema that you define on the Columns tab.

Before you begin

You must define your schema on the Columns tab.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.
2. Click the **Columns** tab.
3. Click **Save**.
4. Type new or change existing field values in this window and click **OK**.
5. Complete the save procedure.
   a. Optional: Change the name of the table definition in **Item name**.
   b. Use the tree to navigate to an existing folder or create a new folder in which to save the table definition.
   c. Double-click the folder. The project path is displayed in the **Folder path** field.
   d. Click **Save**.

Results

The table definition, including the metadata, is now available for reuse.

What to do next

For more information about this procedure, see IBM InfoSphere DataStage and QualityStage Designer Client Guide

Design-time data and the connector

With the ODBC connector, you can view the data in your ODBC data source at design time.

When you view data at design time, you can see whether the following things are true:

- Your connection configuration is accurate
- Your SQL statement is accurate and that you can see the columns that you want to see
- The data in your ODBC data source is what you expect and whether it is valid

Viewing data at design time

You can view the data in your ODBC data source.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.
2. Configure the properties in the **Connection** section.
3. Test the connection settings by clicking **Test**.

   If the connection test fails, troubleshoot the connection settings. Until you can access the ODBC data source, you cannot view data.

Option	Description
Connector with an output link	Define your SQL statement in **Select statement**.
Connector with an input link	Define your **Insert statement**, **Update statement**, or **Delete statement**.

4. Click **View data**.

Data manipulation at run time for the connector

You can control how the connector manipulates data at run time with different SQL statements.

When the connector is a source or is in a lookup operation, you can create a SELECT statement to read data from a data source in the **Select statement** property.

When the connector is a target, you can select from a list of different SQL statements and statement combinations in the **Write mode** property:

Insert Use the **Insert statement** property to define the INSERT statement that inserts data into the data source at run time.

Update
Use the **Update statement** property to define the UPDATE statement that updates the data in the data source at run time.

Delete Use the **Delete statement** property to define the DELETE statement that deletes data from the data source at run time.

Insert then update
Use the **Insert statement** property and **Update statement** property to define the INSERT statement and the UPDATE statement. Update statements are run on only the rows or records that did not get inserted into the database.

Update then insert
Use the **Update statement** property and **Insert statement** property to define the UPDATE statement and the INSERT statement. Insert statements are run on only the rows or records that did not get updated in the database.

Delete then insert
Use the **Delete statement** property and **Insert statement** property to define the DELETE statement and the INSERT statement. For each input record, the connector first tries to delete the matching rows in the target table and then runs the insert statement to insert the record as a new row in the target table. The connector runs the insert statement regardless of whether rows were deleted or not.

Large objects (LOB) in the connector

You can define how LOBs are transferred by the connector in these methods: inline and by reference.

Note: Reading data from tables containing LOB columns is only supported where the LOB columns are the last columns listed in the select statement. Similarly, viewing data from tables containing LOB columns is only supported where the LOB columns are the last columns defined in the table.

The following table describes the types of LOBs and the IBM InfoSphere DataStage data type for them:

Table 4. Supported LOBs and InfoSphere DataStage data types for them

LOB	Description	InfoSphere DataStage data type
Binary LOB (BLOB)	Represents a LOB in binary form	LongVarBinary
Character LOB (CLOB)	Represents a LOB that is held in character form. The database defines the character set.	LongVarChar
NLS Character LOB (NCLOB)	Represents a LOB that is held in the national language set (NLS) for the database. Used for multibyte character sets.	LongNVarChar

LOB transfers inline

When you use the inline method, the actual data is transferred between the connector and the database driver.

If you decide to transfer your LOBs in this way, you must set **Enable LOBs by reference** to No and set **Array size** to 1.

LOB transfers by reference

When you use the by reference method, a locator that represents the LOB is transferred between the connector and the database driver, instead of the actual data. The actual data is then read later on in the job by another connector that uses the inline method.

Transferring large objects (LOBs) by reference

You can configure a connector to transfer LOBs by reference. Because a connector is the only stage type that can do this, the stage that transfers the LOB inline later in the job must also be a connector.

Before you begin

You must create a job in which the connector is the source first. You also must have LOBs in the data that you want to transfer.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.

2. On the **Columns** tab, define or import your table definition. At least one of the columns must be a LOB and there must be at least one primary key field.
3. Configure the properties on the **Properties** tab for transferring the LOBs by reference.
   a. Set **Enable LOB references** to Yes.
   b. In the **Columns** property, you can type the column name, or you can use the **Available columns** button to provide a list of LOB columns from which to select. This button is available only when you click inside the property. If you click the button, select the column or columns in the Select Columns window and click **OK**.
4. Click **OK** to save your connector settings.

Schema reconciliation for the connector

The schemas for job runs are design-time schemas that are defined in the job definition and external schemas that are on the external resource.

A schema defines a structure and the type of contents that each data element within the structure can contain.

Based on the schema reconciliation rules in the ODBC connector,the connector can determine how to resolve or how not to resolve differences between these schemas. These rules help to avoid the following results that can occur when there is a mismatch between the fields in the schemas:

- Runtime errors
- Extra conversions

Schema reconciliation rules for the connector

The connector uses rules to reconcile the differences between the design-time schema and the external schema.

You can configure some of these rules in property settings on the **Properties** tab. The connector uses the following rules:

Presence of fields

The connector attempts to match the design-time schema field names with the external resource field names that the connector accesses.

When you use the connector as a source of data, and there are more fields in the design-time schema than in the external schema in parallel jobs, these extra fields are dropped, and informational messages are generated. Conversely, when there are more fields in the external schema than in the design-time schema, these extra fields are added to the schema, and informational messages are generated.

When you use the connector as a target of data and there are more columns in the external schema than in the design-time schema in parallel jobs, these fields are added to the schema, and informational messages are generated. If you have more fields defined in the design-time schema than you have defined in the external schema, you can determine whether these extra fields in the design-time schema are ignored in the **Drop unmatched columns** property. If you set **Drop unmatched columns** to Yes, the extra fields are ignored and informational messages are generated. Otherwise, an unrecoverable error message is generated, and the job is terminated.

When you use the connector as part of a lookup operation, the unmatched columns are always dropped.

Data types and sizes of fields

The data type reconciliation of fields occurs after the field-matching level. The data types of the design-time schema fields and the external schema fields that are matched in the previous level are compared. If the data types in both schemas are the same, no conversion is required and nothing needs to be reconciled.

If the data types are different, reconciliation is attempted. However, some data types cannot be converted. For example, if you have a string data type in your design-time schema in a target context and the field in the external schema is an integer (for example, int8), the conversion is not reliable. The string can have nonnumeric characters. Therefore, this conversion is not allowed. An error message is generated, and the job is terminated. However, if you had the opposite situation where you had an integer in the design-time schema and a string in the external schema, this conversion can be made.

If you set **Fail on type mismatch** to Yes and the schemas cannot be reconciled to maintain data integrity, an unrecoverable error message is generated and the job is terminated. Otherwise, a warning message is generated.

Attributes of fields

Field attribute reconciliation occurs after the fields match and the data types are converted. The attributes of the design-time schema fields and the external schema fields are compared, and the connector attempts to reconcile any attribute differences. Some attributes include minimum and maximum length (size), precision, and character encoding. You want to prevent conversions that include data write operations from a large field to a smaller field or from a less restrictive field into a more restrictive field.

For the field size, you can set **Fail on size mismatch** to Yes. If you set **Fail on size mismatch** to Yes and issues such as large fields getting written to smaller fields or less restrictive fields into more restrictive fields occur during schema reconciliation, an unrecoverable error message is generated and the job is terminated. Otherwise, a warning message is generated.

Configuring schema reconciliation rules for the connector

You can configure some of the rules that the ODBC connector uses to attempt to resolve differences between design schemas and external schemas.

Procedure

1. In the stage editor, click either Input tab or the Output tab, then select either the input link or the output link.
2. Click **Schema reconciliation** to open the group of sub-properties.
3. Specify whether the job fails if you have a size mismatch in one or more of your fields during schema reconciliation in the **Fail on size mismatch** property.
4. Specify whether the job fails if you have type mismatch that cannot be reconciled in one or more of your fields in the **Fail on type mismatch** property.
5. For input links only, use the **Drop unmatched fields** property to determine how to process fields that do not exist in the input database schema.

Parallel execution and partitioned data for the ODBC connector

For parallel jobs, the connector supports parallel reads.

You set **Enable partitioning** to Yes to allow parallel execution. At run time, when you specify that the data is not partitioned, the connector uses an unmodified WHERE clause to return all of the rows of data. When you specify that the data is partitioned, the connector modifies the WHERE clause to return a subset of the total number of rows. The connector performs the WHERE clause modification on each query that is on each processing node. Each node then receives a unique subset of rows. The subsets of rows are determined by the partitioning method that you specify in the **Partitioning method** property.

Partitioning data for parallel reads for the connector

You must configure the ODBC connector to perform parallel reads. A parallel read is when the data is broken up into subsets of data, and then the data is concurrently read by different processing nodes.

Before you begin

You must create a job where the connector is defined as a source first. Before you run a job for parallel reads, you must configure your processing nodes in addition to performing the steps in this procedure.

About this task

You can perform parallel reads for source jobs and normal lookup jobs.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.
2. On the Output tab, select the reference link for normal lookups only or the output link that you want to configure for parallel reads.
3. Set **Enable partitioning** to Yes.
4. In the **Partitioning method** property, select the partitioning method that you want to divide your data into subsets.
5. In the **Column name** property, type the name of the key field column in which the data is partitioned when the job is run.

Results

When this job is run, the WHERE clause in your SELECT statement is modified to return a subset of rows that are read by each processing node.

What to do next

For more information about partition configuration and logical nodes, refer to the Parallel Job Developer's Guide

Specifying transaction isolation levels for the connector

You can specify how transactions or units of work are processed when other concurrently running transactions run. The degree of isolation that you specify for a transaction can also include commitment information.

Before you begin

Before you can specify the isolation level, you must create a job where you define the connector in a source context, a target context, or in a lookup operation.

About this task

Transactions are committed in the target stage when the end of wave marker is detected by the target stage.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.
2. Select the link that you want to configure.
3. Set **Isolation level** to the value that you want.

SQL statements for the connector

You can use SQL statements in the ODBC connector to work with data in your Data Manipulation Language (DML) statements and to work with tables in your data definition language (DDL) statements.

You can use the ODBC connector with the following kinds of SQL statements:

Table 5. Types of SQL statements for the ODBC connector

Type of statement	Processing level	Description
Generic	Job	Specify when an SQL statement is run. This action can be either before or after the job and either once per job or once per processing node per job.
Data Manipulation Language (DML)	Row	Specify SQL statements that manipulate data at the row level, such as ISNSERT and UPDATE.
Data Definition Language (DDL)	Table	You can specify SQL statements that manipulate data at the table level, such as CREATE TABLE and DROP TABLE. You can also specify TRUNCATE TABLE statements.

Data Definition Language statements for tables

The connector uses Data Definition Language (DDL) statements to create new tables and to replace, append, or truncate existing tables.

You work with the **Table action** property and sub-properties to define your DDL statements.

You can create your DDL statement in these ways:

- Type your statement at design-time in the **Create statement**, **Drop Statement**, or **Truncate statement** properties, depending on the action.

- Automatically generate a generic SQL statement at run time with the **Generate** button. The generated DDL is based on the columns that you define on the **Columns** tab. You might have to edit this statement to make it specific to your situation.

Generating Data Definition Language (DDL) statements in the connector at design time:

You can specify the connector to automatically generate sample, generic DDL statements for your CREATE TABLE, DROP TABLE, or TRUNCATE TABLE statements at design time.

Before you begin

The connector generates a generic version of the DDL statement. You need to edit this statement, especially if you have data types that are not supported for DDL generation in your database.

About this task

You must create a job where the connector is defined as a target first.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.
2. In the **Table action** property, select the type of DDL statement that you want to generate.

   Append
   The data for the columns that you specify on the **Columns** tab are added to the destination table.

   Create, Replace, or Truncate
   The group of properties for that table action are enabled.
3. Set the appropriate generate statement at runtime property to `No`:
   - **Generate create statement at runtime**
   - **Generate drop statement at runtime**
   - **Generate truncate statement at runtime**
4. In the **Fail on error** property, specify whether the job fails if the DDL statement cannot be run successfully.
5. Optional: Configure other properties on the **Properties** tab.
6. Click the **Columns** tab.
7. Make sure that you define the column names and their data types correctly.
8. Click the **Properties** tab.
9. Generate a generic DDL statement that you can edit, or type your own statement. To generate a baseline DDL statement, click in the statement property value, whether it is **Create statement**, **Drop statement**, or **Truncate statement**, and click **Generate**. This button is available only when you click inside the property.
10. Edit the statement as needed.
11. Click **OK** to save the job.

Generating Data Definition Language (DDL) statements in the connector at run time:

The connector can automatically generate the DDL statements for your CREATE TABLE, DROP TABLE, or TRUNCATE TABLE statements at run time.

Before you begin

When you generate the DDL statement at run time, the connector queries the database driver to determine the native data type that corresponds to each data field. Because data types vary from database to database, the connector cannot generate the DDL statement for all data types. Binary and LongVarBinary InfoSphere DataStage data types are not supported DDL statement generation at run time. When you specify the following data types on the **Columns** tab, the connector replaces the data type in the first column with the data type in the second column to generate the DDL statement at run time.

Table 6. Data type processing in runtime generated DDL statements

Design-time data type selected on the Columns tab	Data type used by the connector to generate the DDL statement
LongNVarChar	VarChar
LongVarChar	VarChar
NChar	Char
NVarChar	VarChar

If you have any of these data types in your database, you must edit the generated DDL statement.

About this task

You must create a job with the connector as a target first.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.
2. In the **Table name** property, select the type of DDL statement that you want to generate:

   Append
   The data for the columns that you specify on the Columns tab are added to the destination table.

   Create, Replace or Truncate
   The group of properties for that table action are enabled.
3. Set the appropriate generate statement at runtime property to `Yes`:
   - **Generate create statement at runtime**
   - **Generate drop statement at runtime**
   - **Generate truncate statement at runtime**
4. Specify whether you want the job to fail if the DDL statement cannot be run successfully in the **Fail on error** property.
5. Optional: Configure other properties on the **Properties** tab.
6. Click the **Columns** tab.
7. Make sure that the columns do not contain any of the data types listed above. If you do have any of these data types, you must change them. Otherwise, the job fails.

8. Click **OK** to save the job.

Data Manipulation Language statements for data manipulation

The connector uses Data Manipulation Language (DML) statements to manipulate data in data sources.

For the source context (output links), the SELECT statements select data from a data source during a READ operation.

For the target context (input links) the INSERT, UPDATE, DELETE, INSERT then UPDATE, UPDATE then INSERT, and DELETE then INSERT statements work with the specified data in a data source during a WRITE operation. The multiple-action statements, such as INSERT then UPDATE, specify the order in which these statements are run.

These statement properties are all sub-properties of the **SQL** property on the **Properties** tab.

You can create your DML SQL statement in several different ways:

- Type your statement in the property value.
- Open a small statement window to more easily type a multiple-line statement.

  Click in the property value and then press  to open this window.
- Use the SQL builder to graphically build your statement. Press **Build** at the end of the statement value to select the version of SQL builder that you want to use and to open the SQL builder in that version.
- Automatically generate a SQL statement at run time.

When you use either of the first two methods, make sure that you specify an association between each table column and each statement parameter in your SQL statement. If you do not do this, only limited schema reconciliation is performed. The following example is a statement where the association between columns and statement parameters has not been made:

```
INSERT INTO Table VALUES(ORCHESTRATE.A, ORCHESTRATE.B)
```

The table columns in Table were not identified. The following example is a correct statement that includes the associations with columns X and Y:

```
INSERT INTO Table(X,Y) VALUES(ORCHESTRATE.A, ORCHESTRATE.B)
```

Generating SQL statements in the connector at run time:

You can configure the connector to automatically generate the SELECT, INSERT, UPDATE, DELETE, INSERT then UPDATE, UPDATE then INSERT, or DELETE then INSERT statement at run time.

Before you begin

You must create a job first. The connector can be used in a source context or a target context.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.
2. In the navigator, click the output link or the input link, depending on the job that you create.

3. Set **Generate SQL** to Yes.
4. In the **Table name** property, type the name of the table for the SQL statement.
5. For target contexts (input links) only, in the **Write mode** property, select the type of statement that you want to generate.
6. Optional: Configure other properties on the **Properties** tab.
7. Click the **Columns** tab.
8. Define the columns that you want to use in the SQL statement.
9. Click **OK** to save the job.

Generating SQL statements in the connector at design time

You can configure the connector to generate SQL statements at design time in their statement properties.

Before you begin

Create a job that includes a connector as a source or target.

About this task

You can generate the SQL statement text only for those statement properties that have the **Generate SQL statement** option in the Build list.

Note: Under some circumstances, the connector requires a connection to generate SQL statements. When a user name and password are not supplied and a connection is required, a connection is made by using the user who is running the ASB Agent service.

Procedure

1. Double-click the connector on the job canvas to open the stage editor.
2. In the navigator, click the output or input link, depending on the type of job that you create.
3. Set **Generate SQL at runtime** to No.
4. In the **Table name** property, type the name of the table for the SQL statement.
5. For jobs in target context (input links), select the type of statement you want to generate in the **Write mode** property.
6. On the **Columns** page, define the columns to use in the SQL statement.
7. Click the **Properties** tab.
8. Click the **Build** button that is associated with the statement property, and select **Generate SQL statement** from the list.

   Note: The **Generate SQL statement** option will only be available for statements which that connector supports generating at design time. In some cases a connector may only support generating the SQL at runtime during job execution.
9. Click **OK** to save the job.

Validating SQL statements in the connector at design time

After you generate or write a SQL statement, you can validate the statement during job design.

About this task

You can validate the SQL statement text only for those statement properties that have the **Validate SQL** option in the Build list.

Note: Under some circumstances, the connector requires a connection to validate SQL statements. When a user name and password are not supplied and a connection is required, a connection is made by using the user who is running the ASB Agent service.

Procedure

1. Save the job.
2. Click the **Build** button that is associated with the statement property, and select **Validate SQL**. The **Validate SQL** option is enabled only if the statement property contains a value and this option will only be available for statements which the target RDBMS supports validating.

Results

The connector validates the SQL statement by preparing the statement with the RDBMS it supports. If the SQL contains error, an error message is shown.

ODBC connector properties

The ODBC connector properties define how the connector operates in a job. There are different properties that are available depending upon the context in which you use the connector: source context, target context, or request context for lookup operations.

All of the properties that are displayed in either the **Connection** section or the **Usage** section of the **Properties** tab are listed in alphabetical order.

After SQL

Use this property to specify the SQL statement that is run once per job after any parallel processing occurs.

This property is available only if you set **Before/After SQL** to Yes.

You can type more than one statement in this property. Separate each statement with a semicolon (;). For server jobs, if you enable the **Fail on error** property, the job stops if an error occurs. For parallel jobs, the job does not stop if an error occurs.

To specify that this SQL statement is run once on each node or logical processor that can be a computer or a partition on a computer, use the **After SQL (node)** property instead of this property.

Click  to open a statement window in which to type your SQL statement. This button is available only when you click inside the property.

Valid values are determined by the specific database.

After SQL (node)

Use this property to specify the SQL statement that is run once per node or logical processor that can be a computer or a partition on a computer after all data is processed.

This property is available only if you set **Before/After SQL** to Yes.

You can type more than one statement in this property. Separate each statement with a semicolon (;). Use the **Fail on error** property to specify whether the job stops when an error occurs.

To specify this SQL statement to be run once for the entire job after all parallel processing completes, use the **After SQL** property instead of this property.

Click  to open a statement window in which to type your SQL statement. This button is available only when you click inside the property.

Valid values are determined by the specific database.

Array size

Use this property to specify the number of records or rows that are used at one time for all read and write database operations. The setting in this property can affect performance.

In lookup scenarios, the **Array size** value applies to output rows or records only. The input records or rows are processed one record or row at a time. If your data includes large objects (LOBs), you must set **Array size** to 1. Otherwise, a warning is issued and the job fails.

The **Record count** property value must be a multiple of the value of the **Array size** property.

Valid values are from 1 up to a database-specific maximum integer. The default value is 2000.

Autocommit mode

Use this property to specify when the transactions are committed and whether the connector or the database driver commits the transactions.

If you set **Autocommit mode** to On, the following statements are true:

- The driver determines when the transactions are committed. The connector is passive in this setting.
- The driver commits the transactions after every SQL statement is processed.

If you set **Autocommit mode** to Off, the following statements are true:

- The connector commits the transactions.
- The transactions are committed at every multiple of the value specified in **Record count**.

The default value is Off.

Before/After SQL

Use this property to determine whether you can access the sub-properties to define SQL statements that are run before or after data processing occurs.

If you set **Before/After SQL** to Yes, the sub-properties are available for you to use. If you set **Before/After SQL** to No, the sub-properties are not available to you. The default value is No.

Before SQL

Use this property to specify the SQL statement that is parsed and run once per job before any processing occurs.

This property is available only if you set **Before/After SQL** to Yes.

If you set **Table action** to Append, you cannot specify a CREATE TABLE statement in this property because the destination table must already exist.

You can type more than one statement in this property. Separate each statement with a semicolon (;). Use the **Fail on error** property to specify whether the job stops when an error occurs.

To specify that this SQL statement is run once on each node or logical processor, use the **Before SQL (node)** property instead of this property.

Click  to open a statement window in which to type your SQL statement. This button is available only when you click inside the property.

You must include a CREATE INDEX statement as part of this statement if all of the following statements are true:

- You are using an IBM DB2 database on the mainframe.
- Your table contains primary keys or unique columns.

If you do not include the CREATE INDEX statement, a table is created if set **Table action** to Create or Replace. However, if you try to insert data into that table, an error message is generated and the job fails.

Valid values for **Before SQL** are determined by the specific database.

Before SQL (node)

Use this property to specify the SQL statement that is run once per node or logical processor before any data is processed.

This property is available only if you set **Before/After SQL** to Yes.

You can type more than one statement in this property. Separate each statement with a semicolon (;). Use the **Fail on error** property to specify whether the job stops when an error occurs.

To specify that this SQL statement is run once for the entire job before all parallel processing completes, use the **Before SQL** property instead of this property.

