Informatica

Informatica® PowerExchange for Greenplum 10.2.2

User Guide

Informatica PowerExchange for Greenplum User Guide
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Preface

The *Informatica PowerExchange® for Greenplum User Guide* provides information about loading data into a Greenplum target. It is written for database administrators and developers who are responsible for loading data into Greenplum.

This book assumes you have knowledge of relational database concepts and database engines, Greenplum, and Informatica.

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CHAPTER 1

Introduction to PowerExchange for Greenplum

This chapter includes the following topics:

PowerExchange for Greenplum Overview

You can use PowerExchange for Greenplum to load data to a Greenplum database.

When you run a Greenplum mapping, the Data Integration Service creates a control file to provide load specifications to the Greenplum gpload bulk loading utility, invokes the Greenplum gpload bulk loading utility, and writes data to the named pipe. The Greenplum gpload bulk loading utility launches gpfdist, which is Greenplum's file distribution program, that reads data from the pipe and loads data into the Greenplum target.

You can also use PowerExchange for Greenplum to load data to a HAWQ database in bulk.

Example

You have stored sales information of a store for the past five years. You can use PowerExchange for Greenplum to process sales information and then write to Greenplum tables for storage.

Introduction to the Greenplum Database

The Greenplum Database is a distributed storage system that you can use to store and analyze terabyte to petabytes of data. You can store data on large clusters of powerful and inexpensive servers and storage systems.

A Greenplum database is an array of PostgreSQL databases that consist of the master and segments. You can connect to the Greenplum Database through the master. The master authenticates the client connections and processes the SQL commands. The segments store data. Additionally, the segments process most of the queries. Greenplum interconnect or the networking layer that communicates between the PostgreSQL databases allows the system to behave as one logical database.

CHAPTER 2

PowerExchange for Greenplum Configuration

This chapter includes the following topics:

PowerExchange for Greenplum Overview

PowerExchange for Greenplum installs with the Informatica services and clients.

To configure PowerExchange for Greenplum, complete the prerequisites.

Prerequisites

Before you use PowerExchange for Greenplum, you must configure the Informatica services and clients.

Configure Informatica Services

1. Install the Informatica services.
2. Create a Data Integration Service and a Model Repository Service in the Informatica domain.
3. Install the Greenplum loaders package on the machine where the Data Integration Service runs. The loaders package contains the gpload utility.
4. Verify that you can connect to the Greenplum Database with the gpload utility.
5. Configure the environment variables.
6. On UNIX platforms, ensure that you have write access to the $HOME directory.

Configure Informatica Clients

1. Install the Informatica clients. When you install the Informatica clients, the Developer tool is installed.
2. On the Windows machine that hosts the Developer tool, copy the Pivotal JDBC driver to the following location:

   ```
   <Informatica Installation Directory>/clients/externaljdbcjars
   ```

   Use the Pivotal JDBC driver to import metadata from Greenplum.

Environment Variables

You must configure Greenplum environment variables before you can use PowerExchange for Greenplum.

For information about the environment variables that you need to set, access the `greenplum_loaders_path.sh` file or the `greenplum_loaders_path.bat` file from the location where you installed the Greenplum loaders package.

Note: The list of environment variables that you need to set might change. See the `greenplum_loaders_path` file for the latest updates.

Set the shared library environment variable based on the operating system.

The following table lists the shared library variables for each operating system:

Operating System	Variable
Solaris	LIBRARY_PATH
Linux	LIBRARY_PATH
AIX	PATH
All supported operating systems	GPHOME_LOADERS
All supported operating systems	PYTHONPATH

Setting the Environment Variables

- Configure the environment variables on the node where the Data Integration Service runs.

  GPHOME_LOADERS

  Represents the directory to the Greenplum libraries.

  Set to <Greenplum libraries directory>.

  For example, `GPHOME_LOADERS=opt/thirdparty/`.

  PYTHONPATH

  Represents the directory to the Python path libraries.

  Set to <Python path libraries directory>.

  For example, `PYTHONPATH=$GPHOME_LOADERS/bin/ext`.

  $GPHOME_LOADERS/lib

  Represents the path to the Greenplum libraries.

