

Data Warehouse Service

Tool Guide

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1 Overview

This document describes how to use GaussDB(DWS) tools, including client tools, as shown in [Table 1-1](#), and server tools, as shown in [Table 1-2](#).

The client tools can be obtained by referring to [Downloading Client Tools](#).

The server tools are stored in the `$GPHOME/script` and `$GAUSSHOME/bin` paths on the database server.

Table 1-1 Client Tools

Tool	Description
gsq	A command-line interface (CLI) SQL client tool running on the Linux OS. It is used to connect to the database in a GaussDB(DWS) cluster and perform operation and maintenance on the database.
Data Studio	A client tool used to connect to a database. It provides a GUI for managing databases and objects, editing, executing, and debugging SQL scripts, and viewing execution plans. Data Studio can run on a 32-bit or 64-bit Windows OS. You can use it after decompression without installation.
GDS	A CLI tool running on the Linux OS. It works with foreign tables to quickly import and export data. The GDS tool package needs to be installed on the server where the data source file is located. This server is called the data server or the GDS server.
DSC	A CLI tool used for migrating SQL scripts from Teradata or Oracle to GaussDB(DWS) to rebuild a database on GaussDB(DWS). DSC runs on the Linux OS. You can use it after decompression without installation.

Table 1-2 Server Tools

Tool	Description
gs_dump	gs_dump exports database information, such as the complete and consistent data of database objects (including databases, schemas, tables, and views), without affecting the normal access of users to the database.
gs_dumpall	gs_dumpall exports database information, such as the complete and consistent data of database objects, without affecting the normal access of users to the database.
gs_restore	gs_restore is a tool provided by GaussDB(DWS) to import data that is exported using gs_dump. It can also be used to import files that were exported using gs_dump .
gds_check	gds_check is used to check the GDS deployment environment, including the OS parameters, network environment, and disk usage. It also supports the correction of system parameters. This helps detect potential problems during GDS deployment and running, improving the execution success rate.
gds_install	gds_install is a script tool used to install GDS in batches, improving GDS deployment efficiency.
gds_uninstall	gds_uninstall is a script tool used to uninstall GDS in batches.
gds_ctl	gds_ctl is a script tool used for starting or stopping GDS service processes in batches. You can start or stop GDS service processes, which use the same port, on multiple nodes at a time, and set a daemon for each GDS process during the startup.
gs_sshexkey	During cluster installation, you need to execute commands and transfer files among hosts in the cluster. gs_sshexkey is used to help users establish mutual trust.

2 Downloading Client Tools

Step 1 Log in to the GaussDB(DWS) management console.

Step 2 In the navigation tree on the left, click **Connections**.

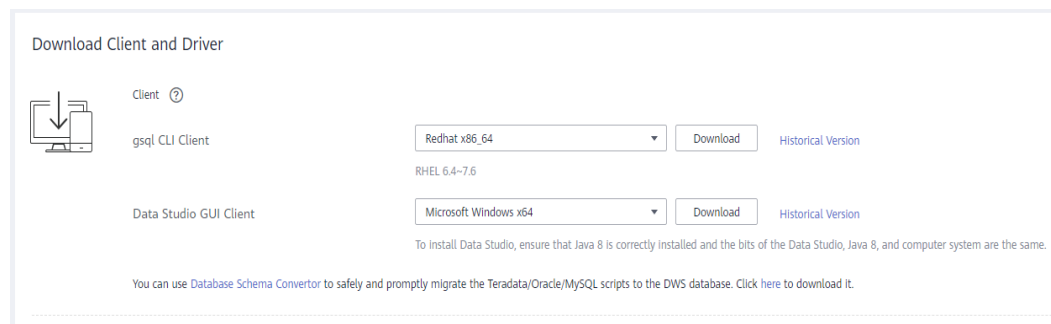
Step 3 In the **Download Client and Driver** area, select the tools corresponding to the cluster version based on the computer OS and download them.

You can download the following tools:

- gsql CLI client: The gsql tool package contains the gsql client tool, GDS (parallel data loading tool), gs_dump, gs_dumpall, and gs_restore tools.
- Data Studio GUI client
- DSC migration tool

The gsql and Data Studio client tools have multiple historical versions. You can click **Historical Version** to download the tools based on the cluster version. GaussDB(DWS) clusters are compatible with earlier versions of gsql and Data Studio tools. You are advised to download the matching tool version based on the cluster version.