Click  to open a statement window in which to type your SQL statement. This button is available only when you click inside the property.

Valid values are determined by the specific database.

Case sensitive

Use this property to specify whether or not text comparisons are case-sensitive.

If the connector uses multiple input links and you choose **Ordered** in the **Record ordering** field, use the **Case sensitive** field to specify whether or not text comparisons in a sort operation are case-sensitive.

Code page

Select the code page that the ODBC connector uses to communicate with the database driver.

The following values are available:

Default
The connector expects the data to be in the code page of the engine operating system where the connector runs. If a different code page is used, the connector converts the data. This value is the default.

Unicode
The data and property values, such as the user credentials in the **Connection** section and the SQL statements, are passed to the database driver in Unicode.

If you have tables with more than one code page, you must select this option. An example of this is an Oracle database table with a VARCHAR2 column and an NVARCHAR column. Each of these columns has its own character set defined for it. To read the data in these columns correctly, you must select `Unicode` as the code page.

User-specified
When you select this option, the **Code page name** property is displayed. You must specify the name of the code page in the **Code page name** property. The name must comply with the Internet Assigned Numbers Authority (IANA) standards, such as UTF-8 or ISO-8859-1. The ODBC connector converts the data to the specified code page.

Code page name

Use this property to specify the name of the code page that is compatible with the data source.

This property is required if you set **Code page** to `User-specified.` The name must comply with the Internet Assigned Numbers Authority (IANA) standards, such as UTF-8 or ISO-8859-1. Valid values are up to 256 characters.

Column delimiter

Use this property to specify the delimiter used between column values in the log.

The **Column delimiter** property is available when you specify **Yes** for the **Log column values on first row error** property. The **Column delimiter** property is not available when **Write mode** property is set to **Bulk load**.

The supported values for the **Column delimiter** property are:

- `Space` - The default column delimiter is space.
- `Newline` - The column delimiter is a new line.
- `Tab` - The column delimiter is tab.
- `Comma` - The column delimiter is comma.

Column name

Use this property to specify the name of the column on which data is partitioned.

The minimum values and maximum values in the **`Column name`** property define a range that is added to the WHERE clause on each player node or logical processor to specify the partitions for that node.

Valid values are up to 256 characters.

Example

In this example, you have an integer column named userID and all of the records in this table have a value of between 0 and 100 for userID. There are four nodes in this example. The range for the first node is a minimum value of 0 and a maximum value of 24; the second node range is 25 and 49, and so on. So the first node receives all of the records with a userID value between 0 and 24.

Columns

Use this property to select the key column or key columns that contain large objects (LOBs) that are passed by using locator or reference information.

If the schema contains LOB columns that you want to pass inline as opposed to by reference, do not specify those columns in this property. If you are not passing LOBs inline, you must also set **`Array size`** to `1`.

Click **Available columns** to select from the list of available LOB columns. You can select more than one column. This button is available only when you click inside the property.

Create statement

Use this property to specify the SQL statement to create a new database table.

This property is available only if you set the following property values:

- **`Write mode`** to `Insert`
- **`Table action`** to `Create` or `Replace`
- **`Generate create statement at runtime`** to `No`

To create a table in a Sybase database, you must set the Data definition language in transaction option in the Sybase database.

When you set **`Table action`** to `Create` and a table already exists with the same name as the one that you want to create, the job step that contains the ODBC connector stops with an error if you set **`Fail on error`** to `Yes`. If you set **`Fail on error`** to `No`, the database error is generated, and a warning message is issued. When you set **`Table action`** to `Replace`, no error is generated. The schema of the Designer client data set determines the schema of the new table. The table is

created with simple default properties. To create a complex create table statement (for example, a table with partitions), you must manually type the SQL statement.

Click **Generate** to automatically generate a generic SQL statement. This button is available only when you click inside the property. The generated statement is not database-specific and you might need to modify it, especially because of unique data types in different databases. You can manually modify the statement, or you can delete the generated statement and type your own statement.

Valid values are determined by the specific database.

Data source

Use this property to specify the data source that is used for all connections.

A data source is a repository of data that can contain a relational database, XML files, table-structured files, or other objects.

Click **Data source** to select from a list of available data sources. This button is available only when you click inside the property.

Valid values are a minimum of one character up to either the maximum for the specific database driver or 256 characters.

Delete statement

Use this property to specify the SQL statement to delete specified rows from an existing database table.

This property is available only if you set the following property values:

- **Write mode** to `Delete` or `Delete then insert`
- **Generate SQL** to `No`

The following is an example of a DELETE statement where table1 is the name of the table. You must precede the ID of every target table name with the word ORCHESTRATE that is followed by a period. ORCHESTRATE can be capitalized or typed in lowercase letters.

```
delete from table1 where ID=ORCHESTRATE.ID
```

Valid values are determined by the specific database.

Drop statement

Use this property to specify the SQL statement to drop an existing database table.

This property is available only if you set the following property values:

- **Write mode** to `Insert`
- **Table action** to `Replace`
- **Generate drop statement at runtime** to `No`

If the table that you want to drop does not exist and you set **Fail on error** to `No`, an error is generated. However, the job continues processing. If you set **Fail on error** to `Yes`, the job stops.

Click **Generate** to automatically generate a generic SQL statement. You can manually modify the generated statement, or you can delete the generated statement and type your own statement.

Valid values are determined by the specific database.

Drop unmatched fields

Use this property to specify whether fields that do not exist in the input database schema are dropped as part of schema reconciliation.

The default value is Yes, which means that the connector ignores any fields in the design-time schema that do not match fields in the database schema. If you set **Drop unmatched fields** to No, the connector attempts to reconcile the schemas according to its schema reconciliation rules. If there are unmatched fields in the design-time schema, the schema is not changed and the connector causes the job to fail.

Enable LOB references

Use the properties in this group to specify whether large object (LOB) columns in the **Columns** property are passed through the connector by using locator information. If the schema contains LOB columns and you set **Enable LOB references** to No, all LOB columns are passed inline. If you set **Enable LOB references** to Yes, only the specified columns are passed by reference. The remaining LOB columns are passed inline.

If you set **Enable LOB references** to Yes, the value that is passed as a locator is read from the database when the target stage runs. But, the rest of the data is read when the source stage runs. You also must set **Array size** to 1 if **Enable LOB references** is Yes.

The following IBM InfoSphere DataStage data types are treated as LOBs:

- LongVarBinary for database binary large object (BLOB) columns
- LongVarChar for database character large object (CLOB) columns
- LongNVarChar for database national character large object (NCLOB) columns

The default value is No.

Enable partitioning

Use this property to specify whether parallel reads are allowed.

This property is available only in the source context.

If you set **Enable partitioning** to Yes, the WHERE clause in the SQL statement is modified during processing to return a subset of the number of rows that would otherwise be returned if an unmodified query is used. This query modification occurs on each node or logical processor so that each node receives a different subset of rows to read. Use the **Partitioning method** property to determine how to partition the rows.

The default value is No that specifies that sequential reads are performed instead of parallel reads.

Enable quoted identifiers

Use this property to specify whether quotation marks are used to enclose all object names in your Data Definition Language (DDL) and Data Manipulation Language (DML) statements.

The default value is `No`. Depending on the database to which you are connecting, if quotation marks are not used, the object names can be converted to uppercase letters. This conversion can cause a problem when the job that contains the statement runs.

The following DDL statement is an example of the generated statement when you set **Enable quoted identifiers** to `Yes`:

```
create table "myTable"("myInt" number(20), "myString" varchar(50))
```

Certain database drivers require additional settings to use quoted identifiers.

For more information about connection values for specific databases and database drivers, see *DataDirect Connect DataDirect Connect XE for ODBC User's Guide and Reference* (`odbcref.pdf`).

End of data

Use this property to specify whether the end of wave marker is inserted for the last remaining set of records. This scenario is invoked when the number of records in that last set is less than the value in the **Record count** property.

This property is available only if you set **End of wave** to a value other than `None`.

Units of work are transactional units. The end of wave marker indicates the end of a unit of work or transaction. The transaction unit is committed in a source stage after the end of wave marker for the transaction unit is successfully passed through the job. If you set this property to `No` and you have fewer records than specified in the **Record count** property, the following actions occur:

1. This last, smaller set of records is read by the connector.
2. The transaction is committed on the source stage.
3. These records are read by the next stage in the job. Also, these records cannot be rolled back to the source stage because the transaction was already committed on that stage.

The default value is `Yes`.

End of wave

Specify how the end of wave markers are handled in all of the transactions.

Units of work are transactional units. The end of wave marker indicates the end of a unit of work or transaction. The transaction unit is committed in a source stage after the end of wave marker for the transaction unit is successfully passed through the job. When the connector is used in a source context (that is, with an output link), the connector defines the unit of work by generating an end of wave marker as defined by the **End of wave** property.

The default value is `None`.

The following values are available:

None No end of wave marker is inserted into the data set.

Before End of wave markers are inserted before the transactions are committed.

After End of wave markers are inserted after the transactions are committed.

Fail on error

Use this property to specify whether the job is terminated when a database error occurs.

The default value is `Yes`.

If you set **`Fail on error`** to `No` and a database error occurs, but the SQL statement completes successfully, the following actions occur:

1. A warning message is generated.
2. The job continues to run.

If you set **`Fail on error`** to `Yes` and a database error occurs, a fatal error is generated, and the job is terminated.

Fail on row error

Use this property to specify if the connector should log a fatal error message and stop the job when an error occurs while writing a record to the database.

If you set this property to `No` and a record could not be written to the database, the connector logs a warning message and continues processing the remaining input records.

If you set this property to `Yes` and a record could not be written to the database, the connector logs an error message and the job stops.

The default value for the property depends on the type of job in which the ODBC connector stage is running:

- For parallel jobs, the default value is `Yes`.
- For server jobs, the default value is `No`.

Note that if a reject link is defined for the stage, this property is not available and automatically defaults to `Yes`.

If the input link to the ODBC connector stage is coming from a Transformer stage that has been configured to reject the rows that the ODBC connector stage could not write to the database, the **`Fail on row error`** property must be set to `No` in order to allow the Transformer stage to route those rows to the reject link.

Fail on size mismatch

Use this property to specify how any data size differences are handled that occur when the schema is validated at run time.

Size limitations are enforced when your design-time metadata is validated against the table definition in the database. This validation does not impact the actual reading or writing of the data. The connector attempts to read and process the data that it accesses as smoothly as possible.

If you set **Fail on size mismatch** to Yes and the connector detects possible incompatibilities when it compares the metadata during schema reconciliation, the job is terminated with an error message. The error message specifies the incompatible schema fields.

If you set **Fail on size mismatch** to No, and the sizes of the fields do not match, a warning message is generated. This message specifies the incompatible field sizes and that data truncation can occur. However, the job continues to run.

With both values, if the field sizes are compatible in both schemas, no message is generated and the job continues to run.

The default value is Yes.

Fail on type mismatch

Use this property to specify how to handle data type differences that occur when the schema is validated at run time.

Data types are compared when your design-time metadata is validated against the table definition in the database. The connector attempts to read and process the data that it accesses without errors as it attempts to reconcile the differences.

If you set **Fail on type mismatch** to Yes and the connector detects possible incompatibilities when it compares the metadata during schema reconciliation, the job is terminated with an error message. This error message specifies the incompatible schema fields.

If you set **Fail on type mismatch** to No, and the data types of the fields cannot be converted, a warning message is generated. This message specifies the incompatible data types and that data corruption can occur. However, the job continues to run.

Some data types can be reconciled; others cannot be reconciled. For example, if you have a string data type that is mapped into an integer data type, this data might be reconciled if the string does not contain any alpha characters. However, if you have a date data type that is mapped into a Boolean data type, reconciliation is attempted. But, the data cannot be reconciled, and the job is terminated.

Generate create statement at runtime

Use the properties in this group to determine whether you manually create or automatically generate a CREATE TABLE statement at run time.

The **Generate create statement at runtime** property is available only if you set the following property values:

- **Write mode** to Insert
- **Table action** to Create or Replace

The default value is No.

Generate drop statement at runtime

Use the properties in this group to determine whether you manually create or automatically generate a DROP TABLE statement at run time.

The **Generate drop statement at runtime** property is available only if you set the following property values:

- **Write mode** to Insert
- **Table action** to Replace

The default value is No.

Generate SQL

Use this property to specify whether the connector generates the SELECT, INSERT, UPDATE, or DELETE statement at run time.

If you set **Generate SQL** to Yes, the SQL statements are automatically generated at run time. You cannot specify them at design-time. The statements are generated by using the table name that you specify in **Table name** and the information that you specify on the **Columns** tab. Schema reconciliation is performed on this data.

If you set **Generate SQL** to No, you must specify your SQL statements at design-time. You must specify a value for **Table name** only if you also want to generate Data Definition Language (DDL) statements and you set **Table action** to Create, Drop, or Truncate.

The default value is No.

In some job configurations, the **Table name** property is disabled and you cannot provide a table name value. If you either generate a data definition language (DDL) SQL statement by clicking Generate, or generate the data manipulation language (DML) SQL statement by selecting **Tools** > **Generate SQL statement**, when the **Table name** property is disabled, then the generated SQL statement uses the placeholder <*TABLENAME*> instead of the table name. You can then replace <*TABLENAME*> with the actual table name

Generate truncate statement at runtime

Use the properties in this group to determine whether you manually create or automatically generate a TRUNCATE TABLE statement at run time.

The **Generate truncate statement at runtime** property is available only if you set the following property values:

- **Write mode** to Insert
- **Table action** to Truncate

The default value is No.

Valid values are determined by the specific database.

Insert statement

Use this property to specify the SQL statement to insert rows into an existing table.

This property is available only if you set **Generate SQL** to No.

The following is an example of an INSERT statement where Name is the column in this statement and table1 is the name of the table. You must precede the column

name of every target column name in the table with the word ORCHESTRATE that is followed by a period. ORCHESTRATE can be capitalized or typed in lowercase letters.

```
insert into table1(Name) values(ORCHESTRATE.Name)
```

This property is available only if you set **Write mode** to `Insert`, `Insert then update`, `Update then insert`, or `Delete then insert`.

Click  to open a statement window in which to type your SQL statement. Click **Build** to open the SQL builder, where you can graphically build your SQL statement. These buttons are available only when you click inside the property.

Valid values are determined by the specific database.

Isolation level

Use this property to specify the degree of isolation of this transaction or unit of work as compared to other concurrently running transactions or units of work.

Transactions or units or work are committed in a target stage when the end of wave marker is detected. The default isolation level value is defined by the database, or it can be specified in the data source. The default value in the connector is `Read uncommitted`.

The following values are available:

Default
The connector uses the value from the database.

Read uncommitted
The row that is read during a unit of work or transaction can be changed by other transactions. Rows that are changed by other transactions can also be read even if the change is not yet committed by that transaction.

Read committed
The row that is read during a unit of work or transaction can be changed by other transactions. However, a row that is changed by another transaction cannot be read until it is committed by that transaction.

Repeatable read
The row that is read during a unit of work is not changed until the unit of work is complete. Also, any row that is changed by another transaction cannot be read until the changed row is committed by that transaction that changed that row.

Serializable
The row that is read or changed cannot be read or changed until the row is committed by the transaction that is reading or changing that row.

Key column

Use this property to specify the name of the column to use as the sort key.

If the connector uses multiple input links and you choose **Ordered** in the **Record ordering** field, use the **Key column** field to specify the field to use as the sort key.

Logging

Use this property to log the values that are in each column when an SQL statement fails to insert, update, or delete a row. Each node that fails to insert, update, or delete rows prints the first row that failed on that node.

The **Logging** property is not available when **Write mode** property is set to **Bulk load**.

The following properties are included in the **Logging** category.

- Log column values on first row error
- Log key values only
- Column delimiter

Log column values on first row error

Use this property to specify whether the connector logs column values for the first row that failed on each node.

The **Log column values on first row error** property is not available when **Write mode** property is set to **Bulk load**.

The supported values for the **Log column values on first row error** property are:

- `No` - The default value is **No**.
- `Yes` - Logs column values for the first row that failed on each node.

Log key values only

Use this property to specify whether the connector logs the values of all columns or only key columns.

The **Log key values only** property is available when you specify **Yes** for the **Log column values on first row error** property. The **Log key values only** property is not available when **Write mode** property is set to **Bulk load**.

The supported values for the **Log key values only** property are:

- `No` - The default value is **No**.
- `Yes` - Logs key column values only.

Log multiple matches

Use this property to specify if you want the connector to log a message when the lookup statement returns multiple matching records for the input key record. The checking is performed for each input record separately.

The **`Log multiple matches`** property is available in the ODBC connector stage when the stage is running in a server job and in the lookup mode of operation. In this mode one or more reference links connect the ODBC connector stage with the Transformer stage. Even if the lookup statement in the connector returns multiple rows, only the first row is provided by the connector on the reference link.

When the ODBC connector stage is running in a parallel job and in lookup, it is connected with a reference link to the Lookup stage, and the Lookup stage provides support for handling multiple lookup matches.

The supported values for the property are:

- `None` - No message is logged for multiple matches and the job continues.
- `Informational` - An information message is logged and the job continues.
- `Warning` - A warning message is logged and the job continues.
- `Fatal` - An error message is logged and the job stops.

Null order

Use this property to specify where to place null values in the sort order.

If the connector uses multiple input links and you choose **Ordered** in the **Record ordering** field, use the **Null order** field to specify where to put null values in relation to non-null values. The choices are **Before** and **After**.

Partitioning method

Use this property to specify how to partition the data for parallel reads.

Each of these methods is an expression that determines how the records are divided into subsets for each processing node. The method that you use depends on how your data is distributed.

Both methods use the following information in their calculations:

- Total number of processing nodes
- Number of the current processing node
- Integer partitioning column value specified in the **`Column name`** property

This property is available only if you set **`Enable partitioning`** to `Yes`.

The following methods are available:

Modulus

The connector adds a modulus expression as a prefix to the WHERE clause of the SQL statement. This expression divides the value of the partitioning column by the total number of nodes or logical processors. When the remainder of this operation matches the number for the current processing node, the current node receives the record. The result is that each node receives a different subset of records.

This is the recommended choice when your data is not evenly distributed, such as: 1,2,3,4,5,6,7,8,9,10,20,40,80.

Min/max range

The connector adds a range expression as a prefix to the WHERE clause of the SQL statement. This expression checks the value of the partitioning column to determine whether it is within the unique range of values for each node or logical processor. The result is that each node receives a different subset of records. This is the default value.

This is the recommended choice when your data is evenly distributed, such as: 1,2,3,4,5,6,7,8,9,10,11,12,13.

Password

Use this property to specify the password for the user name that you specify in the **`Username`** property. These values are used for your data source connection.

This property might not be required, depending on the data source to which you connect.

Valid values are determined by the specific database up to a maximum of 256 characters.

Read After SQL statement from file

Use this property to specify the SQL statement that is run after any parallel processing occurs once per job.

This property has been added as a sub-property of the **After SQL** property. The **Read After SQL statement from file** property can be set to Yes or No. The default is No.

If you set this property to No, the behavior of the **After SQL** property is unaffected. You need to enter the SQL statements that need to be executed in the **After SQL** property.

If you set this property to Yes, you need to enter the absolute path to a file that contains the SQL statements that need to be executed in the **After SQL** property.

Read After SQL (node) statement from file

Use this property to specify the SQL statement that is run after all the data is processed once per node or logical processor, which can be a computer or a partition on a computer.

This property has been added as a sub-property of the **After SQL (node)** property. The **Read After SQL (node) statement from file** property can be set to Yes or No. The default is No. The property is only available when using the ODBC connector stage in a parallel job.

If you set this property to No, the behavior of the **After SQL (node)** property is unaffected. You need to enter the SQL statements that need to be executed in the **After SQL (node)** property.

If you set this property to Yes, you need to enter the absolute path to a file that contains the SQL statements that need to be executed in the **After SQL (node)** property.

Read Before SQL statement from file

Use this property to specify the SQL statement that is parsed and run before any processing occurs once per job.

This property has been added as a sub-property of the **Before SQL** property. The **Read Before SQL statement from file** property can be set to Yes or No. The default is No.

If you set this property to No, the behavior of the **Before SQL** property is unaffected. You need to enter the SQL statements that need to be executed in the **Before SQL** property.

If you set this property to Yes, you need to enter the absolute path to a file that contains the SQL statements that need to be executed in the **Before SQL** property.

Read Before SQL (node) statement from file

Use this property to specify the SQL statement that is run before any data is processed, once per node or logical processor.

This property has been added as a sub-property of the **Before SQL (node)** property. The **Read Before SQL (node) statement from file** property can be set to Yes or No. The default is No. The property is only available when using the ODBC connector stage in a parallel job.

If you set this property to No, the behavior of the **Before SQL (node)** property is unaffected. You need to enter the SQL statements that need to be executed in the **Before SQL (node)** property.

If you set this property to Yes, you need to enter the absolute path to a file that contains the SQL statements that need to be executed in the **Before SQL (node)** property.

Read select statement from file

Use this property to read the data from the file.

This property has been added as a sub-property of the **Select statement** property, which is only available when reading data using the ODBC connector as a source.

The **Read select statement from file** property can be set to Yes or No. The default is No.

If you set this property to No, the behavior of the **Select statement** property is unaffected. You have to enter the required SQL SELECT statement in the **Select statement** property that needs to be executed.

If you set this property to Yes, you have to enter the absolute path of the file in the **Select statement** property that contains the SQL SELECT statement which needs to be executed.

Record count

Use this property to specify the number of records to process before the connector commits the current transaction or unit of work.

You must specify a value that is a multiple of the value that you set for **Array size**. The default value is 2000. If you set **Record count** to 0, all available records are included in the transaction.

Valid values are integers between 0 and 999999999.

Record ordering

Use this property to specify how to process records across multiple links.

Specify how to process records from multiple links. Choose one of the following:

- **All records** - All records from the first link are processed; then all records from the second link are processed; and so on.
- **First record** - One record from each link is processed until all records from all links have been processed.
- **Ordered** - Records are selected from the input links based on the order that you specify by using the **Key column**, **Sort order**, and **Null order** fields.

Row limit

Use this property to specify the maximum number of rows that the ODBC connector will return.

In IBM InfoSphere Data Click, you can limit the number of rows that are offloaded from source to target. In the ODBC connector, this is accomplished with a new **Row limit** property used to specify the number of rows that the connector will return.