  $GPHOME_LOADERS/ext/python/lib

  Represents the path to the Python libraries.

CHAPTER 3

Greenplum Connections

This chapter includes the following topics:

Greenplum Connection Overview

Use a Greenplum connection to access a Greenplum database.

Create a connection to import Greenplum table metadata to create data objects, preview data, and run mappings. When you create a Greenplum connection, you define the connection attributes that the gpload utility uses to connect to a Greenplum database.

You can also use a Greenplum connection to load data to a HAWQ database in bulk. When you create the Greenplum connection, enter the connection attributes that are specific to the HAWQ database that you want to connect to. The gpload utility uses these attributes to connect to the HAWQ database.

SSL Authentication for Greenplum Targets

You can configure secure communication between the gpload utility and the Greenplum server by using the Secure Sockets Layer (SSL) protocol. SSL is a protocol that ensures secure data transfer between a client and a server.

To enable PowerExchange for Greenplum to secure communication between the gpload utility and the Greenplum server, select the **Enable SSL** option in the Greenplum connection. In the Greenplum connection, you must also define the path where the SSL certificates for the Greenplum server are stored.

For information about configuring SSL for the gpload utility, see the gpload documentation.

Greenplum Connection Properties

Use a Greenplum connection to connect to a Greenplum database. The Greenplum connection is a relational type connection. You can create and manage a Greenplum connection in the Administrator tool or the Developer tool.

Note: The order of the connection properties might vary depending on the tool where you view them.

When you create a Greenplum connection, you enter information for metadata and data access.

The following table describes Greenplum connection properties:

Property	Description
Name	Name of the Greenplum relational connection.
ID	String that the Data Integration Service uses to identify the connection. The ID is not case sensitive. It must be 255 characters or fewer and must be unique in the domain. You cannot change this property after you create the connection. Default value is the connection name.
Description	Description of the connection. The description cannot exceed 765 characters.
Location	Domain on which you want to create the connection.
Type	Type of connection.

The user name, password, driver name, and connection string are required to import the metadata. The following table describes the properties for metadata access:

Property	Description
User Name	User name with permissions to access the Greenplum database.
Password	Password to connect to the Greenplum database.
Driver Name	The name of the Greenplum JDBC driver. For example: `com.pivotal.jdbc.GreenplumDriver` For more information about the driver, see the Greenplum documentation.
Connection String	Use the following connection URL: `jdbc:pivotal:greenplum://<hostname>:<port>;DatabaseName=<database_name>` For more information about the connection URL, see the Greenplum documentation.

PowerExchange for Greenplum uses the host name, port number, and database name to create a control file to provide load specifications to the Greenplum gpload bulk loading utility. It uses the Enable SSL option and the certificate path to establish secure communication to the Greenplum server over SSL.

The following table describes the connection properties for data access:

Property	Description
Host Name	Host name or IP address of the Greenplum server.
Port Number	Greenplum server port number. If you enter 0, the gpload utility reads from the environment variable $PGPORT. Default is 5432.
Database Name	Name of the database.
Enable SSL	Select this option to establish secure communication between the gpload utility and the Greenplum server over SSL.
Certificate Path	Path where the SSL certificates for the Greenplum server are stored. For information about the files that need to be present in the certificates path, see the gpload documentation.

Creating a Greenplum Connection

Before you create a Greenplum data object, create a connection in the Developer tool.

1. Click **Window** > **Preferences**.
2. Select **Informatica** > **Connections**.
3. Expand the domain in the **Available Connections**.
4. Select **Databases** > **Greenplum Loaders** and click **Add.**
5. Enter a connection name.
6. Enter an ID for the connection.
7. Optionally, enter a connection description.
8. Select the domain on which you want to create the connection.
9. Select a Greenplum Loader connection type.
10. Click **Next**.
11. Configure the connection properties for metadata access and data access.
12. Click **Test Connection** to verify the connection to Greenplum.
13. Click **Finish**.

CHAPTER 4

PowerExchange for Greenplum Data Objects

This chapter includes the following topics:

Greenplum Data Object Overview

A Greenplum data object is a physical data object that uses Greenplum as a target. A Greenplum data object is the representation of data that is based on a Greenplum table. You can configure the data object write operation properties that determine how data can be loaded to Greenplum targets.