Figure 2-1 Downloading clients



----End

3 gsql - CLI Client

3.1 Overview

Basic Functions

- **Connect to the database:** Use the gsql client to remotely connect to the GaussDB(DWS) database.

 **NOTE**

If the gsql client is used to connect to a database, the connection timeout period will be 5 minutes. If the database has not correctly set up a connection and authenticated the identity of the client within this period, gsql will time out and exit.

To resolve this problem, see [Troubleshooting](#).

- **Run SQL statements:** Interactively entered SQL statements and specified SQL statements in a file can be run.
- **Run meta-commands:** Meta-commands help the administrator view database object information, query cache information, format SQL output, and connect to a new database. For details about meta-commands, see [Meta-Command Reference](#).

Advanced Features

[Table 3-1](#) lists the advanced features of gsql.

Table 3-1 Advanced features of gsql

Feature	Description
Variable	<p>gsql provides a variable feature that is similar to the shell command of Linux. The following \set meta-command of gsql can be used to set a variable:</p> <pre>\set varname value</pre> <p>To delete a variable, run the following command:</p> <pre>\unset varname</pre> <p>NOTE</p> <ul style="list-style-type: none"> • A variable is a key-value pair. The value length is determined by the special variable VAR_MAX_LENGTH. For details, see Table 3-2. • Variable names must consist of case-sensitive letters (including non-Latin letters), digits, and underscores (_). • If the \set varname meta-command (without the second parameter) is used, the variable is set without a value specified. • If the \set meta-command without parameters is used, values of all variables are displayed. <p>For details about variable examples and descriptions, see Variable.</p>
SQL substitution	<p>Common SQL statements can be set to variables using the variable feature of gsql to simplify operations.</p> <p>For details about SQL substitution examples and descriptions, see Variable.</p>
Customized prompt	<p>Prompts of gsql can be customized. Prompts can be modified by changing the reserved variables of gsql: <i>PROMPT1</i>, <i>PROMPT2</i>, and <i>PROMPT3</i>.</p> <p>These variables can be set to customized values or the values predefined by gsql. For details, see Variable.</p>
Client operation history record	<p>gsql records client operation history. This function is enabled by specifying the -r parameter when a client is connected. The number of historical records can be set using the \set command. For example, \set HISTSIZE 50 indicates that the number of historical records is set to 50. \set HISTSIZE 0 indicates that the operation history is not recorded.</p> <p>NOTE</p> <ul style="list-style-type: none"> • The default number of historical records is 32. The maximum number of historical records is 500. If interactively entered SQL statements contain Chinese characters, only the UTF-8 encoding environment is supported. • For security reasons, the records containing sensitive words, such as PASSWORD and IDENTIFIED, are regarded sensitive and not recorded in historical information. This indicates that you cannot view these records in command output histories.

- Variable

To set a variable, run the **\set** meta-command of gsql. For example, to set variable *foo* to **bar**, run the following command:

```
\set foo bar
```

To quote the value of a variable, add a colon (:) before the variable. For example, to view the value of variable *foo*, run the following command:

```
\echo :foo  
bar
```

This variable quotation method is suitable for regular SQL statements and meta-commands.

When the CLI parameter **--dynamic-param** (for details, see [Table 3-7](#)) is used or the special variable **DYNAMIC_PARAM_ENABLE** (for details, see [Table 3-2](#)) is set to **true**, you can execute the SQL statement to set the variable. The variable name is the column name in the SQL execution result and can be referenced using **\${}**. Example:

```
\set DYNAMIC_PARAM_ENABLE true  
SELECT 'Jack' AS "Name";  
Name  
-----  
Jack  
(1 row)  
  
\echo ${Name}  
Jack
```

In the preceding example, the SELECT statement is used to set the **Name** variable, and the **\${}** referencing method is used to obtain the value of the **Name** variable. In this example, the special variable **DYNAMIC_PARAM_ENABLE** controls this function. You can also use the CLI parameter **--dynamic-param** to control this function, for example, **gsql -d postgres -p 25308 --dynamic-param -r**.