The default value is `2000`. If you set the **Row limit** to `0`, all the rows that are produced by the database query are returned.

Valid values are integers in the range 0-999999999.

Schema reconciliation

Use the properties in this group to specify how the schema of the external resource is compared to the design-time schema. The external schema is either from the source in an output link or the target in an input link. The design-time schema is the schema that is represented on the Columns tab.

In this comparison, the schema metadata is compared, not the actual data.

Select statement

Use this property to specify the SQL statement to select rows from an existing table.

This property is available only if you set **`Generate SQL`** to `No`.

Click the browse button to open a statement window in which to type your SQL statement. Click **Tools**, then select **Build New SQL** to open the SQL builder, where you can graphically build, validate or generate your SQL statement. Both of these buttons are available only after you click inside this property value.

Valid values are determined by the specific database.

Subtotal statement usage

To use a subtotal in your SELECT statement, you must add a subtotal column to your schema on the **Columns** tab. For example, say that you want to use the following SELECT statement:

```
Select Title, sum(Age) AS subtotal from YOUR_TABLE GROUP BY Title
HAVING SUM(Age) >60 ORDER BY subtotal
```

You must define Title and subtotal as your column names on the **Columns** tab. When the connector executes this statement, Age is replaced by AS subtotal.

LOB column usage

Some ODBC drivers, such as Microsoft SQL Server drivers, have a limitation when you are working with large object (LOB) columns. With the SQL Server drivers, if a select list contains a LOB column, the LOB column must be listed last in the select list. For these drivers, there are two different scenarios where the query fails:

- The LOB columns are not listed last.

- You specify a wildcard asterisk (*) for the select list and the position of the LOB column in the table is not the last column in that table.

When you use drivers that have this limitation and you have LOBs in your table, you must ensure that the LOB columns are listed last in the select list.

In this example, you have two LOB columns in your Employees table: Description and Comments. If you write the following SELECT statement and run your job, the job fails:

```
select EmployeeID, Description, Comments, Photo from Employees
```

This is because the select list includes the Photo column after the LOB columns. Edit this statement to move the LOBs to the end as specified in the following statement:

```
select EmployeeID, Photo, Description, Comments from Employees
```

The LOB columns are now at the end of the statement. The job will run successfully.

Session

Use the properties in this group to configure various options for the connector.

These options apply to the current session, which is the time that begins when a connection to the database or data source is made and continues until the connection ends. This is the same as the length of time that is required to process a job.

Sort order

Use this property to specify whether to sort values in ascending or descending order.

If the connector uses multiple input links and you choose **Ordered** in the **Record ordering** field, use the **Sort order** field to specify whether to sort values in ascending or descending order.

SQL

Use the properties in this group to define the SQL statement or to define a combination of SQL statements.

Table action

Use this property to specify how to create new tables, to insert rows, or to edit rows in an existing destination table.

For the `Append` and `Truncate` values, the destination table must already exist. The default value is `Append`.

The following values are available:

Append
The schema of the data set must be compatible with the schema of the table.

New rows are appended to the existing destination table. To use this option, you must have INSERT privileges on the existing table.

Create A new destination table is created. To use this option, you must have TABLE CREATE privileges on the existing table. You must provide the name of the destination table in the **Table name** property.

The schema of the data set determines the schema of the new table. The table is created with default properties. You can view this schema on the Columns tab of the stage editor. You can manually modify the generated SQL statement, or you can delete this generated statement and type your own.

If a table already exists with the same name as the table that you want to create, the operation terminates, and an error message is generated if you set **Fail on error** to Yes. No new table is created.

If you set **Fail on error** to No and a table with the same name already exists, the existing table is used. A warning message is generated, and the job continues to run.

Replace
The table that is specified as the destination table is dropped, and a new table is created in its place. To use this option, you must have INSERT and TABLE CREATE privileges on the existing table.

If a table does not already exist, but if you set **Fail on error** for **Drop table** to No, the job continues to run. If a table already exists with the same name as the table that you want to replace, the existing table is overwritten. The schema of the data set determines the schema of the new table.

Truncate
The attributes of the destination table are retained. However, existing records are discarded, and new records are appended. To use this option, you must have INSERT privileges on the existing table.

Table name for Partitioning method

Use this property to specify the table that contains the column that is queried to partition data when the Min/Max range partitioning method is used.

This property is available only if you set **Partitioning method** to Min/Max range.

Table name for Table action

Use this property to specify the name of the table for the SQL statement that the connector generates.

In the source context or lookup scenario, you must type a value for this property if you set **Generate SQL** to Yes. The connector uses this value for the table name in the SELECT statement that is generated at run time.

In the target context, you must type a value in this property under either of the following conditions:

- You set **Generate SQL** to Yes.
- You set **Generate SQL** to No and **Table action** to Create, Replace, or Truncate.

The connector uses this value for the table name in the INSERT, UPDATE, DELETE, CREATE TABLE, DROP TABLE, or TRUNCATE TABLE statement that is generated at run time.

In some job configurations, the **Table name** property is disabled and you cannot provide a table name value. If you either generate a data definition language (DDL) SQL statement by clicking Generate, or generate the data manipulation language (DML) SQL statement by selecting **Tools** > **Generate SQL statement**, when the **Table name** property is disabled, then the generated SQL statement uses the placeholder <*TABLENAME*> instead of the table name. You can then replace <*TABLENAME*> with the actual table name

Transaction

Use the properties in this group to tune parameters for transactional processing, including end of wave markers, for this connector.

These options apply to the current transaction, which is a logical unit of work that is performed on a database management system. A transaction occurs within a session.

Truncate statement

Use this property to specify the SQL statement to truncate an existing database table.

This property is available only if you set the following property values:

- **Write mode** to `Insert`
- **Table action** to `Truncate`
- **Generate truncate statement at runtime** to `No`

Click **Generate** to automatically generate a generic SQL statement. You can manually modify the generated statement, or you can delete the generated statement and type your own statement.

Valid values are determined by the specific database.

Update statement

Use this property to specify the SQL statement to update an existing database table.

This property is available only if you set **Generate SQL** to `No`.

The following is an example of an UPDATE statement where Name is the column in this statement and table1 is the name of the table. You must precede the column name of every target column name in the table with the word ORCHESTRATE that is followed by a period. ORCHESTRATE can be capitalized or typed in lowercase letters.

```
update table1 set Name=ORCHESTRATE.Name where ID=ORCHESTRATE.ID
```

This property is available only if you set **Write mode** to `Update`, `Insert then Update`, or `Update then Insert`.

Valid values are determined by the specific database.

Username

Use this property to specify the user name for connections to the data source.

This property might not be required, depending on the data source to which you connect.

Valid values are determined by the specific database up to a maximum of 256 characters.

For more information about connection values for specific databases and database drivers, see *DataDirect Connect DataDirect Connect XE for ODBC User's Guide and Reference* (`odbcref.pdf`).

Write mode

Use this property to specify the way that records from the data source are inserted into the destination table.

If records cannot be inserted or updated in the destination table and you have reject conditions on the reject link, the records are rejected and passed to the stage that is specified to receive the rejected records. The default value is `Insert`.

The following values are available:

Insert You can create an INSERT statement in the **`Insert statement`** property.

Update
You can create a UPDATE statement in the **`Update statement`** property.

Delete You can create a DELETE statement in the **`Delete statement`** property.

Insert then update
You can create an UPSERT statement by creating the INSERT statement in the **`Insert statement`** property and then by creating the UPDATE statement in the **`Update statement`** property. The INSERT statement is run before the UPDATE statement. The UPDATE statement is run on only those records that fail to be inserted.

Update then insert
You can create an UPSERT statement by creating the UPDATE statement in the **`Update statement`** property and then by creating the INSERT statement in the **`Insert statement`** property. The UPDATE statement is run before the INSERT statement. The INSERT statement is run on only those records that fail to be updated.

Delete then insert
You can create an UPSERT statement by creating the INSERT statement in the **`Insert statement`** property and then by creating the DELETE statement in the **`Delete statement`** property. The DELETE statement is run before the INSERT statement.

Chapter 5. ODBC Enterprise stage

You can use the ODBC Enterprise stage to connect to all the major, external data sources from the parallel canvas of the InfoSphere DataStage: IBM DB2, IBM Informix®, Oracle, Sybase, SQL Server, Netezza, Teradata, MySQL, MS Access, and so on.

When you use IBM InfoSphere DataStage to access external data sources, you can choose from a collection of connectivity options. For most new jobs, use the ODBC Connector stage, which offers better functionality and performance than the ODBC Enterprise stage.

If you have jobs that use the ODBC Enterprise stage and want to use the connector, use the Connector Migration Tool to migrate jobs to use the connector.

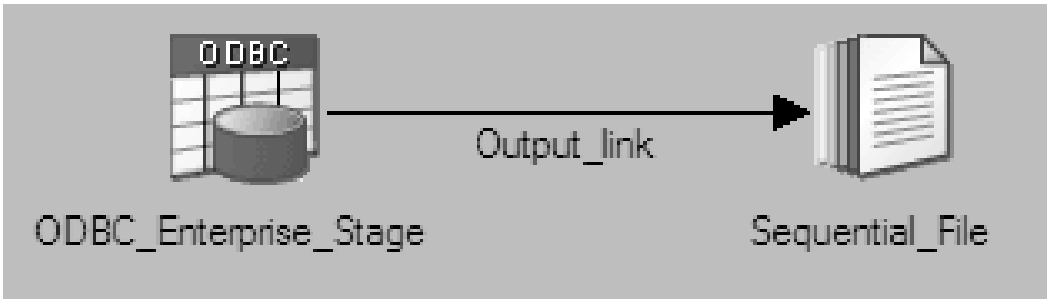
ODBC Enterprise stage operations

You can use an ODBC Enterprise stage to read or lookup data from a data source. You can also use the stage to write or upsert data to a table in an external database.

Read operation

Use the ODBC Enterprise stage to read data from an external data source table and send it to an IBM InfoSphere DataStage output resource such as a data set or sequential file.

The following example shows an InfoSphere DataStage job that includes an ODBC Enterprise stage in read mode:



Write operation

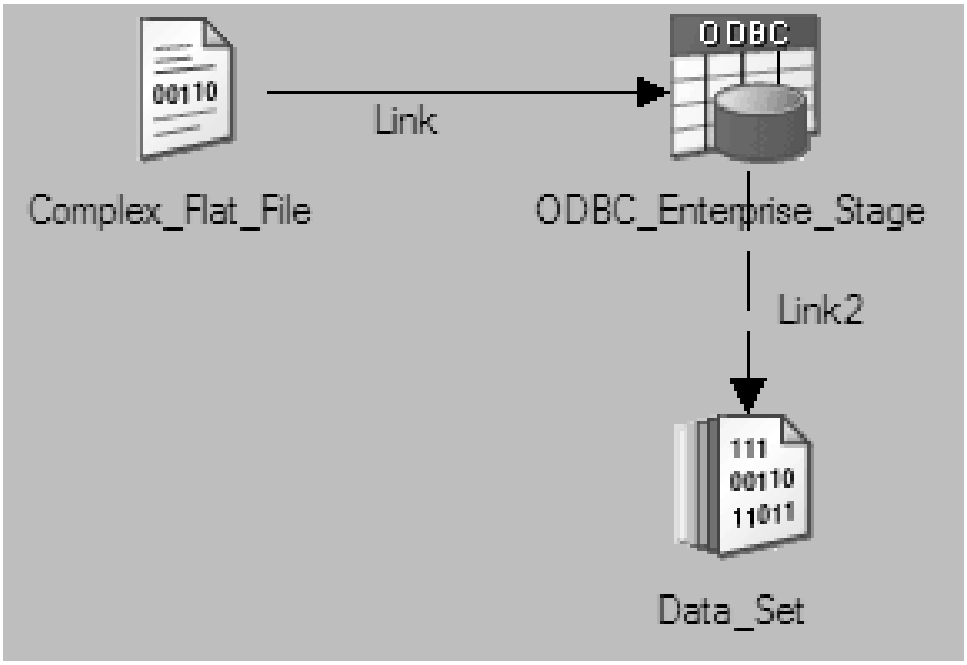
Use the ODBC Enterprise stage in write mode to insert records into a table. The stage takes records from a single input resource such as a data set or sequential file.

The write mode determines how the records of a data set are inserted into the table. The following examples shows an IBM InfoSphere DataStage job that includes an ODBC Enterprise stage in write mode:

Upsert operation

Use the ODBC Enterprise stage in upsert mode to insert, update, or delete records from an external data source table. You can also use the stage to insert and then update records or update and then insert records.

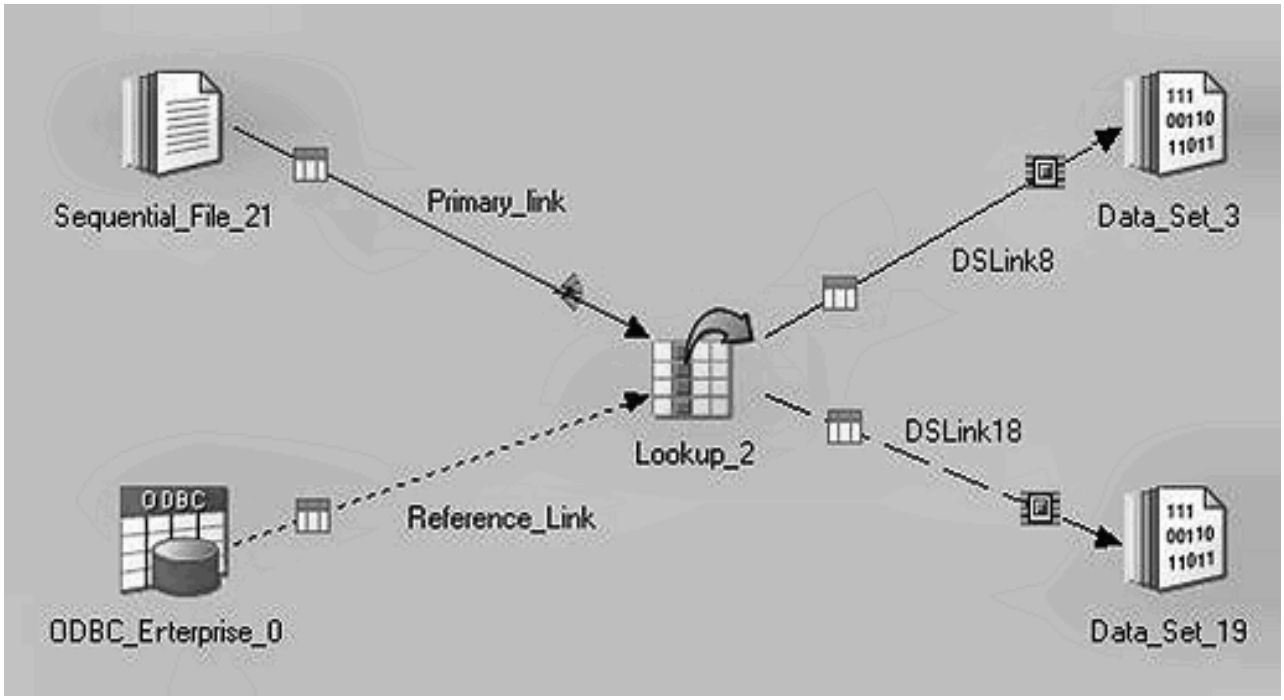
You can match records based on field names. The following example shows an IBM InfoSphere DataStage job that includes an ODBC Enterprise stage in upsert mode:



Lookup operation

Use the ODBC Enterprise stage in lookup mode to join one or more external data source tables with an IBM InfoSphere DataStage input resource such as a data set or a sequential file. The data output is an InfoSphere DataStage data set.

The following example shows an InfoSphere DataStage job that includes an ODBC Enterprise stage in lookup mode.



Working with the ODBC Enterprise stage

To use an ODBC Enterprise stage in an IBM InfoSphere DataStage job, you must specify values for stage properties.

Stage page

You can use the Stage page to specify general information about the ODBC Enterprise stage.

General tab

On the **General** tab, you can optionally specify a description of the ODBC Enterprise stage.

Advanced tab

The Advanced tab properties determine how the ODBC Enterprise stage behaves. Some advanced properties are set automatically, and you cannot change the values of such properties.

The Advanced tab includes the following properties:

- **Execution mode.** This property determines whether your IBM InfoSphere DataStage job runs in parallel or sequential mode. The ODBC enterprise stage automatically sets the execution mode, and does not allow you to change this value. If the stage is operating on only one file and there is one reader, the execution mode is sequential. Otherwise, the execution mode is parallel.
- **Combinability mode**. The default combinability mode is Auto. In Auto mode, the operators underlying the parallel stages are combined so that they run in the same process to improve performance.
- **Preserve partitioning**. You can select Set or Clear. If you select Set, the read operation sends a request to the next stage to preserve partitioning.

- **Node pool and resource constraints**. Select this option to constrain parallel execution to the node pools and resource pools that are specified in the grid. Use the grid to select node pools and resource pools. The selections are populated from the configuration file.
- **Node map constraint**. Select this option to constrain parallel execution to the nodes in a defined node map. You can define a node map by typing node numbers into the text box or by clicking the Browse button to select nodes from the **Available Nodes** window.

NLS Map tab

On the **NLS Map** tab, you can define a character set map for the ODBC Enterprise stage. The character set map that you define overrides the default character set map for the project or the job.

If a job requires the NLS map as a parameter, you can specify on this tab that the map should be supplied as a job parameter.

Input page for write and upsert operations

You can use the Input page to specify how data is transferred from the ODBC Enterprise stage to a remote host by using the ODBC protocol. You can use the General, Properties, Partitioning, Columns and Advanced tabs and the Columns button to set appropriate properties.

The use of General, Partitioning, Columns, and Advanced tabs is similar for write and upsert operations. You must specify different values under the Properties tab and Columns button for write and upsert operations.

Input page for write operation

Use the tabs and buttons on the Input page to set up a write operation.

General tab

On the **General** tab, you can specify an optional description of the input link.

Properties tab

On the **Properties** tab, you can specify properties for the input link. The properties that you specify determine the data source, the operation to be performed on the data, the output resource, and so on. Properties without default settings appear in red and turn black when you supply a value. The following table lists the properties and their attributes. A more detailed description of each property follows.

Table 7. Input page properties and corresponding values for a Write operation.

The following table shows the properties and values on the Properties page for a write operation. Rows that contain a value in only the Category and property column are categories.

Category and property	Value	Default	Required?	Dependent on
Target				
Table	String	N/A	Yes	N/A
Write Method	Write	Write	Yes	N/A

Table 7. Input page properties and corresponding values for a Write operation (continued).

The following table shows the properties and values on the Properties page for a write operation. Rows that contain a value in only the Category and property column are categories.

Category and property	Value	Default	Required?	Dependent on
Write Mode	• Append • Create • Replace • Truncate	Append	Yes	N/A
Data source	Data source	N/A	Yes	N/A
User	User name	N/A	No	N/A
Password	Password	N/A	No	N/A
Insert Array Size	Integer	2000	No	N/A
Truncate Column Name	• False • True	False	No	N/A
Open Command	SQL statement	N/A	No	N/A
Close Command	SQL statement	N/A	No	N/A
Length to Truncate	Integer	N/A	No	N/A
Isolation Level	• Read Uncommitted • Read Committed • Repeatable Read • Serializable	Read Uncommitted	No	N/A
Create Statement	SQL statement	N/A	No	Write method > Write, Write mode > Write method > Upsert
Drop Unmatched Field	• False • True	False	No	N/A

Target

Specify the **Table**, **Write Method** and **Write Mode** values here.

- **Table:** Specify the appropriate value here to connect the ODBC enterprise stage to a target file located in a remote host.
- **Write Method:** Set this property to **Write** to write and export data into a single table.
- **Write Mode:** Specify the appropriate value here to define how the records from the data source are inserted into the destination table. The **Write** mode can have one of the following values. Note that each of the below modes requires specific user privileges.

- **Append -** This is the default mode. The **Append** mode requires that the destination table exists and the record schema of the data set is compatible with the schema of the table. In this mode, the **write** operation appends new rows to the existing destination table. The schema of the existing table determines the input interface of the stage.
- **Create -** In this mode, the **write** operation creates a new destination table. If a table exists with the same name as the one being created, the operation terminates and an error message is displayed. The schema of the InfoSphere DataStage data set determines the schema of the new table. The table is created with simple default properties. To create a table with any properties other than the default properties, such as partitioned, indexed, or in a non-default table space, use the `-createstmt` option with your own `-createtable` statement.
- **Replace -** In this mode, the **write** operation drops the table and creates a new one if the table with the same name exists. If a table with the specified name does not exist, the write operation creates a new table. The schema of the InfoSphere DataStage data set determines the schema of the new table.
- **Truncate -** This mode requires an destination table. In this mode, the **write** operation retains the attributes of the destination table, but discards existing records and appends new records. The schema of the existing table determines the input interface of the ODBC enterprise stage.

Connection

Under this category, you specify values for the **Data source**, **Password** and **User** fields.

- **Data source:** This is a required field. Specify the database connection in this field by using any one of the methods below:
  - **Method 1:** Enter the data source name in the **Data source** field on the right side of the Properties page.
  - **Method 2:** Insert the desired value as a job parameter. Click the pointer button on the extreme right side of the Properties page, and then **Insert Job Parameters**.

    A popup appears with a list of available job parameters from which you can choose. If you wish to create a new parameter for the job, click **[New...]** from the popup list, and create an appropriate environment variable by using the Job Properties dialog that appears.

    Note: Using InfoSphere DataStage Administrator, you can create parameters at the project level for all jobs within the project.
- **Password:** This is an optional field. Specify in this field the password for connecting to the data source by using any one of the methods below:
  - **Method 1:** Enter the data source name in the **Password** field on the right side of the Properties page.
  - **Method 2:** Insert the desired value as a job parameter. Click the pointer button on the extreme right side of the Properties page, and then **Insert Job Parameters**.

    A popup appears with a list of available job parameters from which you can choose. If you wish to create a new parameter for the job, click **[New...]** from the popup list, and create an appropriate environment variable by using the Job Properties dialog that appears.
- **User:** This is an optional field. Specify in this field the user name for connecting to the data source using any one of the methods below:

- **Method 1:** Enter the data source name in the **User** field on the right side of the Properties page.
- **Method 2:** Insert the desired value as a job parameter. Click the pointer button on the extreme right side of the Properties page, and then **Insert Job Parameters**.