Import the Greenplum table into the Developer tool to create a Greenplum data object. Create a data object write operation for the Greenplum data object. Then, you can add the data object write operation to a mapping.

Greenplum Data Object Views

The Greenplum data object contains views to edit the object name and the properties.

After you create a Greenplum data object, you can change the data object and data object operation properties in the following data object views:

- **Overview** view. Use the **Overview** view to edit the Greenplum data object name, description, and tables.
- **Data Object Operation** view. Use the **Data Object Operation** view to view and edit the properties that the Data Integration Service uses when it writes data to Greenplum table.

When you create mappings with a Greenplum target, you can view the data object properties in the **Properties** view.

Greenplum Data Object Overview Properties

The Greenplum **Overview** section displays general information about the Greenplum data object and detailed information about the Greenplum table that you imported.

You configure the following general properties for a Greenplum data object:

Name

Name of the Greenplum data object.

Description

Description of the Greenplum data object.

Connection

Name of the Greenplum connection. Click **Browse** to select another Greenplum connection.

You can view the properties for the Greenplum table that you import:

Name

Name of the Greenplum table.

Type

Native datatype of the Greenplum table.

Description

Description of the Greenplum table.

Greenplum Data Object Write Operation Properties

The Data Integration Service writes data to a Greenplum table based on the data object write operation properties. The Developer tool displays the data object write operation properties for the Greenplum data object in the Data Object Operation section.

You can view or configure the data object write operation from the input and target properties.

- Input properties. Represents data that the Data Integration Service passes into the mapping pipeline. Select the input properties to edit the port properties and specify the advanced properties of the data object write operation.
- Target properties. Represents data that the Data Integration Service writes to the Greenplum table. Select the target properties to view data such as the name and description of the Greenplum table, create key columns to identify each row in a data object write operation, and create key relationships between data object write operations.

Input Properties of a Data Object Write Operation

The input properties represent data that the Data Integration Service passes into the mapping pipeline. Select the input properties to edit the port properties of the data object write operation. You can also specify advanced data object write operation properties to load data into Greenplum tables.

The input properties of the data object write operation include general properties that apply to the data object write operation. They also include port, source, and advanced properties that apply to the data object write operation.

You can view and change the input properties of the data object write operation from the **General**, **Ports**, **Sources**, and **Advanced** tabs.

General Properties

The general properties list the name and description of the data object write operation.

Ports Properties

The input ports properties list the datatypes, precision, and scale of the data object write operation.

You configure the following input ports properties in a data object write operation:

Name

Name of the port.

Type

Datatype of the port.

Precision

Maximum number of significant digits for numeric datatypes or maximum number of characters for string datatypes. For numeric datatypes, precision includes scale.

Scale

Maximum number of digits after the decimal point for numeric values.

Description

Description of the port.

Sources Properties

The sources properties list the Greenplum tables in the data object write operation.

Advanced Properties

The advanced properties allow you to specify data object write operation properties to load data into Greenplum tables.

You can configure the following advanced properties in the data object write operation:

Load Method

Determines how the gpload utility processes the data from the named pipe:

- Insert. Inserts rows into the target.
- Update. Updates rows in the target.
- Merge. If the rows exist in the target, updates the existing rows. If the rows do not exist in the target, inserts the rows into the target.

Match Columns

Matches rows based on the comma-separated list of column names. Enclose the column names in double quotes and ensure that there are no leading and trailing spaces between the column names.

Update Columns

Updates the columns specified in the comma-separated list of column names. Enclose the column names in double quotes and ensure that there are no leading and trailing spaces between the column names.

Update Condition

Updates a row based on the specified condition. The gpload utility performs an update or merge operation based on the update condition specified.

Format

The Data Integration Service writes data in a format that is compatible with the gpload utility. Select one of the following values:

- Text. In the text format, the Data Integration Service separates data using the delimiter character specified in the session properties. If the data contains the delimiter or escape characters specified in the session properties, you can choose to ignore the escape character or specify delimiter and escape character values that are not a part of the data.
- CSV. In the CSV format, the Data Integration Service encloses the data with the quote character specified in the session properties. The Data Integration Service also separates the data using the delimiter character specified in session properties. If the data contains the quote or escape characters specified in the session properties, you can choose to ignore the escape character or specify quote and escape character values that are not a part of the data.