NOTE

- Do not set variables when the SQL statement execution fails.
- If the SQL statement execution result is empty, set the column name as a variable and assign it with an empty string.
- If the SQL statement execution result is a record, set the column name as a variable and assign it with the corresponding string.
- If the SQL statement execution result contains multiple records, set the column name as a variable concatenated by specific characters, and then assign the value to the variable. The special variable **RESULT_DELIMITER** (for details, see [Table 3-2](#)) determines the specific character. The default delimiter is a comma (,).

Examples of setting variables by executing SQL statements:

```
\set DYNAMIC_PARAM_ENABLE true  
CREATE TABLE student (id INT, name VARCHAR(32)) DISTRIBUTE BY HASH(id);  
CREATE TABLE  
INSERT INTO student VALUES (1, 'Jack'), (2, 'Tom'), (3, 'Jerry');  
INSERT 0 3  
-- Do not set variables when the SQL statement execution fails.  
SELECT id, name FROM student ORDER BY idi;  
ERROR: column "idi" does not exist  
LINE 1: SELECT id, name FROM student ORDER BY idi;  
                                         ^  
  
\echo ${id} ${name}  
${id} ${name}  
  
-- If the execution result contains multiple records, use specific characters to concatenate the values.  
SELECT id, name FROM student ORDER BY id;  
id | name  
-----+-----  
1 | Jack  
2 | Tom  
3 | Jerry  
(3 rows)
```



```
\echo ${id} ${name}
1,2,3 Jack,Tom,Jerry

-- If the execution result contains only one record, execute the following statement to set the variable:
SELECT id, name FROM student where id = 1;
id | name
----+-----
 1 | Jack
(1 row)

\echo ${id} ${name}
1 Jack

-- If the execution result is empty, assign the variable with an empty string as follows:
SELECT id, name FROM student where id = 4;
id | name
----+-----
(0 rows)

\echo ${id} ${name}
```

gsql pre-defines some special variables and plans the values of these variables. To ensure compatibility with later versions, do not use these variables for other purposes. For details about all special variables, see [Table 3-2](#).

 **NOTE**

- All the special variables consist of uppercase letters, digits, and underscores (_).
- To view the default value of a special variable, run the `\echo :varname` meta-command, for example, `\echo :DBNAME`.

Table 3-2 Setting special variables

Variable	Setting Method	Description
DBNAME	<code>\set DBNAME dbname</code>	Specifies the name of a connected database. This variable is set again when a database is connected.
ECHO	<code>\set ECHO all queries</code>	<ul style="list-style-type: none">• If this variable is set to all, only the query information is displayed. This has the same effect as specifying the -a parameter when gsql is used to connect to a database.• If this variable is set to queries, the command line and query information are displayed. This has the same effect as specifying the -e parameter when gsql is used to connect to a database.

Variable	Setting Method	Description
ECHO_HIDDEN	\set ECHO_HIDDEN on off noexec	<p>When a meta-command (such as <code>\dg</code>) is used to query database information, the value of this variable determines the query behavior.</p> <ul style="list-style-type: none"> If this variable is set to on, the query statements that are called by the meta-command are displayed, and then the query result is displayed. This has the same effect as specifying the -E parameter when gsql is used to connect to a database. If this variable is set to off, only the query result is displayed. If this variable is set to noexec, only the query information is displayed, and the query is not run.
ENCODING	\set ENCODING <i>encoding</i>	Specifies the character set encoding of the current client.
FETCH_COUNT	\set FETCH_COUNT <i>variable</i>	<ul style="list-style-type: none"> If the value is an integer greater than 0, for example, <i>n</i>, <i>n</i> lines will be selected from the result set to the cache and displayed on the screen when the SELECT statement is run. If this variable is not set or set to a value less than or equal to 0, all results are selected at a time to the cache when the SELECT statement is run. <p>NOTE Setting this variable to a proper value reduces memory usage. Generally, values from 100 to 1000 are proper.</p>
HISTCONTROL	\set HISTCONTROL ignorespace ignoredups ignoreboth none	<ul style="list-style-type: none"> ignorespace: A line started with a space is not written to the historical record. ignoredups: A line that exists in the historical record is not written to the historical record. ignoreboth, none, or other values: All the lines read in interaction mode are saved in the historical record. <p>NOTE none indicates that HISTCONTROL is not set.</p>