  A popup appears with a list of available job parameters from which you can choose. If you wish to create a new parameter for the job, click **[New...]** from the popup list, and create an appropriate environment variable by using the Job Properties dialog that appears.

  Note: If you have inserted all or some of the **Connection** category values from the job parameter list popup, then the job for which you provided these specifications takes the environment variables from the operating system. At runtime, you are prompted to modify the values for those environment variables.

Options

Under this category, you specify values for **Insert Array Size**, **Truncate Column Names**, **Close Command**, **Length to Truncate**, **Drop unmatched field**, **Open Command** and **Isolation level** properties. Under the **Options** category, the **Truncate Column Names** property appears by default. You can add the other properties mentioned above from the **Available properties to add** list.

- **Insert Array Size:** In this field, you specify the size of the insert host array. You can only enter an integer in this field. The default value is 2000.
- **Truncate Column Names:** You can set any of two values below, depending upon your requirement:
  - **True - Set** this value to indicate that column names will be truncated to the size allowed by the ODBC driver.
  - **False -** Set this value to disable truncating of column names.
- **Close Command:** Enter the SQL statement to be executed after an insert array is processed. This statement is executed only once on the conductor node.
- **Length to Truncate:** Specify the appropriate value for this option to indicate the length at which you want column names to be truncated.
- **Drop unmatched field:** You can set one of the values below, depending upon your requirement:
  - **True - Set this** value to indicate that unmatched columns in the data set should be dropped. An unmatched column is a column for which there is no identically named column in the data source table.
  - **False -** This is the default value. **This value** indicates that unmatched fields of the data set will not be dropped.
- **Open Command:** Enter the SQL statement to be executed before the insert array is processed. This statement is executed only once on the conductor node.
- **Isolation level:** Select the isolation level for accessing data from five available options:
  - Read
  - Uncommitted
  - Read Committed
  - Repeatable Read
  - Serializable

The database specified in the data source determines the default isolation level.

Partitioning tab

On the **Partitioning** tab, you can specify details about how the incoming data is partitioned or collected before it is written to the destination database. You can also specify that the data should be sorted before it is written to the destination database.

By default, the ODBC enterprise stage partitions data in Auto mode. Auto mode provides the best partitioning method depending on the execution mode settings of the current and preceding stages and how many nodes are specified in the **configuration** file.

If the stage is operating in sequential mode, it collects data before writing it to the destination database by using the default **Auto** collection method. You can use the **Partitioning** tab to override this default behavior. The options that you set on this tab behave differently according to whether the current and preceding stages are set to run in parallel or sequential mode.

Columns tab

On the **Columns** tab, you can view and modify column metadata for the input link. Use the **Save** button to save any modifications that you make in the column metadata. Use the **Load** button to load an existing source table.

From the Table Definitions window, select the appropriate table to load and click **OK**. The Select Column dialog is displayed. To ensure appropriate conversion of data types, clear the **Ensure all Char columns use Unicode** check box.

Advanced tab

On the **Advanced** tab, you can specify how input data for the ODBC enterprise stage is buffered. By default, data is buffered so that no deadlocks can arise. A deadlock is a situation in which a number of stages are mutually dependent. An example is a situation in which one or more stages are waiting for input from another stage, and those stages cannot output data until they have received input.

Columns button

Use the **Columns** button to define column names for the destination table.

Input page for upsert operation

For an upsert operation, you need to specify appropriate values on the Properties tab.

On the **Properties** tab, you can specify properties for the input link. The properties that you specify determine the data source, the operation to be performed on the data, the output resource, and so on. Properties without default settings appear in red and turn black when you supply a value. The following table lists the properties and their attributes.

Table 8. Input page properties and corresponding values for Upsert.

The following table shows the properties and values on the Properties page for an upsert operation. Rows that contain a value in only the Category and property column are categories.

Property	Values	Default	Required?	Dependent on
Table	String	N/A	Yes	Upsert Method: • Auto-generated SQL • SQL builder generated SQL
Write Method	Upsert	Write	Yes	N/A
Upsert Mode	• Delete only • Delete then Insert • Insert only • Insert then Update • Update only • Update then Insert	Insert then Update	Yes	N/A
Upsert Method	• Auto-generated SQL • SQL builder generated SQL • User-defined SQL	Auto-generated SQL	Yes	N/A
Insert SQL	SQL statement	N/A	No	Upsert Mode: • Delete then Insert • Insert only • Insert then Update • Update then Insert
Delete SQL	SQL statement	N/A	No	Upsert Mode: • Delete only • Delete then Insert
Update SQL	SQL statement	N/A	No	Upsert Mode: • Update only • Insert then Update • Update then Insert
Data source	String	N/A	Yes	N/A
User	String	N/A	No	N/A
Password	String	N/A	No	N/A
Insert Array Size	Integer	2000	No	N/A

Table 8. Input page properties and corresponding values for Upsert (continued).

The following table shows the properties and values on the Properties page for an upsert operation. Rows that contain a value in only the Category and property column are categories.

Property	Values	Default	Required?	Dependent on
Truncate Column Names	• False • True	False	No	N/A
Open Command	SQL statement	N/A	No	N/A
Close Command	SQL statement	N/A	No	N/A

Properties tab

The Properties tab includes properties for write and upsert operations.

Target

Under the Target category, specify values at least for the **Auto-generate Upsert SQL, Upsert mode**, and **Write Method** properties. Based on the values that you select for the **Upsert mode** and **Auto-generate Upsert SQL** properties, you see additional properties. Specify values for these additional properties depending on your requirement.

- **Auto-generate Upsert SQL:** Specify whether the SQL is automatically generated from the set of loaded columns. The default value for this property is **No**. When you set the value to **Yes**, an additional property **Table** appears. Specify the name of the destination table. You can specify this value by using the job parameter popup list.
- **Upsert mode:** Specify how the ***insert*** and ***update*** statements are to be derived. The way in which you set up the **Upsert mode** property depends upon the option you select for the **Auto-generate Upsert SQL** property. The table below describes how the Upsert mode options depending upon the **Auto-generate Upsert SQL** property you have selected. If you select **Yes**, the queries are generated from the built-in templates. If you select No, you can define queries yourself.

Option	If Auto-generated Upsert SQL = Yes	If Auto-generated Upsert SQL = No
Delete only	Select this option to have a *delete* statement generated automatically, based on the table and column details that you provide. When you select **Delete Only** as the **Upsert mode**, an additional property **Delete SQL** appears on the list. You must select an appropriate value for the **Delete SQL** property. To view the automatically generated statement, click **Delete SQL**. The statement appears in a field on the right side of the list of properties.	Select this option to create your own *delete* statement. Click **Delete SQL**, and then enter the statement in the **Delete SQL** field on the right side of the list of properties.

Option	If Auto-generated Upsert SQL = Yes	If Auto-generated Upsert SQL = No
Delete then Insert	Select this option to have *delete and insert* statements generated automatically, based on the table and column details that you provide. When you select **Delete then Insert** as the **Upsert mode**, two additional properties **Delete SQL** and **Insert SQL** appear on the list. You must select appropriate values for these two properties. To view the automatically generated statements, click **Delete SQL** and Insert SQL. The statements appear in their respective fields on the right side of the list of properties.	Select this option to create your own *delete* and *insert* statements. Click **Delete SQL** and then enter the statement in the **Delete SQL** field on the right side of the list of properties. Next, click **Insert SQL** and then enter the statement in the **Insert SQL** field on the right side of the list of properties.
Insert only	Select this option to have an *insert* statement generated automatically, based on the table and column details that you provide. When you select **Insert only** as the **Upsert mode**, an additional property **Insert SQL** appears on the list. You must select an appropriate value for this property. The statement appears in a field on the right side of the list of properties.	Select this option to create your own *insert* statement. Click **Insert SQL**, and then enter the statement in the **Insert SQL** field on the right side of the list of properties.
Insert then Update	Select this option to have *insert and update* statements generated automatically, based on the table and column details that you provide. When you select **Insert then Update** as the **Upsert mode**, two additional properties **Insert SQL** and **Update SQL** appear on the list. You must select appropriate values for these two properties. The statements appear in their respective fields on the right side of the list of properties.	Select this option to create your own *insert* and *update* statements. Click **Insert SQL** and then enter the statement in the **Insert SQL** field on the right side of the list of properties. Next, click **Update SQL** and then enter the statement in the **Update SQL** field on the right side of the list of properties.

Option	If Auto-generated Upsert SQL = Yes	If Auto-generated Upsert SQL = No
Update only	Select this option to have an *update* statement generated automatically, based on the table and column details that you provide. The **Update SQL** property appears on the list by default. You must select an appropriate value for this property. The statement appears in a field on the right side of the list of properties.	Select this option to create your own *update* statement. Click **Insert SQL**, and then enter the statement in the **Insert SQL** field on the right side of the list of properties.
Update then Insert	Select this option to have *update and insert* statements generated automatically, based on the table and column details that you provide. When you select **Update then Insert** as the **Upsert mode**, two additional properties **Update SQL** and **Insert SQL** appear on the list. You must select appropriate values for these two properties. The statements appear in their respective fields on the right side of the list of properties.	Select this option to create your own *update* and *insert* statements. Click **Update SQL** and then enter the statement in the **Update SQL** field on the right side of the list of properties. Next, click **Insert SQL** and then enter the statement in the **Insert SQL** field on the right side of the list of properties.

- **Write Method:** To select the **Upsert** mode, set this value to **Upsert**.

Connection

Under this category, you specify values for **Data source**, **Password** and **User**.

- **Data source:** This is a required field. Specify the database connection in this field by using any one of the methods below:
  - **Method 1:** Enter the data source name in the **Data source** field on the right side of the Properties page.
  - **Method 2:** Insert the desired value as a job parameter. Click the pointer button on the extreme right side of the Properties page, and then **Insert Job Parameters**.

    A popup appears with a list of available job parameters from which you can choose. If you wish to create a new parameter for the job, click **[New...]** from the popup list, and create an appropriate environment variable by using the Job Properties dialog that appears.
- **Password:** This is an optional field. Specify in this field the password for connecting to the data source by using any one of the methods below:
  - **Method 1:** Enter the data source name in the **Password** field on the right side of the Properties page.
  - **Method 2:** Insert the desired value as a job parameter. Click the pointer button on the extreme right side of the Properties page, and then **Insert Job Parameters**.

A popup appears with a list of available job parameters from which you can choose. If you wish to create a new parameter for the job, click **[New...]** from the popup list, and create an appropriate environment variable by using the Job Properties dialog that appears.

- **User:** This is an optional field. Specify in this field the user name for connecting to the data source by using any one of the methods below:
  - **Method 1:** Enter the data source name in the **User** field on the right side of the Properties page.
  - **Method 2:** Insert the desired value as a job parameter. Click the pointer button on the extreme right side of the Properties page, and then **Insert Job Parameters**.

    A popup appears with a list of available job parameters from which you can choose. If you wish to create a new parameter for the job, click **[New...]** from the popup list, and create an appropriate environment variable by using the Job Properties dialog that appears.

    Note: If you have inserted all or some of the **Connection** category values from the job parameter list popup, then the job for which you provided these specifications takes the environment variables from the operating system. At runtime, you are prompted to modify the values for those environment variables.

Options

Under the **Options** category, you specify values for **Open Command**, **Close Command**, **Output Reject Records**, and **Insert Array Size** properties. Under the **Options** category, the **Output Reject Records** property appears by default. You can add the other properties mentioned above from the **Available properties to add** list.

- **Open Command:** Specify in single quotes a command to be parsed and executed by the ODBC database on all processing nodes before the ODBC table is opened. You can specify this value as a job parameter.
- **Close Command:** Specify in single quotes a command to be parsed and executed by the ODBC database on all processing nodes after the ODBC enterprise stage completes processing the ODBC table. You can specify this value as a job parameter.
- **Output Reject Records: S**elect one of the below values:
  - **True:** Select this value to indicate that the rejected records should be sent to the reject link.
  - **False:** This is the default value. Select this value to indicate that rejected records should not be sent to the reject link.
- **Insert Array Size:** Specify the size of the insert host array. This property only accepts an integer. The default value is 2000.

  Note: Using InfoSphere DataStage Administrator, you can also create parameters at the project level for all jobs within the project.

Columns button

Use the **Columns** button to define a list of column names for the destination table. If the ODBC enterprise stage editor for the Input page in **Read** or **Upsert** mode shows both input and output links, then you can choose one of them to function as the reject link.

A reject link contains raw data for columns rejected due to schema mismatch, after the SELECT statement that you specified is executed.

Output page for read and lookup operations

The Output page is shown in the read and lookup modes of the ODBC Enterprise stage. Use the Output page to provide details about the output link to the ODBC Enterprise stage from a remote host.

Using the output link, you can access data from a remote host through ODBC. In read mode, the ODBC Enterprise stage only has an output link. In lookup mode, the stage has an output link as well as a reference link that connects the stage to a lookup stage.

You can use the General, Properties, Partitioning, Columns and Advanced tabs, and the Columns button to set appropriate properties.

The use of General, Partitioning, Columns, and Advanced tabs is similar for read and lookup operations. You must specify different values under the Properties tab and Columns button for write and upsert operations.

Output page for a read operation

Use the tabs and buttons on the Output page to set up a read operation.

General tab

On the **General** tab, optionally enter a description for read operation.

Properties tab

On the Properties tab, specify the properties as follows.

Source

Under this category, you specify values for **Read Method, Query**, and **Table**.

- **Read Method:** Use this property to specify a table or a query for reading the ODBC database. The default value for **Read Method** is **Table**. If you choose **Table** as the **read** method, then you must specify the data source table for the **Table** option (see the **Table** section below for details). Alternatively, you can setup **Read Method** as an SQL query. In that case, you must specify whether you want the query to be generated automatically or you want to define the query yourself.

  Note: The **Query** property appears on the list of properties only when you select **Auto-generated SQL** or **User-defined SQL** as the **read** method. To select one of these two types of query, click **Read Method,** and then select the appropriate option from the **Read Method** list on the right side of the properties list.
- **Query:** Specify an SQL statement for reading a table. The statement should specify the table to read and the processes to perform on the table during the **read** operation. This statement can contain **join** and **view** operations, database links, synonyms, and so on. Choose from the following available values:
  - **Auto-generated SQL:** Select this read method if you wish to have an SQL query generated automatically, based on the table that you specify in the **Table** field and the columns that you define.

– **User-defined SQL:** Select this read method if you wish to define your own SQL query.

Note: An SQL query is read both in parallel and sequential execution modes.

- **Table:** If you have chosen **Table** as the read method (see the **Read Method** section in the above), then you must specify the name of the source ODBC table. Note that the specified table must exist and you must have **SELECT** privileges for this table. If your ODBC user name does not correspond to the owner of the specified table, you can prefix it with a table owner. You must add a new job parameter to fix the table owner name.

  To fix the table owner name:

  1. Click **Table** and then the arrow on the right side of the dialog.
  2. Click **Insert job parameter** and then **[New...]** from the popup list.
  3. In the Job Properties dialog that appears, enter the required table details in **Default Value** column for the **$user** parameter. Use the below format:

     ```
     table_owner.table_name
     ```

     Before you select a value for this option, you must fulfil the below dependencies:
  4. Use the **WHERE** clause in your **SELECT** statement to specify the rows of the table to be included or excluded from the read operation. If you do not supply a **WHERE** clause, all rows are read.
  5. You can specify in your **SELECT** statement the columns that you wish to read. You must specify the columns in this list in the same order as they are defined in the record schema of the input table.

Connection

Under this category, you specify the **Data source**, **Password** and **User** values.

- **Data source:** This is a required field. Specify the database connection in this field by using any one of the methods below:
  – **Method 1:** Enter the data source name in the **Data source** field on the right side of the Properties page.
  – **Method 2:** Insert the desired value as a job parameter. Click the pointer button on the extreme right side of the Properties page, and then **Insert Job Parameters**.

    A popup appears with a list of available job parameters from which you can choose. If you wish to create a new parameter for the job, click **[New...]** from the popup list, and create an appropriate environment variable by using the Job Properties dialog that appears.
- **Password:** This is an optional field. Specify in this field the password for connecting to the data source by using any one of the methods below:
  – **Method 1:** Enter the data source name in the **Password** field on the right side of the Properties page.
  – **Method 2:** Insert the desired value as a job parameter. Click the pointer button on the extreme right side of the Properties page, and then **Insert Job Parameters**.

    A popup appears with a list of available job parameters from which you can choose. If you wish to create a new parameter for the job, click **[New...]** from the popup list, and create an appropriate environment variable by using the Job Properties dialog that appears.
- **User:** This is an optional field. Specify in this field the user name for connecting to the data source by using any one of the methods below:

- **Method 1:** Enter the data source name in the **User** field on the right side of the Properties page.
- **Method 2:** Insert the desired value as a job parameter. Click the pointer button on the extreme right side of the Properties page, and then **Insert Job Parameters**.

  A popup appears with a list of available job parameters from which you can choose. If you wish to create a new parameter for the job, click **[New...]** from the popup list, and create an appropriate environment variable by using the Job Properties dialog that appears.

  Note: If you have inserted all or some of the **Connection** category values from the job parameter list popup, then the job for which you provided these specifications takes the environment variables from the operating system. At runtime, you are prompted to modify the values for those environment variables.

Options

Under this category, you specify values for **FetchArraySize**, **Isolation Level**, **Close Command** and **Open Commands**. All of these properties are optional. You see these properties in the **Available properties to add** list that appears in the bottom right corner of the Output page. To add any of these subproperties under **Options**, click **Options**, and then the property that you wish to add from the **Available properties to add** list.

- **Fetch Array Size:** Specify the number of rows to retrieve during each **fetch** operation. The default value is 1.
- **Isolation Level:** Enter the isolation level for accessing data. Choose from the four available options:
  - Read Committed
  - Read Uncommitted
  - Repeatable Read
  - Serializable

  The database that you specified for the **Data source** option (see the **Data source** section on the above) determines the default isolation level.
- **Close Command:** Enter an SQL statement to be executed after the insert array is processed. You cannot commit work by using this option. The statements are executed only once on the conductor node.
- **Open Command:** Enter an SQL statement to be executed before the insert array is processed. The statements are executed only once on the conductor node.
- **Partition Column:** Specify the partition column name to read data in parallel mode. The prerequisite for a parallel read is that the data must be in increasing order. Reading data in parallel mode enhances the performance of the read operator.

  Note: Using InfoSphere DataStage Administrator, you can create parameters at the project level for all jobs within the project.

Advanced tab

Use the **Advanced** tab to specify how input and output data for the ODBC enterprise stage is buffered. By default, data is buffered so that no deadlocks can arise. A deadlock is a situation in which a number of stages are mutually dependent, and cannot output data until they have received input.

Columns button

Use the **Columns** button to define a list of column names for the output table.

View Data button

To view the number of rows in the table that you specified for the **Table** option under **Source**, click the **View Data** button. You can specify the number of rows that you wish to view at a time.

Output page for a lookup operation

For a lookup operation, you need to specify appropriate values on the Properties tab. You can use the rest of the tabs in the same manner as for the read operation.

Properties tab

Use the **Properties** tab to set appropriate values for **Source**, **Connection**, and **Options** properties. Below is a sample of the dialog that appears when you click the **Properties** tab from the Output page.

Source

Under this category, you specify values for **Lookup Type**, **Query**, **Read Method**, and **Table**.

- **Lookup Type:** You can choose **Normal** or **Sparse** as the lookup method.
  - **Normal:** This is the default lookup method. A normal lookup is an in-memory lookup on an ODBC database table. In case of a normal lookup, the **lookup** stage can have multiple reference links.
  - **Sparse:** A sparse lookup accesses the source database directly. In case of a sparse lookup, the **lookup** stage has one reference link.
- **Query:** Specify an SQL statement for reading a table. The statement should specify the table to read and the processes to perform on the table during the **read** operation. This statement can contain **join** and **view** operations, database links, synonyms, and so on. Choose from the following available values:
  - **Auto-generated SQL:** Select this read method if you wish to have an SQL query generated automatically, based on the table that you specify in the **Table** field and the columns that you define.
  - **User-defined SQL:** Select this read method if you wish to define your own SQL query.

    Note: An SQL query is read in both parallel and sequential execution modes.
- **Table:** If you have chosen **Table** as the read method (see the **Read Method** section above), then you must specify the name of the source ODBC table. Note that the specified table must exist and you must have **SELECT** privileges for this table. If your ODBC user name does not correspond to the owner of the specified table, you can prefix it with a table owner. You must add a new job parameter to fix the table owner name.

  To fix the table owner name:

  1. Click **Table** and then the arrow on the right side of the dialog.
  2. Click **Insert job parameter** and then **[New...]** from the popup list.
  3. In the Job Properties dialog that appears, enter the required table details in **Default Value** column for the **$user** parameter. Use the below format:

     ```
     table_owner.table_name
     ```

Before you select a value for this option, you must fulfill the below dependencies:

4. Use the **WHERE** clause in your **SELECT** statement to specify the rows of the table to be included or excluded from the read operation. If you do not supply a **WHERE** clause, all rows are read.
5. You can specify in your **SELECT** statement the columns that you wish to read. You must specify the columns in this list in the same order as they are defined in the record schema of the input table.

Connection

Under this category, you specify the **Data source**, **Password** and **User** values.

- **Data source:** This is a required field. Specify the database connection in this field by using any one of the methods below:
  - **Method 1:** Enter the data source name in the **Data source** field on the right side of the Properties page.
  - **Method 2:** Insert the desired value as a job parameter. Click the pointer button on the extreme right side of the Properties page, and then **Insert Job Parameters**.

    A popup appears with a list of available job parameters from which you can choose. If you wish to create a new parameter for the job, click **[New...]** from the popup list, and create an appropriate environment variable by using the Job Properties dialog that appears.

    Using the IBM InfoSphere DataStage and QualityStage Administrator client, you can also create parameters at the project level for all jobs within the project.
- **Password:** This is a required field. Specify in this field the password for connecting to the data source by using any one of the methods below:
  - **Method 1:** Enter the data source name in the **Password** field on the right side of the Properties page.
  - **Method 2:** Insert the desired value as a job parameter. Click the pointer button on the extreme right side of the Properties page, and then **Insert Job Parameters**.