Default is Text.

Note: If the data contains newline characters, you must use the CSV format. If you use the Text format and the data contains newline characters, the data after the newline character is treated as a new record. In such situations, the gpload utility might reject or insert incorrect data into the tables.

Delimiter

Delimiter separates successive input fields. For data in the text format, use any 7-bit ASCII value except a-z, A-Z, and 0-9. For data in the CSV format, use any 7-bit ASCII value except \n, \r, and \\.

Default is pipe (|).

You can also specify a non printable ASCII character through an escape sequence using the decimal representation of the ASCII character. For example, \014 represents the shift out character.

Escape

Character that treats special characters in the data as regular characters. In the text format, special characters comprise delimiter and escape characters. In the CSV format, special characters comprise quotes and escape characters. Use any 7-bit ASCII value as an escape character. Default is backslash (\).

Note: You can improve the session performance if the data does not contain escape characters.

Skip Escaping

Skips escaping special characters in the data. Clear this option to treat special characters in the data as regular characters.

Null As

String that represents a null value. In the source data, any data item that matches the string is treated as a null value. Default is backslash N (\N).

Quote

Character that encloses the data in the CSV format. The Data Integration Service encloses data by the specified character and passes the data to the gpload utility. The quote character is ignored for data in

the text format. Use any 7-bit ASCII value that is not equal to the delimiter or null value. Default is double quotes (").

Error Limit

For each Greenplum segment, across all partitions if pass-through partitioning is used, the number of rows that the gpload utility discards or logs in the error table because of format errors. The gpload utility fails the session if the error limit is reached for any Greenplum segment. Default is zero. The maximum error limit is 2,147,483,647.

Error Table

Name of the error table where the gpload utility logs rejected rows when reading data that is processed by the Data Integration Service. The naming convention for the table name is <schema name>.<table name>, where schema name is the name of the schema that contains the table.

Greenplum Pre SQL

The SQL command to run before loading data to the target.

Greenplum Post SQL

The SQL command to run after loading data to the target.

Truncate Target Option

Truncates the Greenplum target table before loading data to the target. Default is unchecked.

Reuse Table

Determines if the gpload utility drops the external table objects and staging table objects it creates. The gpload utility reuses the objects for future load operations that use the same load specifications.

Default is unchecked.

Greenplum Schema Name

Overrides the default schema name.

Name of the schema that contains the metadata for Greenplum targets.

Greenplum Target Table

Overrides the default target table name.

Greenplum Loader Logging Level

Sets the logging level for the gpload utility. You can select one of the following values:

- None
- Verbose
- Very Verbose

Default is None.

Greenplum gpfdist Timeout

The number of seconds that elapse before the gpfdist process times out when attempting to connect to the target. The default value is 30 seconds.

Windows Pipe Buffer Size

The number of kilobytes that the Data Integration Service allocates to buffer data before writing to the Greenplum bulk loader. Enter a value from 1 through 131072. The default value is 2048 KB. You might need to test different settings for optimal performance. This attribute is applicable for Informatica servers running on Windows.

Delete Control File

Determines if the Data Integration Service must delete the gpload control file after the session is complete.

Default is checked.

Gpload Log File Location

The file system location where the gpload utility generates the gpload log file.

Ensure that the file system location exists on all the nodes.

Default is the location of the temporary directories of the Data Integration Service process node.

Gpload Control File Location

The file system location where the Data Integration Service generates the gpload control file.

Ensure that the file system location exists on all the nodes.

Default is the location of the temporary directories of the Data Integration Service process node.

Encoding

Character set encoding of the source data.

PowerExchange for Greenplum supports only the UTF-8 character set encoding.

Pipe Location

The file system location where the pipes used for data transfer are created. This attribute is not applicable to Informatica servers running on Windows.

Ensure that the file system location exists on all the nodes.

Default is the location of the temporary directories of the Data Integration Service process node.