Variable	Setting Method	Description
HISTFILE	\set HISTFILE <i>filename</i>	Specifies the file for storing historical records. The default value is <code>~/.bash_history</code> .
HISTSIZE	\set HISTSIZE <i>size</i>	Specifies the number of commands in the history command. The default value is 500 .
HOST	\set HOST <i>hostname</i>	Specifies the name of a connected host.
IGNOREEOF	\set IGNOREEOF <i>variable</i>	<ul style="list-style-type: none"> If this variable is set to a number, for example, 10, the first nine EOF characters (generally Ctrl+C) entered in gsql are neglected and the gsql program exits when the tenth Ctrl+C is entered. If this variable is set to a non-numeric value, the default value is 10. If this variable is deleted, gsql exits when an EOF is entered.
LASTOID	\set LASTOID <i>oid</i>	Specifies the last OID, which is the value returned by an INSERT or lo_import command. This variable is valid only before the output of the next SQL statement is displayed.
ON_ERROR_ROLLBACK	\set ON_ERROR_ROLLBACK on interactive off	<ul style="list-style-type: none"> If the value is on, an error that may occur in a statement in a transaction block is ignored and the transaction continues. If the value is interactive, the error is ignored only in an interactive session. If the value is off (the default value), the error triggers the rollback of the transaction block. In on_error_rollback-on mode, a SAVEPOINT is set before each statement of a transaction block, and an error triggers the rollback of the transaction block.
ON_ERROR_STOP	\set ON_ERROR_STOP on off	<ul style="list-style-type: none"> on: specifies that the execution stops if an error occurs. In interactive mode, gsql returns the output of executed commands immediately. off (default value): specifies that an error, if occurring during the execution, is ignored, and the execution continues.

Variable	Setting Method	Description
PORT	<code>\set PORT <i>port</i></code>	Specifies the port number of a connected database.
USER	<code>\set USER <i>username</i></code>	Specifies the connected database user.
VERBOSITY	<code>\set VERBOSITY terse default verbose</code>	This variable can be set to terse , default , or verbose to control redundant lines of error reports. <ul style="list-style-type: none">• terse: Only critical and major error texts and text locations are returned (which is suitable for single-line error information).• default: Critical and major error texts and text locations, error details, and error messages (possibly involving multiple lines) are all returned.• verbose: All error information is returned.
VAR_NOT_FOUND	<code>\set VAR_NOT_FOUND default null error</code>	You can set this parameter to default , null , or error to control the processing mode when the referenced variable does not exist. <ul style="list-style-type: none">• default: Do not replace the variable and retain the original character string.• null: Replace the original character string with an empty character string.• error: Output error information and retain the original character string.
VAR_MAX_LENGTH	<code>\set VAR_MAX_LENGTH <i>variable</i></code>	Specifies the variable value length. The default value is 4096. If the length of a variable value exceeds the specified parameter value, the variable value is truncated and an alarm is generated.
ERROR_LEVEL	<code>\set ERROR_LEVEL transaction statement</code>	Indicates whether a transaction or statement is successful or not. Value options: transaction or statement . Default value: transaction <ul style="list-style-type: none">• statement: ERROR records whether the previous SQL statement is executed successfully.• transaction: ERROR records whether the previous SQL statement is successfully executed or whether an error occurs during the execution of the previous transaction.

Variable	Setting Method	Description
ERROR	\set ERROR true false	Indicates whether the previous SQL statement is successfully executed or whether an error occurs during the execution of the previous transaction. false : succeeded. true : failed. default value: false The setting can be updated by executing SQL statements. You are not advised to manually set this parameter.
LAST_ERROR_SQLSTATE	\set LAST_ERROR_SQLSTATE state	Error code of the previously failed SQL statement execution. The default value is 00000 . The setting can be updated by executing SQL statements. You are not advised to manually set this parameter.
LAST_ERROR_MESSAGE	\set LAST_ERROR_MESSAGE message	Error message of the previously failed SQL statement execution. The default value is an empty string. The setting can be updated by executing SQL statements. You are not advised to manually set this parameter.
ROW_COUNT	\set ROW_COUNT count	<ul style="list-style-type: none"> If ERROR_LEVEL is set to statement, this parameter indicates the number of rows returned after the previous SQL statement is executed or the number of affected rows. If ERROR_LEVEL is set to transaction and an internal error occurs when a transaction ends, this parameter indicates the number of rows returned by the last SQL statement of the transaction or the number of affected rows. Otherwise, this parameter indicates the number of rows returned by the last SQL statement or the number of affected rows. <p>If the SQL statement fails to be executed, set this parameter to 0. The default value is 0. The setting can be updated by executing SQL statements. You are not advised to manually set this parameter.</p>