    A popup appears with a list of available job parameters from which you can choose. If you wish to create a new parameter for the job, click **[New...]** from the popup list, and create an appropriate environment variable by using the Job Properties dialog that appears.

    Using the IBM InfoSphere DataStage and QualityStage Administrator client, you can also create parameters at the project level for all jobs within the project.
- **User:** his is a required field. Specify in this field the user name for connecting to the data source by using any one of the methods below:
  - **Method 1:** Enter the data source name in the **User** field on the right side of the Properties page.
  - **Method 2:** Insert the desired value as a job parameter. Click the pointer button on the extreme right side of the Properties page, and then **Insert Job Parameters**.

    A popup appears with a list of available job parameters from which you can choose. If you wish to create a new parameter for the job, click **[New...]** from the popup list, and create an appropriate environment variable by using the Job Properties dialog that appears.

Using the IBM InfoSphere DataStage and QualityStage Administrator client, you can also create parameters at the project level for all jobs within the project.

Note: If you have inserted all or some of the **Connection** category values from the job parameter list popup, then the job for which you provided these specifications takes the environment variables from the operating system. At runtime, you are prompted to modify the values for those environment variables.

Options

Under this category, specify the **Fetch Array Size**, **Isolation Level**, **Close Command** and **Open Commands**. All of these properties are optional. You see these properties in the **Available properties to add** list that appears in the bottom right corner of the Output page. To add any of these subproperties under **Options**, click **Options**, and then the property that you wish to add from the **Available properties to add** list. Note that Isolation Level appears on the list only if you select **Lookup Type** as **Normal**.

- **Fetch Array Size: Fetch Array Size:** Specify the number of rows to retrieve during each **fetch** operation. The default value is 1.
- **Isolation Level:** Enter the isolation level for accessing data. Choose from the four available options:
  - Read Committed
  - Read Uncommitted
  - Repeatable Read
  - Serializable

  The database that you specified for the **Data source** option (see the **Data source** section above) determines the default isolation level.
- **Close Command:** Enter an SQL statement to be executed after the insert array is processed. You cannot commit work by using this option. The statements are executed only once on the conductor node.
- **Open Command:** Enter an SQL statement to be executed before the insert array is processed. The statements are executed only once on the conductor node.

Output page with a reject link for an upsert operation

If the stage editor shows both input and output links for a lookup or write operation, you can choose any of the links as the reject link. A reject link contains raw data for columns rejected due to schema mismatch, after a SELECT statement is executed.

An Output page with a reject link or an upsert operation contains the same tabs and buttons as the Output page for a read or lookup operation. You can use these tabs and buttons in the same manner as you did for a read or lookup operation.

Chapter 6. ODBC stage

The ODBC stage is used to represent a database that supports the industry-standard Open Database Connectivity API. The ODBC stage is a passive connectivity stage.

When you use IBM InfoSphere DataStage to access external data sources, you can choose from a collection of connectivity options. For most new jobs, use the ODBC Connector stage, which offers better functionality and performance than the ODBC stage.

If you have jobs that use the ODBC stage and want to use the connector, use the Connector Migration Tool to migrate jobs to use the connector.

Using the ODBC stage

You can use an ODBC stage to extract, write, or aggregate data. Each ODBC stage can have any number of input or output links.

Input links specify the data that you are writing. Output links specify the data that you are extracting and any aggregations that are required.

You can specify the data on an input link by using any of the following methods:

- an SQL statement that is constructed by IBM InfoSphere DataStage
- a user-defined SQL query
- a stored procedure

You can specify the data on an output link by using any of the following methods:

- an SQL statement that is processed by ODBC
- an SQL statement that is passed through ODBC and processed by the underlying database
- a stored procedure

When you edit an ODBC stage, the ODBC stage editor opens. This window can have up to three pages (depending on whether there are inputs to and outputs from the stage):

Stage Displays the name of the stage you are editing. Use the General tab to define the data source name and to type a description of the stage in the **Description** field. You can also specify a quote character and schema delimiter that are used by the data source, or you can retrieve them automatically by clicking the **Get SQLInfo** button. Use the NLS tab to define a character set map to use with the stage, if required.

Inputs This page is displayed only if you have an input link to the stage. Specifies the SQL tables or stored procedure to use, and the associated column definitions for each data input link. This page also specifies how data is written, and contains the SQL statement or call syntax that is used to write the data.

Outputs
This page is displayed only if you have an output link from the stage. Specifies the SQL tables or stored procedure to use, and the associated

column definitions for each data output link. This page also contains the SQL SELECT statement or call syntax that is used to extract the data.

Click **OK** to close the ODBC stage editor. Changes are saved when you save the job design.

Must Do's

To configure an ODBC stage, you must define a connection and specify the data on the input and output links.

Procedure

1. Define the connection.
2. If NLS is enabled, optionally define a character set map on the NLS tab.
3. Define the data on the input links.
4. Define the data on the output links.

Defining the connection

To connect to an ODBC data source, you must install and configure a suitable ODBC driver on your system.

ODBC connection parameters

You set the ODBC connection parameters on the General tab of the Stage page.

Procedure

1. In the **Data source name** field, select the data source name. This list contains all of the data sources that are defined in the **Table Definitions** > **ODBC** folder in the repository.

   If the data source name that you want is not listed, type the name in the **Data source name** field or create a new table definition. You can also specify a job parameter.
2. In the **User name** field, type the name to use to connect to the data source. You can also specify a job parameter.
3. In the **Password** field, type the password to use. You can also specify a job parameter.

   Note: Certain ODBC drivers allow you to specify the user name and password to use on connection. If you are connecting to an ODBC data source by using a driver that has a user name and password already specified, you do not need to specify a user name and password on the General tab.
4. Optional: Specify the quote character that is used by the data source. By default this is set to " (double quotes). You can also click **Get SQLInfo** to connect to the data source and retrieve the quote character it uses. An entry of 000 (three zeroes) specifies that no quote character should be used.
5. Optional: Specify the schema delimiter that is used by the data source. By default this is set to . (period), but you can specify a different schema delimiter, or multiple schema delimiters. For example, where table identifiers have the form:

   ```
   Node:Schema.Owner;TableName
   ```

   you would type **:.;** into this field. You can also click **Get SQLInfo** to connect to the data source and retrieve the schema delimiter it uses.
6. Optional: In the **Description** field, type a description of the ODBC stage.

Defining character set maps

Use the NLS tab on the Stage page to define a character set map for an ODBC stage. To change the default character set map that is defined for the project or the job, select a map name from the list.

The NLS tab also has the following options:

- **Show all maps**. Lists all of the maps that are supplied with IBM InfoSphere DataStage. Maps cannot be used unless they have been loaded by using the Administrator.
- **Loaded maps only**. Displays the maps that are loaded and ready for use.
- **Allow per-column mapping**. Allows character set maps to be specified for individual columns within the table definition. If per-column mapping is selected, an extra property called **NLS Map** appears in the grid on the Columns tab.
- **Use Job Parameter**. Allows you to specify a character set map as a parameter to the job that contains the stage. If the parameter has not yet been defined, you are prompted to define it from the Job Properties window.

Handling SQL Server data types

The ODBC stage can handle the GUID, Timestamp, and SmallDateTime SQL Server data types.

GUID type

If you imported column metadata from a SQL Server data source that contains GUID types, load the required table definition on the Columns tab. If you specify the table definition manually, you must configure the column that you want to contain a GUID data type.

About this task

To manually specify the table definition:

Procedure

1. Set the SQL Type to VarChar.
2. Set the length to 36.
3. Set the data element to SQL.GUID.

Results

Data will be read in as VARCHAR data type, and written to a database as UNIQUEIDENTIFIER data type.

Note: To read new UIDs from a table rather than existing ones, specify `newid()` in the **Derivation** field for that column on the Outputs page Columns tab.

Timestamp type

Timestamp data types cannot be handled automatically by importing the SQL Server metadata. They always need to be set up manually

For the column that you want to contain a Timestamp data type

Procedure

1. Set the SQL Type to Integer.
2. Set the length to 10.
3. Set the data element to SQL.ROWVERNUM.

Results

Data will be read as an integer.

For pseudo-timestamp data

About this task

Pseudo-timestamp data is data where the data is timestamp but the column in the database is defined as binary.

Procedure

1. Set the SQL Type to Integer.
2. Set the length to 10.
3. Set the data element to SQL.BINARY8.

Results

Data will be read as an integer and written to a database as a binary.

SmallDateTime type

If you imported column metadata from an SQL Server data source that contains SmallDateTime types, load the required table definition on the Columns tab. If you specify the table definition manually, you must configure the column that you want to contain a SmallDateTime data type.

About this task

To configure the column:

Procedure

1. Set the SQL Type to Char.
2. Set the length to 16.
3. Set the data element to SQL.SMALLDATETIME.

Results

Data will be read in as a 16-character string of the form *yyyy-mm-dd hh:mm* and written to a database as a SmallDateTime.

Defining ODBC input data

When you write data to a table or stored procedure in an ODBC database, the ODBC stage has an input link. The properties of this link and the column definitions of the data are defined on the Inputs page in the ODBC stage editor.

The Inputs page has the following field and up to six tabs. The tabs that are displayed depend on the update action that you select on the General tab, and whether you want to create a table in the target database:

Input name

This field displays the name of the input link. Choose the link that you want to edit from the list. The list contains all of the input links to the ODBC stage.

General

This tab is displayed by default and contains the following components:

- **Table name**. This field appears when the update action is *not* **Call stored procedure** or **User-defined SQL**. It is the name of the table that the data is written to. Choose the table from the **Table name** list. This list contains all of the tables that are defined in the **Table Definitions** > **ODBC** > *Data source* folder in the repository. *Data source* is the data source name chosen on the General tab on the Stage page.

  If the table that you want is not listed, you need to create a table definition. Alternatively, click **Browse...** to display the Table Definitions window and choose a suitable table definition. You can also specify a job parameter in this field.
- **Stored procedure name**. This field appears only when the update action is **Call stored procedure**. It is the name of the procedure that the data is passed to. Choose the stored procedure that you want to use from the list. This list contains all of the stored procedures that are defined in the **Table Definitions** > **StoredProcedures** folder in the repository for the specified DSN.

  If the stored procedure that you want is not listed, you must define the stored procedure. Alternatively, click **Browse...** to search for the stored procedure.
- **Update action**. Specifies how the data is written. Choose the option you want from the list:
  - **Clear the table, then insert rows**. Deletes the contents of the table and adds the new rows.
  - **Insert rows without clearing**. Inserts the new rows in the table.
  - **Insert new or update existing rows**. New rows are added or, if the insert fails, the existing rows are updated.
  - **Replace existing rows completely**. Deletes the existing rows, then adds the new rows to the table.
  - **Update existing rows only**. Updates the existing data rows. If a row with the supplied key does not exist in the table, then the table is not updated and a warning is logged.
  - **Update existing or insert new rows**. The existing data rows are updated or, if this fails, new rows are added.
  - **Call stored procedure**. Writes the data using a stored procedure. When you select this option, the **Stored procedure name** field appears.
  - **User-defined SQL**. Writes the data by using a user-defined SQL statement. When you select this option, the View SQL tab is replaced by the Enter SQL tab.
- **Create table in target database**. Select this check box if you want to automatically create a table in the target database at run time. A table is created based on the defined column set for this stage. If you select this

option, an additional tab, Edit DDL, appears. This shows the SQL CREATE statement to be used for table generation.

- **Description**. Contains an optional description of the input link.

Columns

This tab is always present and contains the column definitions for the data written to the table or file. If you are using a stored procedure, the column definitions represent the stored procedure input parameters. You must have at least the same number of column definitions as expected parameters. The column definitions are used in the order that they appear in the Columns grid.

View SQL

This tab appears when you select any update action other than **User-defined SQL**. It displays the SQL statement or stored procedure call syntax that is used to write the data. You cannot edit this statement, but you can click **Copy** to copy it to the Clipboard for use elsewhere.

Enter SQL

This tab appears only when you set the update action to **User-defined SQL**, when it replaces the View SQL tab. It displays the user-defined SQL statement.

Edit DDL

This tab appears if you have chosen to automatically generate a table at run time by selecting the **Create table in target database** check box on the General tab. It displays the SQL CREATE statement that will be used to create the table. To generate the statement, click **Create DDL**. InfoSphere DataStage will connect to the target database and generate the statement. (If you are creating a table in a Sybase database, the Sybase database needs to have the "Data definition language in transaction" option set.) You can edit the statement on this tab to make any required changes. This tab also allows you to specify that any existing table by this name should be dropped first. If you do not select this option and such a table already exists in the target database, then the create will fail.

Error Codes

This tab appears when you set the update action on the General tab to **Call stored procedure** (or if you have not yet set an update action). It allows you to specify a space-separated list of values in the **Fatal errors** and **Warnings** fields to handle raiserror calls within the stored procedure. You can also load predefined information from the repository by clicking **Load**.

Transaction Handling

This tab allows you to specify the transaction handling features of the stage as it writes to the ODBC data source. You can choose whether to use transaction grouping or not, and you can specify an isolation level, the number of rows written before each commit, and the number of rows written in each operation. A grid shows details of the transaction group to which the currently selected input link belongs.

Click **View Data...** to open the Data Browser. This enables you to look at the data that is associated with the input link.

Specifying transaction control information

If multiple input links write to a single ODBC data source, you can associate the links together as a transaction group.

If transaction grouping is off, you can specify the following information on the Transaction Handling tab:

- Type a suitable value in the **Rows per transaction** field. This is the number of rows written before the data is committed to the data table. The default value is 0, that is, all of the rows are written before being committed to the data table.
- Type a suitable value in the **Parameter array size** field. This is the number of rows written at a time. The default is 1, that is, each row is written in a separate operation. If the current setting of **Parameter array size** causes available storage space to be exceeded at run time, you will be informed when you compile the job.

  Note: If the **Parameter array size** setting conflicts with the **Rows per transaction** setting, the former takes precedence.
- Select a suitable **Isolation Level**. The isolation level specifies how potential conflicts between transactions (for example, dirty reads, nonrepeatable reads, and phantom reads) are handled.

If transaction grouping is enabled, the following rules govern the grouping of links:

- All of the input links in the transaction group must originate from the same Transformer stage.
- The ordering of the links within the transaction group is determined in the preceding Transformer stage.
- A transaction group cannot use a **Rows per transaction** or **Parameter array size** other than 1. Using an **Isolation level** of **Auto-commit** is permitted, but obviates the effect of organizing links in a transaction group.

You should be aware of the following facts about transaction groups (assuming that you commit on every row):

- A transaction starts at the beginning of each iteration of the Transformer stage that precedes the ODBC stage. Any uncommitted changes that are left over from a previous transaction are rolled back.
- The links in the transaction group are processed in the order laid down in the Transformer stage. Individual links might be skipped if the constraints laid down in the preceding Transformer stage so dictate.
- Each link in the transaction group can specify whether to roll back on failure. A rollback on any link causes the transaction to be abandoned and any subsequent links in the group to be skipped.
- Each link in the transaction group can be set to roll back if a constraint on that link is not met. Again, such a rollback causes the transaction to be abandoned and any subsequent links in the group to be skipped.
- The row counter for each link will be incremented only if the SQL that is associated with the link executes successfully and the transaction is successfully committed.
- The transaction ends after the last link in the transaction group is processed, unless a preceding link performs a rollback, in which case the transaction ends there.

To specify transaction control information for a transaction group:

1. Click the Transaction Handling tab.

2. Select the **Enable transaction grouping** check box. This option is only available if more than one link exists and the links come from the same Transformer stage. The current link must be one of those from the Transformer stage.
3. In the **Isolation Level** field, select an appropriate transaction isolation level. The isolation level specifies how potential conflicts between transactions (for example, dirty reads, nonrepeatable reads, and phantom reads) are handled. (If you select **Auto-commit**, you are specifying that every statement will effectively be executed in a separate transaction, which will obviate the advantages of transaction groups).
4. For transaction groups, **Rows per transaction** is automatically set to 1 and you cannot alter it.
5. For transaction groups, **Parameter array size** is automatically set to 1 and you cannot alter it.
6. Supply necessary details about the transaction group in the grid. The grid has a line for every link in the transaction group. The links are shown in transaction processing order, which is set in the preceding Transformer stage. Each line contains the following information:
   - **Input name**. The name of the input link. You cannot change this.
   - **On Skip**. This specifies whether to continue or roll back if a link is skipped due to a constraint on it not being satisfied. Choose **Continue** or **Rollback** from the list.
   - **On Fail**. This specifies whether to continue or roll back on failure of the SQL statement. Choose **Continue** or **Rollback** from the list.
   - **SQL**. Shows the SQL statement that is associated with the input link. You cannot change this, but clicking the cell will display the entire statement.

Using a generated query

You can write data to an SQL table by using an SQL statement that is constructed by IBM InfoSphere DataStage. When you specify the table and the column definitions to use, the SQL statement is automatically constructed and can be viewed on the View SQL tab.

Procedure

1. Click the General tab on the Inputs page.
2. In the **Table name** field, select a table.
3. In the **Update action** field, specify how you want the data to be written. There are six options for a generated query:
   - **Clear the table, then insert rows**
   - **Insert rows without clearing**
   - **Insert new or update existing rows**
   - **Replace existing rows completely**
   - **Update existing rows only**
   - **Update existing or insert new rows**

     For a description of each update action, see the "Update action" section of the General tab.
4. Optional: In the **Description** field, type a description of the input link.
5. Click the Columns tab.
6. Edit the Columns grid to specify column definitions for the columns that you want to write.

The SQL statement is automatically constructed by using your chosen update action and the columns that you have specified.

7. Click the View SQL tab to view the SQL statement.
8. Click **OK** to close the ODBC stage editor. Changes are saved when you save your job design.

Using a user-defined SQL statement

Instead of writing data to a table by using a SQL statement that is constructed byIBM InfoSphere DataStage, you can specify your own SQL statement for each ODBC input link.

Procedure

1. Click the General tab on the Inputs page.
2. In the **Update action** field, select **User-defined SQL**. The View SQL tab is replaced with the Enter SQL tab.
3. Click the Columns tab.
4. Edit the Columns grid to specify column definitions for the columns that you want to write.
5. Click the Enter SQL tab.
6. Type the SQL statement that you want to use. This statement must contain the table name, the type of update action that you want to perform, and the columns that you want to write.

   Note: You must also ensure that the statement contains the correct number of ? parameter markers. You must have a parameter marker for each column that you have defined on the Columns tab.
7. Click **OK** to close the ODBC stage editor. Changes are saved when you save your job design.

Using a stored procedure

Instead of writing data to a table by using an SQL statement, you can write data to a stored procedure. The columns that you define are bound (in order) to the input parameters in the stored procedure.

About this task

The call syntax that is used to write the data is constructed by IBM InfoSphere DataStage and can be viewed on the View SQL tab. The procedure is called once for each row of data that is presented to the input link.

Procedure

1. Click the General tab on the Inputs page.
2. In the **Update action** field, select **Call stored procedure**. The **Table name** field is replaced by the **Stored procedure name** field.
3. In the **Stored procedure name** field, select the stored procedure.
4. Optional: In the **Description** field, type a description of the input link.
5. Click the Columns tab.
6. Edit the Columns grid to specify the column definitions. The column definitions are used as the input parameters to the stored procedure. You must have at least the same number of column definitions as the number of expected input parameters.

The call statement is automatically constructed by using the stored procedure name and the columns that you have specified.

7. Click the View SQL tab to view the SQL statement.
8. Click **OK** to close the ODBC stage editor. Changes are saved when you save your job design.

Defining ODBC output data

When you extract data from an ODBC data source, the ODBC stage has an output link. The properties of this link and the column definitions of the data are defined on the Outputs page in the ODBC stage editor.

The Outputs page has the following field and up to six tabs. The tabs that are displayed depend on how you choose to specify the SQL statement to output the data:

Output name
This field displays the name of the output link. Choose the link that you want to edit from the list. The list contains all of the output links from the ODBC stage.

General
This tab is displayed by default and contains the following components:

- **Table names**. This field appears only when you select **Generated query** or **User-defined SQL query**. It contains the names of the tables or files that are being accessed. You can also use a job parameter to specify the table name.
- **Available tables**. This list appears only when you select **Generated query** or **User-defined SQL query**. It displays the names of the available tables or files that have definitions in the repository.
- **Add**. This button appears only when you select **Generated query** or **User-defined SQL query**. It adds a table from the **Available tables** list to the **Table names** field.
- **Stored procedure name**. This list is available only when you select **Stored procedure**. It displays the name of the stored procedure that you want to use. This list displays all of the stored procedure definitions in the **Table Definitions** > **StoredProcedures** > *DSN* folder in the repository.
- **Apply**. This button appears only when you select **Stored procedure**. It updates the Columns and Parameters tabs with the settings for the chosen stored procedure.
- **Generated query**. Specifies that the data is extracted by using an SQL statement that is constructed by InfoSphere DataStage. This is the default setting. When this option is selected, the Selection and View SQL tabs appear.
- **Stored procedure**. Specifies that the data is extracted by using a stored procedure. When this option is selected, the View SQL, Parameters, and Error Codes tabs appear.
- **User-defined SQL query**. Specifies that the data is extracted by using a user-defined SQL query. When this option is selected, the SQL Query tab appears.
- **Description**. Contains an optional description of the output link.
- **Browse...** . Opens the Table Definitions window, allowing you to choose a suitable table or stored procedure definition.

Columns
This tab contains the column definitions for the data that is being output on the chosen link. It also specifies which columns are aggregated.

Selection
This tab appears when you select **Generated query**. It contains optional SQL SELECT clauses for the conditional extraction of data.

Parameters
This tab appears when you select **Stored procedure**. It contains the input parameters for a chosen stored procedure.

View SQL
This tab appears when you select **Generated query** or **Stored procedure**. It displays the SQL statement that is used to extract the data from the chosen table or tables. The SQL statement exists in two forms, depending on the type of input link that is required by the previous stage in the job:

- **SQL for reference inputs**. Displays the SQL statement that is used when this link is a reference input to a Transformer stage.
- **SQL for primary inputs**. Displays the SQL statement that is used in all other cases.

  You cannot edit the SQL statement, but you can click **Copy** to copy it to the Clipboard for use elsewhere.