Port [Range]

The port number or port range that the gpfdist uses to read data from the pipe and load data to the Greenplum target.

If you specify a port number, the gpfdist uses the port number. If the port number you specify is not available, gpload fails.

If you specify a port range, the gpfdist uses a port that is available from the port range.

Default is [8000, 9000].

Max_Line_Length

The Max_Line_Length integer specifies the maximum length of a line in the XML transformation data that is passed to gpload.

Target Properties of the Data Object Write Operation

The target properties represent the data that is populated based on the Greenplum tables that you added when you created the data object. The target properties of the data object write operation include general and column properties that apply to the Greenplum tables. You can view the target properties of the data object write operation from the **General**, **Column**, and **Advanced** tabs.

General Properties

The general properties display the name and description of the Greenplum table.

Column Properties

The column properties display the datatypes, precision, and scale of the target property in the data object write operation.

You can view the following target column properties of the data object write operation:

Name

Name of the column property.

Type

Native datatype of the column property.

Precision

Maximum number of significant digits for numeric datatypes, or maximum number of characters for string datatypes. For numeric datatypes, precision includes scale.

Scale

Maximum number of digits after the decimal point for numeric values.

Primary Key

Determines if the column property is a part of the primary key.

Description

Description of the column property.

Advanced Properties

The advanced property displays the physical name of the Greenplum table.

Importing a Greenplum Data Object

Import a Greenplum data object to add to a mapping.

1. Select a project or folder in the **Object Explorer** view.
2. Click **File** > **New** > **Data Object**.
3. Select **Greenplum Data Object** and click **Next**.

   The **Greenplum Data Object** dialog box appears.
4. Enter a name for the data object.
5. Click **Browse** next to the **Location** option and select the target project or folder.
6. Click **Browse** next to the **Connection** option and select the Greenplum connection from which you want to import the Greenplum table metadata.
7. To add a table, click **Add** next to the **Selected Resources** option.

   The **Add Resource** dialog box appears.
8. Select a table. You can search for it or navigate to it.
   - Navigate to the Greenplum table that you want to import and click **OK**.
   - To search for a table, enter the name or the description of the table you want to add. Click **OK**.
9. If required, add more tables to the Greenplum data object.

You can also add tables to a Greenplum data object after you create it.

10. Click **Finish**.
    The data object appears under Data Objects in the project or folder in the **Object Explorer** view.

Creating a Data Object Operation Write Operation

You can create the data object write operation for one or more Greenplum data objects. You can add a Greenplum data object write operation to a mapping as a target.

1. Select the data object in the **Object Explorer** view.
2. Right-click and select **New** > **Data Object Operation**.

   The **Data Object Operation** dialog box appears.
3. Enter a name for the data object operation.
4. Select **Write** as the type of data object operation.
5. Click **Add**.

   The **Select Resources** dialog box appears.
6. Select the Greenplum table for which you want to create the data object write operation and click **OK**.

   You can select only one data object to a data object write operation.
7. Click **Finish**.

The Developer tool creates the data object write operation for the selected data object.

CHAPTER 5

Greenplum Mappings

This chapter includes the following topics:

Greenplum Mappings Overview

After you create a Greenplum data object write operation, you can develop a mapping.

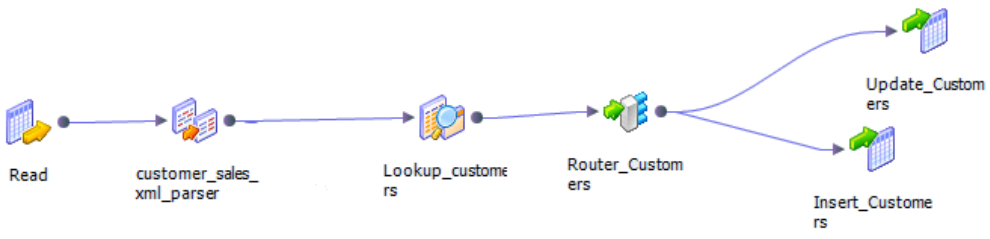
You can create an Informatica mapping that contains objects such as a relational or flat file data object operation as the input. You can add transformations and a Greenplum data object write operation as the output to load data to Greenplum tables.

Validate and run the mapping. You can deploy the mapping and run it, or you can add the mapping to a Mapping task in a workflow.

Greenplum Mapping Example

Your organization needs to sort sales information based on new and existing customers. Create a mapping that reads the sales information, segregates the sales information for new and existing customers, and loads specific data to the Greenplum table.

The following image shows the Greenplum mapping example:



The mapping contains an XML file as a source that contains sales information for your organization. The Data Processor transformation parses the XML file. The Lookup transformation looks up sales information based on the customer ID. The Router transformation routes the sales data based on new customers and

existing customers. The mapping output contains two Greenplum data object write operations to write data to the Greenplum table.

Mapping Input

The source for the mapping is an XML file stored in HDFS. The source contains information for your organization, including customer information, product information, and country information.

Source columns include columns for customer information, such as customer ID, first name, last name, gender, year of birth, email, phone number, and address.

Transformations

You can add the following transformations to get sales information based on new customers and existing customers:

Data Processor Transformation

The customer_sales_xml_parser transformation parses the XML file.

Lookup Transformation

The Lookup_customer transformation looks up sales information based on the customer ID. The lookup table has the same structure as the source.

You use the following lookup condition:

```
customerid=customerid1
```

Router Transformation

The Router_Customers transformation routes the sales data for new customers to the group called Insert_Customers and routes the sales data for existing customers to the group called Update_Customers.

Mapping Output

The mapping output is a Greenplum data object. To write data to the Greenplum table, create a data object write operation called Insert_Customers for new customers and a data object write operation called Update_Customers for existing customers.

The target columns include customer ID, first name, last name, gender, year of birth, email, phone number, and address.

When you run the mapping, the Data Integration Service loads the sales information to the Greenplum table. Analysts can run queries and generate reports based on the data in the Greenplum table.

CHAPTER 6

Greenplum Run-time Processing

This chapter includes the following topics:

Greenplum Run-time Processing Overview

When you develop a Greenplum mapping, you define data object operation write properties that determine how data can be loaded to Greenplum targets.

The data object operation write properties you can set include configuring the match and update columns and setting the error limit.

Match and Update Columns

Before you run a mapping that loads data to a Greenplum target, you can configure the match and update columns.

The Data Integration Service matches rows based on the list of column names you specify in the advanced properties of the data object write operation. The Data Integration Service updates columns based on the list of column names you specify in the advanced properties of the data object write operation.

You can configure the following data object write operation properties for match and update columns:

Match Column

Matches rows specified on the comma-separated list of column names. Enclose the column names in double quotes and ensure that there are no leading or trailing spaces between the column names.

Update Column

Updates the columns specified in the comma-separated list of column names. Enclose the column names in double quotes and ensure that there are no leading or trailing spaces between the column names.

Match Columns

You can specify the columns to use for the update of rows in the target. The attribute value in the specified target columns must be equal to that of the corresponding source data columns in order for the row to be updated in the target table. You must specify the match columns if you configure update or merge as the method to process data from the named pipe.

Update Columns

You can specify the columns to update for the rows that meet the criteria of the update column property. You must specify update columns that are not used for the Greenplum distribution key for the table. You must specify the update columns if you configure update or merge as the method to process data from the named pipe.

Error Handling for Greenplum Targets

You can set the error limit for a Greenplum segment to specify the number of rows that the gpload utility can discard before it fails a mapping. You can set the error limit in the Advanced properties of the data object write operation. If you specify an error table, the gpload utility logs the discarded rows in the error table.

The error limit includes rows with format errors. The default value is 0. By default, the gpload utility stops a mapping when it encounters a row with format errors.

Use the following naming convention for the error table name: `<schema name>.<table name>`

If you do not specify a schema name, the gpload utility creates the error table in the public schema. The error table format is predefined in the Greenplum database.

Consider the following behavior for error tables:

- If the table does not exist, the gpload utility creates the table based on the format predefined in the Greenplum database.
- If the specified table exists in the schema, but the table is not in the format predefined in the Greenplum database, the mapping fails.
- If a mapping fails, see the error table for more information about the errors.
- If you run the mapping again, the gpload utility appends the discarded rows to the error table.