Error Codes
This tab appears when you select **Stored procedure**. It allows you to specify a space-separated list of values in the **Fatal errors** and **Warnings** fields to handle raiserror calls within the stored procedure. You can also load predefined information from the repository by clicking **Load**.

SQL Query
This tab appears when you select **User-defined SQL query**. It contains a user-defined SQL query. This tab is divided into two areas:

- **SQL for primary inputs**. Contains a user-defined SQL query for a link that is a primary input to a Transformer stage, or an input to any other type of stage.
- **SQL for reference inputs**. Contains a user-defined SQL query for a link that is a reference input to a Transformer stage.

Transaction Handling
This tab allows you to specify a transaction isolation level for read data. The isolation level specifies how potential conflicts between transactions (for example, dirty reads, nonrepeatable reads, and phantom reads) are handled.

Click **View Data...** to open the Data Browser. This enables you to look at the data that is associated with the output link.

Key fields

The column definitions for output links contain a key field. Key fields are used to join primary and reference inputs to a Transformer stage.

For details about how to specify and use key fields, see the *IBM InfoSphere DataStage Server Job Developer's Guide*.

Using a generated query

When you use a generated query, data is extracted from an ODBC data source by using an SQL SELECT statement that is constructed by IBM InfoSphere DataStage.

SQL SELECT statements have the following syntax:

```
SELECT clause FROM clause
    [WHERE clause]
    [GROUP BY clause]
    [HAVING clause]
    [ORDER BY clause];
```

After you specify the tables to use and the columns to be output from the ODBC stage, the SQL SELECT statement is automatically constructed and can be viewed by clicking the View SQL tab on the Outputs page.

For example, if you extract the columns **Name**, **Address**, and **Phone** from a table called Table1, the SQL statement that is displayed on the View SQL tab is:

```
SELECT Name, Address, Phone FROM Table1;
```

The SELECT and FROM clauses are the minimum clauses that are required. These clauses are automatically generated by InfoSphere DataStage. However, you can use any of these SQL SELECT clauses:

SELECT clause
Specifies the columns to select from the database.

FROM clause
Specifies the tables that contain the selected columns.

WHERE clause
Specifies the criteria that rows must meet to be selected.

GROUP BY clause
Groups rows to summarize results.

HAVING clause
Specifies the criteria that grouped rows must meet to be selected.

ORDER BY clause
Sorts selected rows.

If you want to use the additional SQL SELECT clauses, you must specify them on the Selection tab on the Outputs page. The Selection tab is divided into two parts:

- **WHERE clause**. This text box allows you to insert an SQL WHERE clause to specify criteria that the data must meet before being selected.
- **Other clauses**. This text box allows you to insert a HAVING clause or an ORDER BY clause.

Using a WHERE clause

In the ODBC stage, you can use a WHERE clause to select only the data that meets certain criteria or join two tables from the same data source.

To use a WHERE clause, type the column and the condition into the **WHERE clause** text entry box on the Selection tab on the Outputs page.

For example, if you have a table (Sales1) containing sales data, you can choose to only output data where the value in the **Price** column is greater than $10.00. In this case, type:

```
Price>10
```

Alternatively, if you are extracting data from two tables in the data source, you can use a WHERE clause to relate a column in one table to a column in the other table.

For example, Table1 contains the columns **Pcode**, **OrderNo**, and **SaleDate** and Table2 contains **Pcode**, **CustNo**, **Quantity**, and **Cost**. You can use the WHERE clause to join the two tables together by the related column. In this case, the column is **Pcode** and you type:

```
Table1.Pcode = Table2.Pcode
```

Note: Only one column definition called **Pcode** is loaded or inserted into the grid on the Columns tab.

You can also use a job parameter in the WHERE clause.

The SQL SELECT statement is automatically updated to include the WHERE clause. Click the View SQL tab to display the statement.

Using a HAVING clause

If you use an ODBC stage to aggregate data, you can use a HAVING clause to specify conditions that the grouped data must meet before it is selected.

To use a HAVING clause, type the clause, column, and condition into the **Other clauses** text entry box on the Selection tab on the Outputs page.

For example, you could choose to only output summed quantities that are greater than or equal to 1000. In this case, type:

```
HAVING SUM(QtySold)>=1000
```

You can also use a job parameter in the HAVING clause.

The SQL SELECT statement is updated automatically. Click the View SQL tab to display the statement.

Using an ORDER BY clause

In the ODBC stage, you can sort data based on a column by including an ORDER BY clause in the SQL SELECT statement. Records are sorted by data in the chosen column they are sent to the output link.

You can specify a column name or a column position and whether to sort in ascending or descending order.

To use an ORDER BY clause, type the clause, column, and condition into the **Other clauses** text entry box on the Selection tab on the Outputs page.

For example, if your table contains a **Name** column, you might want to sort the column alphabetically (A to Z). In this case, type:

```
ORDER BY Name ASC
```

The SQL SELECT statement is updated automatically. Click the View SQL tab to display the statement.

Aggregating data

If you use a generated query, you can use the ODBC stage to aggregate data at the source instead of using an intermediate Aggregator stage. By aggregating data, you can add values in a column for all of the records in a table and then send the sum to the output link.

You can aggregate data in two ways:

- Using an Aggregator stage
- Using an ODBC stage

If you aggregate data by using an ODBC stage, the columns to group by and sum together are also specified by the SQL SELECT statement. To specify the columns to group by and summarize, you must edit the column definitions in the Columns grid on the Columns tab.

For example, if you have a sales database (Sales1) it might contain the following columns: **Product**, **SaleDate**, and **QtySold**. If this database is updated daily, you have a record of how many of each product are sold each day. However, if you want to know how many of each product were sold since 01/01/96 you need to specify a WHERE clause for the **SaleDate** and group (and summarize) the data.

Because you want the total for each product, you need to group all of the occurrences of the same value in the **Product** column and sum the value in the **QtySold** column.

To group by a column, click the **Group** cell for the column definition that you want to group by and choose **Yes** from the list. In the example, you would choose the **Product** column to edit.

To summarize a column, edit the **Derivation** cell for the column that you want to aggregate (by using SUM or COUNT). By default the **Derivation** cell contains the name of the table and column in the format *tablename.columnname*. You can edit this cell to add SUM or COUNT. In the example, you would edit the **Derivation** cell for the **QtySold** column. The resulting expression would be SUM(Sales1.QtySold).

You can use the Expression Substitution window to edit multiple **Derivation** cells at the same time. Select the columns and choose **Derivation Substitution...** from the pop-up menu.

When you group by or summarize columns, the SQL statement is automatically updated to include the GROUP BY clause and the aggregation expression. To view the SQL statement, click the View SQL tab on the Outputs page.

The SQL statement for this example would be:

```
SELECT Product, SUM(QtySold) FROM Sales1
   WHERE Saledate>=01/01/96
   GROUP BY Product;
```

Using a user-defined SQL statement

Instead of using the SQL statement that is constructed by IBM InfoSphere DataStage, you can specify your own SQL statement for each ODBC output link.

Procedure

1. Click the General tab on the Outputs page.
2. Click **User-defined SQL query**. The SQL Query tab appears.
3. Click the SQL Query tab. When you first view this tab, the **SQL for primary inputs** and **SQL for reference inputs** fields might contain the SQL statements that are constructed by the InfoSphere DataStage. These statements are displayed if you selected **Generated query** or **Stored procedure** before you selected **User-defined SQL query**. You can modify or overwrite each statement to construct your own SQL query or call to a stored procedure.

   The way you edit these fields depends on whether the output is a primary input to a stage or a reference input to a Transformer stage:

   - If the output is a primary input to any stage, whether or not it is a Transformer stage, edit the **SQL for primary inputs** field. The SQL query must contain the same number of columns (and column names) as the SQL statement that is constructed by the InfoSphere DataStage.

     You must ensure that the table definitions for the output link are correct and represent the columns that are expected. The result set that is generated from this statement returns at least one row. If more than one result set is produced, only the first set is used.
   - If the output is a reference input to a Transformer stage, edit the **SQL for reference inputs** field. The SQL query must contain the same number of columns as the SQL statement that is constructed by the InfoSphere DataStage. You must ensure that the table definitions for the output link are correct and represent the columns that are expected. The statement must have the same number of parameter values (?) as key columns on the link. The result set that is generated by this statement or procedure contains at most one row.
4. Click **OK** to close the ODBC stage editor. Changes are saved when you save your job design.

Using a stored procedure

Instead of a user-defined SQL statement or a SQL statement that is constructed by IBM InfoSphere DataStage, you can use a stored procedure to define the data to extract for each ODBC output link.

About this task

You cannot use the output from a stored procedure as a reference input to a Transformer stage. If the ODBC output is an input to another stage in the job design, you must specify values for the stored procedure's parameters.

Procedure

1. Click the General tab on the Outputs page.
2. Click **Stored procedure**. The Parameters, View SQL, and Error Codes tabs appear.
3. In the **Stored procedure name** list, select the stored procedure that you want to use. This list contains the names of the stored procedures that are defined in the **Table Definitions** > **StoredProcedures** > *DSN* folder in the repository.

   If you can't see the name of the stored procedure that you want to use, you must define it in the repository. Alternatively, click **Browse...** to search the system for the stored procedure.

4. Click **Apply**. The Columns and Parameters tabs are updated with the column and parameter definitions for the chosen stored procedure.
5. Click the Parameters tab.
6. In the **Value** cell for each parameter, type suitable values. You can type constants or use job parameters.

   The call syntax that is used to extract the data is automatically updated with the parameter values. You can view this syntax on the View SQL tab.
7. Click **OK** to close the ODBC stage editor. Changes are saved when you save your job design.

Results

When the job runs, the stored procedure is called once with the given parameter values. The result set that is generated should contain at least one row.

Chapter 7. Building SQL statements

Use the graphical interface of SQL builder to construct SQL statements that run against databases.

You can construct the following types of SQL statements.

Table 9. SQL statement types

SQL statement	Description
SELECT	Selects rows of data from a database table. The query can perform joins between multiple tables and aggregations of values in columns.
INSERT	Inserts rows in a database table.
UPDATE	Updates existing rows in a database table.
DELETE	Deletes rows from a database table.

You can use the SQL builder from various connectivity stages that IBM InfoSphere DataStage supports.

Different databases have slightly different SQL syntax (particularly when it comes to more complex operations such as joins). The exact form of the SQL statements that the SQL builder produces depends on which stage you invoke it from.

You do not have to be an SQL expert to use the SQL builder, but it helps to have some familiarity with the basic structure of SQL statements in this documentation.

Avoid using column names that are SQL reserved words as their use might result in unexpected results when the SQL is built or run.

Starting SQL builder from a stage editor

If a stage supports the SQL builder, you can open the SQL builder by clicking **Build SQL** in the stage editor. For some stages, you can use the SQL builder only for some access methods.

The SQL builder is available to help you build select statements where you are using a stage to read a database (that is, a stage with an output link).

The SQL builder is available to help you build insert, update, and delete statements where you are using the stage to write to database (that is, a stage with an input link).

Starting SQL builder

Use the graphical interface of SQL builder to construct SQL queries that run against federated databases.

Procedure

1. In the Reference Provider pane, click **Browse**. The Browse Providers dialog box opens.
2. In the **Select a Reference Provider** type list, select **Federation Server**. In the Select a Federated Datasource tree, the list of database aliases opens.
3. Click a database alias. The list of schemas opens as nodes beneath each database alias.
4. In the **SQL Type** list, select the type of SQL query that you want to construct.
5. Click the **SQL builder** button. The SQL Builder - DB2 / UDB 8.2 window opens. In the Select Tables pane, the database alias appears as a node.

Building SELECT statements

Build SELECT statements to query database tables and views.

Procedure

1. Click the **Selection** tab.
2. Drag any tables you want to include in your query from the repository tree to the canvas. You can drag multiple tables onto the canvas to enable you to specify complex queries such as joins. You must have previously placed the table definitions in the IBM InfoSphere DataStage repository. The easiest way to do this is to import the definitions directly from your relational database.
3. Specify the columns that you want to select from the table or tables on the column selection grid.
4. If you want to refine the selection you are performing, choose a predicate from the **Predicate** list in the filter panel. Then use the expression editor to specify the actual filter (the fields displayed depend on the predicate you choose). For example, use the Comparison predicate to specify that a column should match a particular value, or the Between predicate to specify that a column falls within a particular range. The filter appears as a WHERE clause in the finished query.
5. Click the **Add** button in the filter panel. The filter that you specify appears in the filter expression panel and is added to the SQL statement that you are building.
6. If you are joining multiple tables, and the automatic joins inserted by the SQL builder are not what is required, manually alter the joins.
7. If you want to group your results according to the values in certain columns, select the Group page. Select the Grouping check box in the column grouping and aggregation grid for the column or columns that you want to group the results by.
8. If you want to aggregate the values in the columns, you should also select the Group page. Select the aggregation that you want to perform on a column from the **Aggregation** drop-down list in the column grouping and aggregation grid.
9. Click on the **Sql** tab to view the finished query, and to resolve the columns generated by the SQL statement with the columns loaded on the stage (if necessary).

Building INSERT statements

Build INSERT statements to insert rows in a database table.

Procedure

1. Click the **Insert** tab.
2. Drag the table you want to insert rows into from the repository tree to the canvas. You must have previously placed the table definitions in the IBM InfoSphere DataStage repository. The easiest way to do this is to import the definitions directly from your relational database.
3. Specify the columns that you want to insert on the column selection grid. You can drag selected columns from the table, double-click a column, or drag all columns.
4. For each column in the column selection grid, specify how values are derived. You can type a value or select a derivation method from the drop-down list.
   - **Job Parameters**. The Parameter dialog box appears. Select from the job parameters that are defined for this job.
   - **Lookup Columns**. The Lookup Columns dialog box appears. Select a column from the input columns to the stage that you are using the SQL builder in.
   - **Expression Editor**. The Expression Editor opens. Build an expression that derives the value.
5. Click on the **Sql** tab to view the finished query.

Building UPDATE statements

Build UPDATE statements to update existing rows in a database table.

Procedure

1. Click the **Update** tab.
2. Drag the table whose rows you want to update from the repository tree to the canvas. You must have previously placed the table definitions in the IBM InfoSphere DataStage repository. The easiest way to do this is to import the definitions directly from your relational database.
3. Specify the columns that you want to update on the column selection grid. You can drag selected columns from the table, double-click a column, or drag all columns.
4. For each column in the column selection grid, specify how values are derived. You can type a value or select a derivation method from the drop-down list. Enclose strings in single quotation marks.
   - **Job Parameters**. The Parameter dialog box appears. Select from the job parameters that are defined for this job.
   - **Lookup Columns**. The Lookup Columns dialog box appears. Select a column from the input columns to the stage that you are using the SQL builder in.
   - **Expression Editor**. The Expression Editor opens. Build an expression that derives the value.
5. If you want to refine the update you are performing, choose a predicate from the **Predicate** list in the filter panel. Then use the expression editor to specify the actual filter (the fields displayed depend on the predicate you choose). For example, use the Comparison predicate to specify that a column should match a particular value, or the Between predicate to specify that a column falls within a particular range. The filter appears as a WHERE clause in the finished statement.
6. Click the **Add** button in the filter panel. The filter that you specify appears in the filter expression panel and is added to the update statement that you are building.

7. Click on the **Sql** tab to view the finished query.

Building DELETE statements

Build DELETE statements to delete rows from a database table.

Procedure

1. Click the **Delete** tab.
2. Drag the table from which you want to delete rows from the repository tree to the canvas. You must have previously placed the table definitions in the IBM InfoSphere DataStage repository. The easiest way to do this is to import the definitions directly from your relational database.
3. You must choose an expression which defines the rows to be deleted. Choose a predicate from the **Predicate** list in the filter panel. Then use the expression editor to specify the actual filter (the fields displayed depend on the predicate you choose). For example, use the Comparison predicate to specify that a column should match a particular value, or the Between predicate to specify that a column falls within a particular range. The filter appears as a WHERE clause in the finished statement.
4. Click the **Add** button in the filter panel. The filter that you specify appears in the filter expression panel and is added to the update statement that you are building.
5. Click on the **Sql** tab to view the finished query.

The SQL builder interface

The components in the upper half of the SQL builder are common to all types of SQL statement that you can build. The pages that are available in the lower half depend on the type of query that you build.

Toolbar

The toolbar for the SQL builder contains tools for actions such as clearing the current query, viewing data, and validating the statement.

The SQL builder toolbar contains the following tools.

- **Clear Query** removes the field entries for the current SQL query.
- **Cut** removes items and placed them on the Microsoft Windows clipboard so they can be pasted elsewhere.
- **Copy** copies items and place them on the Windows clipboard so they can be pasted elsewhere.
- **Paste** pastes items from the Windows clipboard to certain places in the SQL builder.
- **SQL properties** opens the Properties dialog box.
- **Quoting** toggles quotation marks in table and column names in the generated SQL statements.
- **Validation** toggles the validation feature. Validation automatically occurs when you click OK to exit the SQL builder.
- **View Data** is available when you invoke the SQL builder from stages that support the viewing of data. It causes the calling stage to run the SQL as currently built and return the results for you to view.
- **Refresh** refreshes the contents of all the panels on the SQL builder.

- **Window View** allows you to select which panels are shown in the SQL builder window.
- **Help** opens the online help.

Tree panel

The tree panel shows the table definitions in the IBM InfoSphere DataStage repository. You can import a table definition from the database that you want to query.

You can import the table definition by using the Designer client, or you can do it directly from the shortcut menu in the tree panel. You can also manually define a table definition from within the SQL builder by selecting **New Table...** from the tree panel shortcut menu.

To select a table to query, select it in the tree panel and drag it to the table selection canvas. A window appears in the canvas representing the table and listing all its individual columns.

A shortcut menu allows you to:

- Refresh the repository view
- Define a new table definition (the Table Definition dialog box opens)
- Import metadata directly from a data source (a sub menu offers a list of source types)
- Copy a table definition (you can paste it in the table selection canvas)
- View the properties of the table definition (the Table Definition dialog box opens)

You can also view the properties of a table definition by double-clicking on it in the repository tree.

Table selection canvas

The table selection canvas shows a list of columns and column types for the table that the SQL statement accesses.

You can drag a table from the tree panel to the table selection canvas. If the desired table does not exist in the repository, you can import it from the database you are querying by choosing **Import Metadata** from the tree panel shortcut menu.

The table appears in a window on the canvas, with a list of the columns and their types. For insert, update, and delete statements you can only place one table on the canvas. For select queries you can place multiple tables on the canvas.

Wherever you try to place the table on the canvas, the first table you drag will always be placed in the top left hand corner. If you are building a select query, subsequent tables can be dragged before or after the initial, or on a new row underneath. Eligible areas are highlighted on the canvas as you drag the table, and you can only drop a table in one of the highlighted areas. When you place tables on the same row, the SQL builder will automatically join the tables (you can alter the join if it's not what you want).

When you place tables on a separate row, no join is added. An old-style Cartesian product of the table rows on the different rows is produced: `FROM FirstTable, SecondTable`.

Click the **Select All** button underneath the table title bar to select all the columns in the table. Alternatively you can double-click on or drag individual columns from the table to the grid in the **Select**, **Insert**, or Update page to use just those columns in your query.

With a table selected in the canvas, a shortcut menu allows you to:

- Add a related table (select queries only). A submenu shows you tables that have a foreign key relationship with the currently selected one. Select a table to insert it in the canvas, together with the join expression inferred by the foreign key relationship.
- Remove the selected table.
- Select all the columns in the table (so that you could, for example, drag them all to the column selection grid).
- Open a Select Table dialog box to allow you to bind an alternative table for the currently selected table (select queries only).
- Open the **Table Properties** dialog box for the currently selected table.

With a join selected in the canvas (select queries only), a shortcut menu allows you to:

- Open the Alternate Relation dialog box to specify that the join should be based on a different foreign key relationship.
- Open the Join Properties dialog box to modify the type of join and associated join expression.

From the canvas background, a shortcut menu allows you to:

- Refresh the view of the table selection canvas.
- Paste a table that you have copied from the tree panel.
- View data - this is available when you invoke the SQL builder from stages that support the viewing of data. It causes the calling stage to run the SQL as currently built and return the results for you to view.
- Open the Properties dialog box to view details of the SQL syntax that the SQL builder is currently building a query for.

Selection page

Use the Selection page to specify details for a SELECT statement.

Column selection grid

Use the column selection grid to specify the columns to include in your query.

You can populate the grid in a number of ways:

- Drag columns from the tables in the table selection canvas
- Choose columns from a list in the grid
- Double-click the column name in the table selection canvas
- Copy and paste from the table selection canvas

Column expression

The column expression identifies the columns to include in the SELECT statement.

You can specify the following parts:

- **Job parameter**. A dialog box appears offering you a choice of available job parameters. This allows you to specify the value to be used in the query at run time (the stage you are using the SQL builder from must allow job parameters for this to appear).
- **Expression**. An expression editor dialog box appears, allowing you to specify an expression that represents the value to be used in the query.
- **Data flow variable**. A dialog box appears offering you a choice of available data flow variables (the stage you are using the SQL builder from must support data flow variables for this to appear)
- **Lookup Column**. You can directly select a column from one of the tables in the table selection canvas.

Table

This property identifies the table that the column belongs to.

If you populate the column grid by dragging, copying or double-clicking on a column from the table selection canvas, the table name is filled in automatically. You can also choose a table from the list.

To specify the table name at run time, choose a job parameter from the list.

Column alias

Use this property to specify an alias for the column.

Output

Select this property to indicate that the column is part of the query output. The property is selected automatically when you add a column to the grid.

Sort

Choose **Ascending** or **Descending** to have the query sort the returned rows by the value of this column. Selecting to sort adds an ORDER BY clause to the query.

Sort order

You can specify the order in which rows are sorted if you order by more than one column.

Shortcut menu

Use the shortcut menu to paste a column that you copied from the table selection canvas, insert or remove a row, and show or hide the filter panel.

Filter panel

In the filter panel, you specify a WHERE clause for the SELECT statement that you are building. The filter panel includes a predicate list and an expression editor panel, the contents of which depends on the chosen predicate.

Filter expression panel

The filter expression panel shows the filters that you added to the query. You can edit a filter that you added by using the filter expression editor or you can enter a filter manually.

Group page

Use the Group page, which appears when you build SELECT statements, to specify that the results of the query are grouped by a column or columns.