For more information about the error tables, see the Greenplum documentation.

You can view load statistics in the session log. The gpload utility writes the error messages to the gpload log. The Data Integration Service reads the gpload log and writes the errors to the session log. The gpload utility writes the error messages to the gpload log at the location of the temporary directories of the Data Integration Service process node.

Parameterization

You can parameterize Greenplum data object operation properties to override the write data object operation properties during run time.

You can parameterize the following data object write operation properties for Greenplum targets:

- Load Method
- Match Columns
- Update Columns
- Update Condition
- Format
- Delimiter
- Escape
- Skip Escaping
- Null AS
- Quote
- Error Limit
- Error Table
- Greenplum Pre SQL
- Greenplum Post SQL
- Truncate Target Option
- Reuse Table
- Greenplum Schema Name
- Greenplum Target Table
- Greenplum Loader Logging Level
- Greenplum gpfdist Timeout
- Windows Pipe Buffer Size
- Delete Control File
- Gpload Log File Location
- Gpload Control File Location
- Encoding
- Pipe Location
- Port[Range]
- Max Line Length
- Treat Null as Empty String

The following attributes support partial parameterization:

- Update Condition
- Greenplum Pre SQL
- Greenplum Post SQL
- Gpload Log File Location

- Gpload Control File Location
- Pipe Location

Partitioning

When a mapping that is enabled for partitioning contains a Greenplum data object as a target, the Data Integration Service can use multiple threads to write to the target.

You can configure dynamic partitioning for Greenplum data object operations. The Data Integration Service processes partitions concurrently.

To enable partitioning, administrators and developers perform the following tasks:

Administrators set maximum parallelism for the Data Integration Service to a value greater than 1 in the Administrator tool.

Maximum parallelism determines the maximum number of parallel threads that process a single pipeline stage. Administrators increase the **Maximum Parallelism** property value based on the number of CPUs available on the nodes where mappings run.

Developers can set a maximum parallelism value for a mapping in the Developer tool.

By default, the **Maximum Parallelism** property for each mapping is set to Auto. Each mapping uses the maximum parallelism value defined for the Data Integration Service.

Developers can change the maximum parallelism value in the mapping run-time properties to define a maximum value for a particular mapping. When maximum parallelism is set to different integer values for the Data Integration Service and the mapping, the Data Integration Service uses the minimum value of the two.

When you run a Greenplum data object write operation, the Data Integration Service creates a control file to provide load specifications to the gpload utility, invokes the gpload utility, and writes data to the named pipe. Each partition creates a pipe. The gpload utility launches gpfdist, which is the file distribution program of Greenplum, that reads data from the named pipe and writes data into the Greenplum target.

APPENDIX A

Data Type Reference

This appendix includes the following topics:

Data Type Reference Overview

When you import Greenplum tables as a data object and create a data object write operation, the JDBC data types corresponding to the Greenplum data types appear in the Developer tool.

The Data Integration Service writes the data as JDBC data types. PowerExchange for Greenplum writes the data into the gpload utility and the gpload utility converts the data type to the Greenplum data type before it writes to the Greenplum database.

Greenplum, JDBC, and Transformation Data Types

The following table lists the Greenplum data types that Data Integration Service supports and the corresponding JDBC and transformation data types:

Greenplum Data Type	JDBC Data Type	Transformation Data Type
Bigint	BIGINT	Bigint
Bigserial	BIGINT	Bigint
Boolean	BOOLEAN	String
Character	CHARACTER	String
Character varying	CHARACTER VARYING	String
Date	DATE	Date/Time
Numeric	NUMERIC	Decimal

Greenplum Data Type	JDBC Data Type	Transformation Data Type
Double precision	DOUBLE PRECISION	Double
Integer	INTEGER	Integer
Real	REAL	Double
Serial	INTEGER	Integer
Smallint	INTEGER	Integer
Text	TEXT	Text
Time	TIME	Date/Time
Timestamp	TIMESTAMP	Date/Time

Note: The Developer tool converts the unsupported data types to CHARACTER VARYING data types with a precision of zero.

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