Also, you can use the page to aggregate the results in some of the columns. For example, you can specify COUNT to count the number of rows that contain a non-null value in a column.

The **Group** tab gives access to the toolbar, tree panel, and the table selection canvas, in exactly the same way as the Selection page.

Grouping grid

In the grouping grid, you can specify the columns to group by or aggregate on.

The grid is populated with the columns that you selected on the Selection page. You can change the selected columns or select new ones, which will be reflected in the selection your query makes.

The grid has the following fields:

- **Column expression**. Identifies the column to be included in the query. You can modify the selections from the Selection page, or build a column expression.
  - Job parameter. A dialog box appears offering you a choice of available job parameters. This allows you to specify the value to be used in the query at run time (the stage you are using the SQL builder from must allow job parameters for this to appear).
  - Expression Editor. An expression editor dialog box appears, allowing you to specify an expression that represents the value to be used in the query.
  - Data flow variable. A dialog box appears offering you a choice of available data flow variables (the stage you are using the SQL builder from must support data flow variables for this to appear).
  - Lookup Column. You can directly select a column from one of the tables in the table selection canvas.
- **Column Alias**. This allows you to specify an alias for the column. If you select an aggregation operation for a column, SQL builder will automatically insert an alias of the form Alison; you can edit this if required.
- **Output**. This is selected to indicate that the column will be output by the query. This is automatically selected when you add a column to the grid.
- **Distinct**. Select this check box if you want to add the DISTINCT qualifier to an aggregation. For example, a COUNT aggregation with the distinct qualifier will count the number of rows with distinct values in a field (as opposed to just the not-null values). For more information about the DISTINCT qualifier, see SQL Properties Dialog Box.
- **Aggregation**. Allows you to select an aggregation function to apply to the column (note that this is mutually exclusive with the Group By option). See Aggregation Functions for details about the available functions.
- **Group By**. Select the check box to specify that query results should be grouped by the results in this column.

Aggregation functions

The aggregation functions that are available depend on the stage that you opened the SQL builder from. All SQL syntax variants include the AVG, COUNT, MAX, MIN, STDDEV, and VARIANCE aggregation functions.

The following aggregation functions are supported.

- AVG. Returns the mean average of the values in a column. For example, if you had six rows with a column containing a price, the six rows would be added together and divided by six to yield the mean average. If you specify the

DISTINCT qualifier, only distinct values will be averaged; if the six rows only contained four distinct prices then these four would be added together and divided by four to produce a mean average.

- COUNT. Counts the number of rows that contain a not-null value in a column. If you specify the DISTINCT qualifier, only distinct values will be counted.
- MAX. Returns the maximum value that the rows hold in a particular column. The DISTINCT qualifier can be selected, but has no effect on this function.
- MIN. Returns the minimum value that the rows hold in a particular column. The DISTINCT qualifier can be selected, but has no effect on this function.
- STDDEV. Returns the standard deviation for a set of numbers.
- VARIANCE. Returns the variance for a set of numbers.

Filter panel

In the Filter panel, you can specify a HAVING clause for the SELECT statement. The Filter panel includes a predicate list and an expression editor panel, the contents of which depends on the chosen predicate.

Filter Expression panel

The Filter Expression panel shows the filters that you added to the query. You can edit a filter that you added by using the filter expression editor, or you can enter a filter manually.

Insert page

Use the Insert page to specify the details of an INSERT statement. The page includes the insert columns grid.

Insert Columns grid

In the Insert Columns grid, you specify the columns to include in the INSERT statement and the values that they will take.

Insert column

This property identifies the columns to include in the INSERT statement.

You can populate this in a number of ways:

- Drag columns from the table in the table selection canvas
- Choose columns from a list in the grid
- Double-click the column name in the table selection canvas
- Copy and paste from the table selection canvas

Insert value

This property identifies the values that you are setting the corresponding column to. You can enter a value manually or specify a job parameter, expression, data flow variable, or lookup column.

When you specify a value, you can use the following objects:

- **Job parameter**. A dialog box appears offering you a choice of available job parameters. This allows you to specify the value to be used in the query at run time (the stage you are using the SQL builder from must allow job parameters for this to appear).
- **Expression**. An expression editor dialog box appears, allowing you to specify an expression that represents the value to be used in the query.

- **Data flow variable**. A dialog box appears offering you a choice of available data flow variables (the stage you are using the SQL builder from must support data flow variables for this to appear)
- **Lookup column**. You can directly select a column from one of the tables in the table selection canvas.

Update page

Use the Update page to specify details of an UPDATE statement.

Update Column grid

In the Update Column grid, you specify the columns to include in the UPDATE statement and the values that they will take.

Update column

This property identifies the columns to include in the UPDATE statement.

You can populate this in the following ways:

- Drag columns from the table in the table selection canvas.
- Choose columns from a list in the grid.
- Double-click the column name in the table selection canvas.
- Copy and paste from the table selection canvas.

Update value

This property identifies the value that you are setting the corresponding column to. You can enter a value in the field manually, or you can specify a job parameter, expression, data flow variable, or lookup column.

You can specify the following objects:

- **Job parameter**. A dialog box appears offering you a choice of available job parameters. This allows you to specify the value to be used in the query at run time (the stage you are using the SQL builder from must allow job parameters for this to appear).
- **Expression**. An expression editor dialog box appears, allowing you to specify an expression that represents the value to be used in the query.
- **Data flow variable**. A dialog box appears offering you a choice of available data flow variables (the stage you are using the SQL builder from must support data flow variables for this to appear)
- **Lookup column**. You can directly select a column from one of the tables in the table selection canvas.

Filter panel

In the filter panel, you can specify a WHERE clause for the UPDATE statement that you build. The filter panel includes a predicate list and an expression editor panel, the contents of which depends on the chosen predicate.

Filter expression panel

The filter expression panel shows the filters that you added for the query. You can edit the filter in the panel or enter a filter manually.

Delete page

On the Delete page, you specify details for the DELETE statement that you build.

Filter panel

On the filter panel, you can specify a WHERE clause for the DELETE statement that you build. The filter panel includes a predicate list and an expression editor panel, the contents of which depend on the chosen predicate.

Filter expression panel

The filter expression panel shows the filters that you add to the query. You can edit a filter in the panel or enter a filter manually.

SQL page

On the SQL page, you view the SQL statement that you build.

For SELECT queries, if the columns that you defined as output columns for your stage do not match the columns that the SQL statement is generating, use the Resolve columns grid to reconcile them. In most cases, the columns match.

Resolve columns grid

If the columns that you loaded in a stage do not match the columns that are generated by the SQL statement that you built, you can reconcile the differences in the Resolve columns grid.

Ideally the columns should match (and in normal circumstances usually would). A mismatch would cause the metadata in your job to become out of step with the metadata as loaded from your source database (which could cause a problem if you are performing usage analysis based on that table).

If there is a mismatch, the grid displays a warning message. Click the Auto Match button to resolve the mismatch. You are offered the choice of matching by name, by order, or by both. When matching, the SQL builder seeks to alter the columns generated by the SQL statement to match the columns loaded onto the stage.

If you choose Name matching, and a column of the same name with a compatible data type is found, the SQL builder:

- Moves the result column to the equivalent position in the grid to the loaded column (this will change the position of the named column in the SQL).
- Modifies all the attributes of the result column to match those of the loaded column.

If you choose Order matching, the builder works through comparing each results column to the loaded column in the equivalent position. If a mismatch is found, and the data type of the two columns is compatible, the SQL builder:

- Changes the alias name of the result column to match the loaded column (provided the results set does not already include a column of that name).
- Modifies all the attributes of the result column to match those of the loaded column.

If you choose Both, the SQL builder applies Name matching and then Order matching.

If auto matching fails to reconcile the columns as described above, any mismatched results column that represents a single column in a table is overwritten with the details of the loaded column in the equivalent position.

When you click **OK** in the Sql tab, the SQL builder checks to see if the results columns match the loaded columns. If they don't, a warning message is displayed allowing you to proceed or cancel. Proceeding causes the loaded columns to be merged with the results columns:

- Any matched columns are not affected.
- Any extra columns in the results columns are added to the loaded columns.
- Any columns in the loaded set that do not appear in the results set are removed.
- For columns that don't match, if data types are compatible the loaded column is overwritten with the results column. If data types are not compatible, the existing loaded column is removed and replaced with the results column.

You can also edit the columns in the Results part of the grid in order to reconcile mismatches manually.

Expression editor

In the expression editor, you can specify a WHERE clause to add to your SQL statement. If you are joining tables, you can also specify a WHERE or HAVING clause for a join condition.

A variant of the expression editor allows you to specify a calculation, function, or a case statement within an expression. The expression editor can be opened from various places in the SQL builder.

Main expression editor

In the expression editor, you can specify a filter that uses the Between, Comparison, In, Like, or Null predicates.

To specify an expression:

- Choose the type of filter by choosing a predicate from the list.
- Fill in the information required by the Expression Editor fields that appear.
- Click the **Add** button to add the filter to the query you are building. This clears the expression editor so that you can add another filter if required.

The contents of the expression editor vary according to which predicate you have selected. The following predicates are available:

- **Between**. Allows you to specify that the value in a column should lay within a certain range.
- **Comparison**. Allows you to specify that the value in a column should be equal to, or greater than or less than, a certain value.
- **In**. Allows you to specify that the value in a column should match one of a list of values.
- **Like**. Allows you to specify that the value in a column should contain, start with, end with, or match a certain value.
- **Null**. Allows you to specify that a column should be null or should not be null.

Between predicate

When you specify a Between predicate in the expression editor, you choose a column, specify a range, and specify whether a value must be in the range or not in the range.

The expression editor when you have selected the Between predicate contains:

- **Column**. Choose the column on which you are filtering from the drop-down list. You can also specify:
  - **Job parameter**. A dialog box appears offering you a choice of available job parameters. This allows you to specify the value to be used in the query at run time (the stage you are using the SQL builder from must allow job parameters for this to appear).
  - **Expression**. An expression editor dialog box appears, allowing you to specify an expression that represents the value to be used in the query.
  - **Data flow variable**. A dialog box appears offering you a choice of available data flow variables (the stage you are using the SQL builder from must support data flow variables for this to appear)
  - **Column**. You can directly select a column from one of the tables in the table selection canvas.
- **Between/Not Between**. Choose Between or Not Between from the drop-down list to specify whether the value you are testing should be inside or outside your specified range.
- **Start of range**. Use this field to specify the start of your range. Click the menu button to the right of the field and specify details about the argument you are using to specify the start of the range, then specify the value itself in the field.
- **End of range**. Use this field to specify the end of your range. Click the menu button to the right of the field and specify details about the argument you are using to specify the end of the range, then specify the value itself in the field.

Comparison predicate

When you specify a Comparison predicate in the expression editor, you choose a column, a comparison operator, and a comparison value.

The expression editor when you have selected the Comparison predicate contains:

- **Column**. Choose the column on which you are filtering from the drop-down list. You can specify one of the following in identifying a column:
  - **Job parameter**. A dialog box appears offering you a choice of available job parameters. This allows you to specify the value to be used in the query at run time (the stage you are using the SQL builder from must allow job parameters for this to appear).
  - **Expression**. An expression editor dialog box appears, allowing you to specify an expression that represents the value to be used in the query.
  - **Data flow variable**. A dialog box appears offering you a choice of available data flow variables (the stage you are using the SQL builder from must support data flow variables for this to appear)
  - **Column**. You can directly select a column from one of the tables in the table selection canvas.
- **Comparison operator**. Choose the comparison operator from the drop-down list. The available operators are:
  - = equals
  - <> not equal to
  - < less than

- <= less than or equal to
- > greater than
- >= greater than or equal to

- **Comparison value**. Use this field to specify the value you are comparing to. Click the menu button to the right of the field and choose the data type for the value from the menu, then specify the value itself in the field.

In predicate

When you specify an In predicate in the expression editor, you choose a column, select items to include in the query, and specify whether selected values are in the list or not in the list.

The expression editor when you have selected the In predicate contains:

- **Column**. Choose the column on which you are filtering from the drop-down list. You can specify one of the following in identifying a column:
  - **Job parameter**. A dialog box appears offering you a choice of available job parameters. This allows you to specify the value to be used in the query at run time (the stage you are using the SQL builder from must allow job parameters for this to appear).
  - **Expression**. An expression editor dialog box appears, allowing you to specify an expression that represents the value to be used in the query.
  - **Data flow variable**. A dialog box appears offering you a choice of available data flow variables (the stage you are using the SQL builder from must support data flow variables for this to appear)
  - **Column**. You can directly select a column from one of the tables in the table selection canvas.
- **In/Not In**. Choose IN or NOT IN from the drop-down list to specify whether the value should be in the specified list or not in it.
- **Selection**. These fields allows you to specify the list used by the query. Use the menu button to the right of the single field to specify details about the argument you are using to specify a list item, then enter a value. Click the double right arrow to add the value to the list.

  To remove an item from the list, select it then click the double left arrow.

Like predicate

When you specify a Like predicate in the expression editor, you choose a column, an operator, and a value. You then specify whether values are included or excluded by the comparison.

The expression editor when you have selected the Like predicate is as follows. The fields it contains are:

- **Column**. Choose the column on which you are filtering from the drop-down list. You can specify one of the following in identifying a column:
  - **Job parameter**. A dialog box appears offering you a choice of available job parameters. This allows you to specify the value to be used in the query at run time (the stage you are using the SQL builder from must allow job parameters for this to appear).
  - **Expression**. An expression editor dialog box appears, allowing you to specify an expression that represents the value to be used in the query.
  - **Data flow variable**. A dialog box appears offering you a choice of available data flow variables (the stage you are using the SQL builder from must support data flow variables for this to appear)

  - **Column**. You can directly select a column from one of the tables in the table selection canvas.
- **Like/Not Like**. Choose LIKE or NOT LIKE from the drop-down list to specify whether you are including or excluding a value in your comparison.
- **Like Operator.** Choose the type of Like or Not Like comparison you want to perform from the drop-down list. Available operators are:
  - Match Exactly. Your query will ask for an exact match to the value you specify.
  - Starts With. Your query will match rows that start with the value you specify.
  - Ends With. Your query will match rows that end with the value you specify.
  - Contains. Your query will match rows that contain the value you specify anywhere within them.
- **Like Value**. Specify the value that your LIKE predicate will attempt to match.

Null predicate

When you specify a Null predicate in the expression editor, you choose a column and specify whether your query must match a NULL or NOT NULL condition in the column.

The expression editor when you have selected the Null predicate is as follows. The fields it contains are:

- **Column**. Choose the column on which you are filtering from the drop-down list. You can specify one of the following in identifying a column:
  - **Job parameter**. A dialog box appears offering you a choice of available job parameters. This allows you to specify the value to be used in the query at run time (the stage you are using the SQL builder from must allow job parameters for this to appear).
  - **Expression**. An expression editor dialog box appears, allowing you to specify an expression that represents the value to be used in the query.
  - **Data flow variable**. A dialog box appears offering you a choice of available data flow variables (the stage you are using the SQL builder from must support data flow variables for this to appear)
  - **Column**. You can directly select a column from one of the tables in the table selection canvas.
- **Is Null/Is Not Null**. Choose whether your query will match a NULL or NOT NULL condition in the column.

Join predicate

When you specify a Join predicate in the expression editor, you choose the columns to join and a join type.

This predicate is only available when you are building an Oracle 8i query with an `old style' join expression. The Expression Editor is as follows.

- **Left column**. Choose the column to be on the left of your join from the drop-down list.
- **Join type**. Choose the type of join from the drop-down list.
- **Right column**. Choose the column to be on the right of your query from the drop-down list.

Calculation, function, and case expression editor

In this version of the expression editor, you can specify an expression in a WHERE expression, a HAVING expression, or a join condition. The expression editor windows are numbered to show how deeply they are nested.

Calculation predicate

When you use the Calculation predicate, you specify the left value, right value, and calculation operator in the expression editor.

The expression editor when you have selected the Calculation predicate contains these fields:

- **Left Value**. Enter the argument you want on the left of your calculation. You can choose the type of argument by clicking the menu button on the right and choosing a type from the menu.
- **Calculation Operator**. Choose the operator for your calculation from the drop-down list.
- **Right Value**. Enter the argument you want on the right of your calculation. You can choose the type of argument by clicking the menu button on the right and choosing a type from the menu.

Functions predicate

When you use the functions predicate, you can specify the function, description, and function parameters in the expression editor.

The expression editor when you have selected the Functions predicate contains these fields:

- **Function**. Choose a function from the drop-down list.

  The list of available functions depends on the database you are building the query for.
- **Description**. Gives a description of the function you have selected.
- **Parameters**. Enter the parameters required by the function you have selected. The parameters that are required vary according to the selected function.

Case predicate

When you use the case predicate, you can include case statements in the SQL that you build in the expression editor.

The case option on the expression editor enables you to include case statements in the SQL you are building. You can build case statements with the following syntax.

```
CASE WHEN condition THEN value
CASE WHEN...
ELSE value
```

or

```
CASE subject
WHEN match_value THEN value
WHEN...
ELSE value
```

The expression editor when you have selected the Case predicate contains these fields:

- **Case Expression**. This is the subject of the case statement. Specify this if you are using the second syntax described above (CASE *subject* WHEN). By default, the field offers a choice of the columns from the table or tables you have dragged to

the table selection canvas. To choose an alternative, click the browse button next to the field. This gives you a choice of data types, or of specifying another expression, a function, or a job parameter.

- **When**. This allows you to specify a condition or match value for your case statement. By default, the field offers a choice of the columns from the table or tables you have dragged to the table selection canvas. To choose an alternative, click the browse button next to the field. This gives you a choice of data types, or of specifying another expression, a function, or a job parameter. You can access the main expression editor by choose case expression editor from the menu. This allows you to specify expressions such as comparisons. You would typically use this in the first syntax example. For example, you would specify grade=3 as the condition in the expression WHEN grade=3 THEN 'first class'.
- **Then**. Use this to specify the value part of the case expression. By default, the field offers a choice of the columns from the table or tables you have dragged to the table selection canvas. To choose an alternative, click the browse button next to the field. This gives you a choice of data types, or of specifying another expression, a function, or a job parameter.
- **Add**. Click this to add a case expression to the query. This clears the When and Then fields so that you can specify another case expression.
- **Else Expression**. Use this to specify the value for the optional ELSE part of the case expression.

Expression editor menus

From the expression editor, you can open a menu where you can specify details about an argument in the expression.

A button appears to the right of many of the fields in the expression editor and related dialogs. Where it appears you can click it to open a menu that allows you to specify more details about an argument being given in an expression.

- **Bit**. Specifies that the argument is of type bit. The argument field offers a choice of 0 or 1 in a drop-down list.
- **Column**. Specifies that the argument is a column name. The argument field offer a choice of available columns in a drop-down list.
- **Date**. Specifies that the argument is a date. The SQL builder enters today's date in the format expected by the database you are building the query for. You can edit this date as required or click the drop-down button and select from a calendar.
- **Date Time**. Specifies that the argument is a date time. The SQL builder inserts the current date and time in the format that the database the query is being built for expects. You can edit the date time as required.
- **Plaintext**. Allows you to select the default value of an argument (if one is defined).
- **Expression Editor.** You can specify a function or calculation expression as an argument of an expression. Selecting this causes the Calculation/Function version of the expression editor to open.
- **Function**. You can specify a function as an argument to an expression.

  Selecting this causes the Functions Form dialog box to open. The functions available depend on the database that the query you are building is intended for.

  Selecting this causes the Function dialog box to open.

- **Job Parameter**. You can specify that the argument is a job parameter, the value for which is supplied when you actually run the IBM InfoSphere DataStage job. Selecting this opens the Parameters dialog box.
- **Integer**. Choose this to specify that the argument is of integer type.
- **String**. Select this to specify that the argument is of string type.
- **Time**. Specifies that the argument is the current local time. You can edit the value.
- **Timestamp**. Specifies that the argument is a timestamp. You can edit the value.

  The SQL builder inserts the current date and time in the format that the database that the query is being built for expects.

Functions Form window

In the Functions Form window, you select a function to use in an expression and specify parameters for the function.

The fields are as follows:

- **Function**. Choose a function from the drop-down list.

  The available functions depend on the database that you are building the query for.
- **Format**. Gives the format of the selected function as a guide.
- **Description**. Gives a description of the function you have selected.
- **Result**. Shows the actual function that will be included in the query as specified in this dialog box.
- **Parameters**. Enter the parameters required by the function you have selected. The parameters that are required vary according to the selected function.

Function window:

In the Function window, you can select a function to use in an expression and specify parameters for the function.

The fields are as follows:

- **Function**. Choose a function from the drop-down list.

  The available functions depend on the database that you are building the query for.
- **Format**. Gives the format of the selected function as a guide.
- **Description**. Gives a description of the function you have selected.
- **Result**. Shows the actual function that will be included in the query as specified in this dialog box.
- **Parameters**. Enter the parameters required by the function you have selected. The parameters that are required vary according to the selected function.

Parameters window

This window lists the job parameters that are currently defined for the job and the data type of each parameter. The SQL builder does not check that the type of parameter that you insert matches the type that is expected by the argument that you use it for.

Joining tables

When you use the SQL builder to build SELECT statements, you can specify table joins in a statement.

When you drag multiple tables onto the table selection canvas, the SQL builder attempts to create a join between the table added and the one already on the canvas to its left. If foreign key metadata is available for the tables, the SQL builder uses it. The join is represented by a line joining the columns the SQL builder has decided to join on. After the SQL builder automatically inserts a join, you can amend it.

When you add a table to the canvas, SQL builder determines how to join the table with tables that are on the canvas. The process depends on whether the added table is positioned to the right or left of the tables on the canvas.

To construct a join between the added table and the tables to its left:

1. SQL builder starts with the added table.
2. Determine if there is a foreign key between the added table and the subject table.
   - If a foreign key is present, continue to Step 3.
   - If a foreign key is not present, skip to Step 4.
3. Choose between alternatives for joining the tables that is based on the following precedence.
   - Relations that apply to the key fields of the added tables
   - Any other foreign key relation

   Construct an INNER JOIN between the two tables with the chosen relationship dictating the join criteria.
4. Take the subject as the next table to the left, and try again from step 2 until either a suitable join condition has been found or all tables, to the left, have been exhausted.
5. If no join condition is found among the tables, construct a default join.

   If the SQL grammar does not support a CROSS JOIN, an INNER JOIN is used with no join condition. Because this produces an invalid statement, you must set a suitable condition, either through the Join Properties dialog box, or by dragging columns between tables.

   An INNER JOIN is used with no join condition. Because this produces an invalid statement, you must set a suitable condition, either through the Join Properties dialog box, or by dragging columns between tables.

To construct a join between the added table and tables to its right:

1. SQL builder starts with the added table.
2. Determine if foreign key information exists between the added table and the subject table.
   - If a foreign key is present, continue to Step 3.
   - If a foreign key is not present, skip to Step 4.
3. Choose between alternatives based on the following precedence:
   - Relations that apply to the key fields of the added tables
   - Any other joins

   Construct an INNER JOIN between the two tables with the chosen relationship dictating the join criteria.
4. Take the subject as the next table to the right and try again from step 2.
5. If no join condition is found among the tables, construct a default join.

If the SQL grammar does not support a CROSS JOIN, an INNER JOIN is used with no join condition. Because this produces an invalid statement, you must set a suitable condition, either through the Join Properties dialog box, or by dragging columns between tables.

An INNER JOIN is used with no join condition. Because this produces an invalid statement, you must set a suitable condition, either through the Join Properties dialog box, or by dragging columns between tables.

Specifying joins

When you add more than one table to the table selection canvas, the SQL builder inserts a join automatically. To change the join, you can use the Join Properties window, use the Alternate Relation window, or drag a column from one table to a column in another table.

You can change the join in the following ways:

- Using the Join Properties dialog box. Open this by selecting the link in the table selection canvas, right clicking and choosing **Properties** from the shortcut menu. This dialog allows you to choose a different type of join, choose alternative conditions for the join, or choose a natural join.
- Using the Alternate Relation dialog box. Open this by selecting the link in the table selection canvas, right clicking and choosing **Alternate Relation** from the shortcut menu. This dialog allows you to change foreign key relationships that have been specified for the joined tables.
- By dragging a column from one table to another column in any table to its right on the canvas. This replaces the existing automatic join and specifies an equijoin between the source and target column. If the join being replaced is currently specified as an inner or outer join, then the type is preserved, otherwise the new join will be an inner join.

Yet another approach is specify the join using a WHERE clause rather than an explicit join operation (although this is not recommended where your database supports explicit join statements). In this case you would:

1. Specify the join as a Cartesian product. (SQL builder does this automatically if it cannot determine the type of join required).
2. Specify a filter in the **Selection** tab filter panel. This specifies a WHERE clause that selects rows from within the Cartesian product.

If you are using the SQL builder to build Oracle 8i, Microsoft SQL Server, IBM Informix, or Sybase queries, you can use the Expression Editor to specify a join condition, which will be implemented as a WHERE statement. Oracle 8i does not support JOIN statements.

Join Properties window

Use the Join Properties window to change the type of an existing join and modify or specify the join condition.

The window contains the following fields:

- **Cartesian product**. The Cartesian product is the result that is returned from two or more tables that are selected from, but not joined; that is, no join condition is specified. The output is all possible rows from all the tables selected from. For example, if you selected from two tables, the database would pair every row in the first table with every row in the second table. If each table had 6 rows, the Cartesian product would return 36 rows.

If the SQL builder cannot insert an explicit join based on available information, it will default to a Cartesian product that is formed with the CROSS JOIN syntax in the FROM clause of the resulting SQL statement: `FROM FirstTable CROSS JOIN SecondTable`. You can also specify a Cartesian product by selecting the Cartesian product option in the Join Properties dialog box. The cross join icon is shown on the join.

- **Table join**. Select the **Table Join** option to specify that your query will contain join condition for the two tables being joined. The **Join Condition** panel is enabled, allowing you to specify further details about the join.
- **Join Condition panel**. This shows the expression that the join condition will contain. You can enter or edit the expression manually or you can use the menu button to the right of the panel to specify a natural join, open the Expression Editor, or open the Alternate relation dialog box.
- **Include**. These fields allow you to specify that the join should be an outer join, where the result of the query should include the rows as specified by one of the following:
  - Select **All rows from left table name** to specify a left outer join
  - Select **All rows from right table name** to specify a right outer join
  - Select both **All rows from left table name** and **All rows from right table name** to specify a full outer join
- **Join Icon**. This tells you the type of join you have specified.

Alternate Relation window

The Alternate Relation window shows the foreign key relationships that are defined between the target table and tables that appear to the left of it on the table selection canvas. Select the relationship that you want to appear as the join in your query so that it appears in the list box, and then click **OK**.

Properties windows

The Properties windows contain properties for tables, SQL, and joins.

Depending where you are in the SQL builder, choosing **Properties** from the shortcut menu opens a dialog box as follows:

- The Table Properties dialog box opens when you select a table in the table selection canvas and choose **Properties** from the shortcut menu.
- The SQL Properties dialog box opens when you select the **Properties** icon in the toolbox or **Properties** from the table selection canvas background.
- The Join Properties dialog box opens when you select a join in the table selection canvas and choose **Properties** from the shortcut menu.

Table Properties window

In the Table Properties window, you can view the table name and view or edit the table alias.

The **Table Properties** dialog box contains the following fields:

- **Table name**. The name of the table whose properties you are viewing.

  You can click the menu button and choose **Job Parameter** to open the Parameter dialog box. This allows you to specify a job parameter to replace the table name if required, but note that the SQL builder will always refer to this table using its alias.

- **Alias**. The alias that the SQL builder uses to refer to this table. You can edit the alias if required. If the table alias is used in the selection grid or filters, changing the alias in this dialog box will update the alias there.

SQL Properties window

The SQL Properties window shows the SQL grammar that the SQL builder uses.

The SQL Properties window contains the following fields:

- **Description**. The name and version of the SQL grammar.
  The SQL grammar depends on the stage that you invoke the SQL builder from.
- **DISTINCT**. Specify whether the SQL builder supports the DISTINCT qualifier.
  If the stage supports it, the DISTINCT option is selected.

Chapter 8. Environment variables: ODBC connector

The ODBC Connector stage uses these environment variables.

CC_GUARDIUM_EVENTS

Set this environment variable to specify whether connectors report the InfoSphere DataStage context information to the InfoSphere Guardium Database Activity monitor.

When the value of this environment variable is set, the connectors report the InfoSphere DataStage context information such as host, project, job names, stage name and node ID that the stage is running on to the InfoSphere Guardium Database Activity monitor. When this environment variable is defined and set to any value, the connectors report context information to the Guardium server after the initial connection is established.

When this environment variable is undefined, the connectors do not attempt to report context information to Guardium servers. The setting of this environment variable applies to all database connectors in the job.

CC_IGNORE_TIME_LENGTH_AND_SCALE

Set this environment variable to change the behavior of the connector on the parallel canvas.

When this environment variable is set to 1, the connector running with the parallel engine ignores the specified length and scale for the timestamp column. For example, when the value of this environment variable is not set and if the length of the timestamp column is 26 and the scale is 6, the connector on the parallel canvas considers that the timestamp has a microsecond resolution. When the value of this environment variable is set to 1, the connector on the parallel canvas does not consider that the timestamp has a microsecond resolution unless the microseconds extended property is set even if the length of the timestamp column is 26 and the scale is 6.

CC_MSG_LEVEL

Set this environment variable to specify the minimum severity of the messages that the connector reports in the log file.

At the default value of 3, informational messages and messages of a higher severity are reported to the log file.

The following list contains the valid values:

- 1 - Trace
- 2 - Debug
- 3 - Informational
- 4 - Warning
- 5 - Error
- 6 - Fatal

CC_ODBC_USE_TRUNCATE_FOR_TRUNCATE

Set this environment variable to a nonzero value so that the connector generates a TRUNCATE TABLE command instead of the default DELETE FROM command.

When the value of this environment variable is set to a nonzero value, the **Table action** property is set to **Truncate**, and the **Generate truncate statement at runtime** property to **Yes** the connector generates a **TRUNCATE TABLE** command instead of the default **DELETE FROM** command.

CC_ODBC_USE_NEW_DRIVER_MANAGER

Set this environment variable to specify whether a DataDirect ODBC driver manager version 06.00.0127 (U0090) or later is used with InfoSphere Information Server, Version 8.5.

If you use the DataDirect ODBC driver manager version `06.00.0127 (U0090)` or later, you must set this environment variable to 1

This environment variable is not supported on Windows operating systems.

CC_SE_TIMESTAMP_FF

Set this environment variable to specify whether decimal point and fractional digits are included in the timestamp values, when the connector runs in server jobs.

When the environment variable is set to a value other than NONE, MICROSECONDS or SCALE, the behavior is the same as if the environment variable was not set. The environment variable values are case sensitive. When the environment variable is not set, the timestamp values that are produced by the job include a trailing decimal point and six fractional digits.

You can set the environment variable to the following values:

NONE
The trailing decimal point and the fractional digits are both omitted.

MICROSECONDS
The trailing decimal point and six fractional digits are included.

SCALE
The trailing decimal point and *S* fractional digits are included, where *S* represents the value of the Scale attribute in the timestamp column definition. When the Scale attribute value is not defined for the column, the Scale attribute value of zero is assumed.

CC_TRUNCATE_STRING_WITH_NULL

Set this environment variable to truncate string data that includes the string 0x00.

When the value of this environment variable is set and when the input data contains a null character, the input data is truncated with 0x00 and the rest of the string is dropped. This environment variable applies to fields of Char, VarChar, and LongVarChar InfoSphere DataStage types.

CC_TRUNCATE_NSTRING_WITH_NULL

Set this environment variable to truncate string data that includes the string 0x00.

When the value of this environment variable is set and when the input data contains a null character, the input data is truncated with 0x00 and the rest of the string is dropped.

CC_USE_EXTERNAL_SCHEMA_ON_MISMATCH

Set this environment variable to use an external schema rather than a design schema when the schemas do not match.

This schema is used for schema reconciliation. When the value of this environment variable is set, the behavior remains the same and is not changed from the old version.

Appendix A. Product accessibility

You can get information about the accessibility status of IBM products.

The IBM InfoSphere Information Server product modules and user interfaces are not fully accessible.

For information about the accessibility status of IBM products, see the IBM product accessibility information at http://www.ibm.com/able/product_accessibility/index.html.

Accessible documentation

Accessible documentation for InfoSphere Information Server products is provided in an information center. The information center presents the documentation in XHTML 1.0 format, which is viewable in most web browsers. Because the information center uses XHTML, you can set display preferences in your browser. This also allows you to use screen readers and other assistive technologies to access the documentation.

The documentation that is in the information center is also provided in PDF files, which are not fully accessible.

IBM and accessibility

See the IBM Human Ability and Accessibility Center for more information about the commitment that IBM has to accessibility.

Appendix B. Reading command-line syntax

This documentation uses special characters to define the command-line syntax.

The following special characters define the command-line syntax:

[ ] Identifies an optional argument. Arguments that are not enclosed in brackets are required.

... Indicates that you can specify multiple values for the previous argument.

| Indicates mutually exclusive information. You can use the argument to the left of the separator or the argument to the right of the separator. You cannot use both arguments in a single use of the command.

{ } Delimits a set of mutually exclusive arguments when one of the arguments is required. If the arguments are optional, they are enclosed in brackets ([ ]).

Note:

- The maximum number of characters in an argument is 256.
- Enclose argument values that have embedded spaces with either single or double quotation marks.

For example:

wsetsrc*[-S server] [-l label] [-n name] source*

The *source* argument is the only required argument for the **wsetsrc** command. The brackets around the other arguments indicate that these arguments are optional.

wlsac *[-l | -f format] [key...] profile*

In this example, the -l and -f format arguments are mutually exclusive and optional. The *profile* argument is required. The *key* argument is optional. The ellipsis (...) that follows the *key* argument indicates that you can specify multiple key names.

wrb -import *{rule_pack | rule_set}...*

In this example, the rule_pack and rule_set arguments are mutually exclusive, but one of the arguments must be specified. Also, the ellipsis marks (...) indicate that you can specify multiple rule packs or rule sets.

Appendix C. How to read syntax diagrams

The following rules apply to the syntax diagrams that are used in this information:

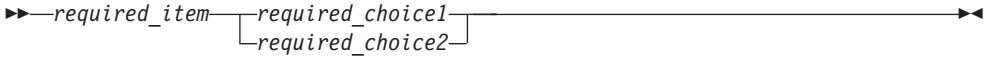
- Read the syntax diagrams from left to right, from top to bottom, following the path of the line. The following conventions are used:
  - The >>--- symbol indicates the beginning of a syntax diagram.
  - The ---> symbol indicates that the syntax diagram is continued on the next line.
  - The >--- symbol indicates that a syntax diagram is continued from the previous line.
  - The --->< symbol indicates the end of a syntax diagram.
- Required items appear on the horizontal line (the main path).

- Optional items appear below the main path.

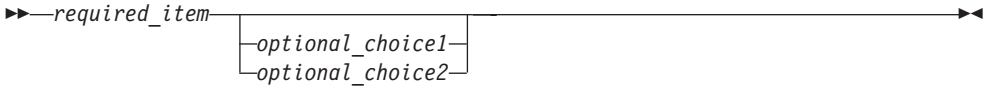
  If an optional item appears above the main path, that item has no effect on the execution of the syntax element and is used only for readability.

- If you can choose from two or more items, they appear vertically, in a stack.

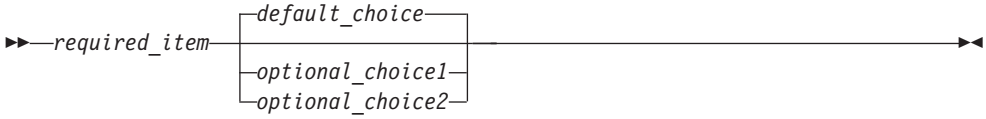
  If you must choose one of the items, one item of the stack appears on the main path.



  If choosing one of the items is optional, the entire stack appears below the main path.

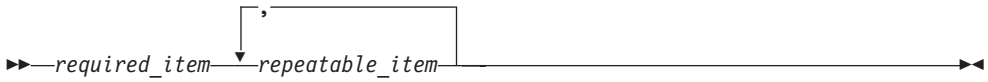


  If one of the items is the default, it appears above the main path, and the remaining choices are shown below.



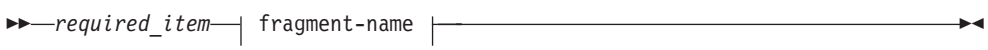
- An arrow returning to the left, above the main line, indicates an item that can be repeated.

If the repeat arrow contains a comma, you must separate repeated items with a comma.



A repeat arrow above a stack indicates that you can repeat the items in the stack.

- Sometimes a diagram must be split into fragments. The syntax fragment is shown separately from the main syntax diagram, but the contents of the fragment should be read as if they are on the main path of the diagram.



Fragment-name:

- Keywords, and their minimum abbreviations if applicable, appear in uppercase. They must be spelled exactly as shown.
- Variables appear in all lowercase italic letters (for example, **column-name**). They represent user-supplied names or values.
- Separate keywords and parameters by at least one space if no intervening punctuation is shown in the diagram.
- Enter punctuation marks, parentheses, arithmetic operators, and other symbols, exactly as shown in the diagram.
- Footnotes are shown by a number in parentheses, for example (1).

Appendix D. Contacting IBM

You can contact IBM for customer support, software services, product information, and general information. You also can provide feedback to IBM about products and documentation.

The following table lists resources for customer support, software services, training, and product and solutions information.

Table 10. IBM resources

Resource	Description and location
IBM Support Portal	You can customize support information by choosing the products and the topics that interest you at www.ibm.com/support/entry/portal/Software/Information_Management/InfoSphere_Information_Server
Software services	You can find information about software, IT, and business consulting services, on the solutions site at www.ibm.com/businesssolutions/
My IBM	You can manage links to IBM Web sites and information that meet your specific technical support needs by creating an account on the My IBM site at www.ibm.com/account/
Training and certification	You can learn about technical training and education services designed for individuals, companies, and public organizations to acquire, maintain, and optimize their IT skills at http://www.ibm.com/training
IBM representatives	You can contact an IBM representative to learn about solutions at www.ibm.com/connect/ibm/us/en/

Appendix E. Accessing the product documentation

Documentation is provided in a variety of formats: in the online IBM Knowledge Center, in an optional locally installed information center, and as PDF books. You can access the online or locally installed help directly from the product client interfaces.

IBM Knowledge Center is the best place to find the most up-to-date information for InfoSphere Information Server. IBM Knowledge Center contains help for most of the product interfaces, as well as complete documentation for all the product modules in the suite. You can open IBM Knowledge Center from the installed product or from a web browser.

Accessing IBM Knowledge Center

There are various ways to access the online documentation:

- Click the **Help** link in the upper right of the client interface.
- Press the F1 key. The F1 key typically opens the topic that describes the current context of the client interface.

  Note: The F1 key does not work in web clients.
- Type the address in a web browser, for example, when you are not logged in to the product.

  Enter the following address to access all versions of InfoSphere Information Server documentation:

  `http://www.ibm.com/support/knowledgecenter/SSZJPZ/`

  If you want to access a particular topic, specify the version number with the product identifier, the documentation plug-in name, and the topic path in the URL. For example, the URL for the 11.3 version of this topic is as follows. (The ⇒ symbol indicates a line continuation):

  ```
  http://www.ibm.com/support/knowledgecenter/SSZJPZ_11.3.0/⇒
  com.ibm.swg.im.iis.common.doc/common/accessingiidoc.html
  ```

  Tip:

  The knowledge center has a short URL as well:

  `http://ibm.biz/knowctr`

  To specify a short URL to a specific product page, version, or topic, use a hash character (#) between the short URL and the product identifier. For example, the short URL to all the InfoSphere Information Server documentation is the following URL:

  `http://ibm.biz/knowctr#SSZJPZ/`

  And, the short URL to the topic above to create a slightly shorter URL is the following URL (The ⇒ symbol indicates a line continuation):

  ```
  http://ibm.biz/knowctr#SSZJPZ_11.3.0/com.ibm.swg.im.iis.common.doc/⇒
  common/accessingiidoc.html
  ```

Changing help links to refer to locally installed documentation

IBM Knowledge Center contains the most up-to-date version of the documentation. However, you can install a local version of the documentation as an information center and configure your help links to point to it. A local information center is useful if your enterprise does not provide access to the internet.

Use the installation instructions that come with the information center installation package to install it on the computer of your choice. After you install and start the information center, you can use the **iisAdmin** command on the services tier computer to change the documentation location that the product F1 and help links refer to. (The ⇒ symbol indicates a line continuation):

Windows

```
IS_install_path\ASBServer\bin\iisAdmin.bat -set -key ⇒
com.ibm.iis.infocenter.url -value http://<host>:<port>/help/topic/
```

AIX® Linux

```
IS_install_path/ASBServer/bin/iisAdmin.sh -set -key ⇒
com.ibm.iis.infocenter.url -value http://<host>:<port>/help/topic/
```

Where <host> is the name of the computer where the information center is installed and <port> is the port number for the information center. The default port number is 8888. For example, on a computer named server1.example.com that uses the default port, the URL value would be http://server1.example.com:8888/help/topic/.

Obtaining PDF and hardcopy documentation

- The PDF file books are available online and can be accessed from this support document: https://www.ibm.com/support/docview.wss?uid=swg27008803&wv=1.
- You can also order IBM publications in hardcopy format online or through your local IBM representative. To order publications online, go to the IBM Publications Center at http://www.ibm.com/e-business/linkweb/publications/servlet/pbi.wss.

Appendix F. Providing feedback on the product documentation

You can provide helpful feedback regarding IBM documentation.

Your feedback helps IBM to provide quality information. You can use any of the following methods to provide comments:

- To provide a comment about a topic in IBM Knowledge Center that is hosted on the IBM website, sign in and add a comment by clicking **Add Comment** button at the bottom of the topic. Comments submitted this way are viewable by the public.
- To send a comment about the topic in IBM Knowledge Center to IBM that is not viewable by anyone else, sign in and click the **Feedback** link at the bottom of IBM Knowledge Center.
- Send your comments by using the online readers' comment form at www.ibm.com/software/awdtools/rcf/.
- Send your comments by e-mail to comments@us.ibm.com. Include the name of the product, the version number of the product, and the name and part number of the information (if applicable). If you are commenting on specific text, include the location of the text (for example, a title, a table number, or a page number).

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Table 11. Use of cookies by InfoSphere Information Server products and components

Product module	Component or feature	Type of cookie that is used	Collect this data	Purpose of data	Disabling the cookies
Any (part of InfoSphere Information Server installation)	InfoSphere Information Server web console	• Session • Persistent	User name	• Session management • Authentication	Cannot be disabled
Any (part of InfoSphere Information Server installation)	InfoSphere Metadata Asset Manager	• Session • Persistent	No personally identifiable information	• Session management • Authentication • Enhanced user usability • Single sign-on configuration	Cannot be disabled

Table 11. Use of cookies by InfoSphere Information Server products and components (continued)

Product module	Component or feature	Type of cookie that is used	Collect this data	Purpose of data	Disabling the cookies
InfoSphere DataStage	Big Data File stage	• Session • Persistent	• User name • Digital signature • Session ID	• Session management • Authentication • Single sign-on configuration	Cannot be disabled
InfoSphere DataStage	XML stage	Session	Internal identifiers	• Session management • Authentication	Cannot be disabled
InfoSphere DataStage	IBM InfoSphere DataStage and QualityStage Operations Console	Session	No personally identifiable information	• Session management • Authentication	Cannot be disabled
InfoSphere Data Click	InfoSphere Information Server web console	• Session • Persistent	User name	• Session management • Authentication	Cannot be disabled
InfoSphere Data Quality Console		Session	No personally identifiable information	• Session management • Authentication • Single sign-on configuration	Cannot be disabled
InfoSphere QualityStage Standardization Rules Designer	InfoSphere Information Server web console	• Session • Persistent	User name	• Session management • Authentication	Cannot be disabled
InfoSphere Information Governance Catalog		• Session • Persistent	• User name • Internal identifiers • State of the tree	• Session management • Authentication • Single sign-on configuration	Cannot be disabled
InfoSphere Information Analyzer	Data Rules stage in the InfoSphere DataStage and QualityStage Designer client	Session	Session ID	Session management	Cannot be disabled

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