Variable	Setting Method	Description
SQLSTATE	<code>\set SQLSTATE state</code>	<ul style="list-style-type: none">• If <code>ERROR_LEVEL</code> is set to statement, this parameter indicates the status code of the previous SQL statement.• If <code>ERROR_LEVEL</code> is set to transaction and an internal error occurs when a transaction ends, this parameter indicates the status code of the last SQL statement in the transaction. Otherwise, this parameter indicates the status code of the previous SQL statement. <p>The default value is 00000. The setting can be updated by executing SQL statements. You are not advised to manually set this parameter.</p>
LAST_SYS_CODE	<code>\set LAST_SYS_CODE code</code>	Returned value of the previous system command execution. The default value is 0 . The setting can be updated by using the meta-command <code>\!</code> to run the system command. You are not advised to manually set this parameter.
DYNAMIC_PARAMETER_ENABLE	<code>\set DYNAMIC_PARAMETER_ENABLE true false</code>	Controls the generation of variables and the variable referencing method <code>\${}</code> during SQL statement execution. The default value is false . <ul style="list-style-type: none">• true: Generate variables when executing SQL statements, and support the <code>\${}</code> variable referencing method.• false: Do not generate variables when executing SQL statements, and the <code>\${}</code> variable referencing method is not supported either.
RESULT_DELIMITER	<code>\set RESULT_DELIMITER delimiter</code>	Controls the delimiter used for concatenating multiple records when variables are generated during SQL statement execution. The default delimiter is comma (,).

Variable	Setting Method	Description
COMPARE_STRATEGY	<code>\set COMPARE_STRATEGY default natural equal</code>	<p>Used to control the value comparison policy of the <code>\if</code> expression. The default value is default.</p> <ul style="list-style-type: none">• default: Specifies the default comparison policy. Only strings or numbers can be compared, and strings cannot be compared with numbers. Parameters inside single quotation marks (') are identified as strings, and parameters outside single quotation marks (') are identified as numbers.• natural: The default comparison policy is supported, and parameters that contain dynamic variables can also be identified as strings. When one side of the comparison operator is a number, try to convert the other side to a number, and then compare the numbers on both sides. If the conversion fails, an error is reported and the comparison result is false.• equal: Only the equality comparison is supported. The comparison is performed based on strings. <p>For details, see \if conditional block comparison rules and examples.</p>
COMMAND_ERROR_STOP	<code>\set COMMAND_ERROR_STOP on off</code>	<p>Determines whether to report the error and stop executing the meta-command when an error occurs during meta-command execution. By default, the meta-command execution is not stopped.</p> <p>For details, see the COMMAND_ERROR_STOP example.</p>

- The following is an example of using the special variables **ERROR_LEVEL** and **ERROR**:

When **ERROR_LEVEL** is set to **statement**, **ERROR** records whether the previous SQL statement is executed successfully. In the following example, when a SQL execution error occurs in a transaction and the transaction ends, the value of **ERROR** is **false**. In this case, **ERROR** only records whether the previous SQL statement is executed successfully.

```
\set ERROR_LEVEL statement
begin;
BEGIN
select 1 as ;
ERROR: syntax error at or near ";"
```

```
LINE 1: select 1 as ;
          ^
end;
ROLLBACK
\echo :ERROR
false
```

When **ERROR_LEVEL** is set to **transaction**, **ERROR** can be used to capture SQL execution errors in a transaction. In the following example, when a SQL execution error occurs in a transaction and the transaction ends, the value of **ERROR** is **true**.

```
\set ERROR_LEVEL transaction
begin;
BEGIN
select 1 as ;
ERROR: syntax error at or near ";"
LINE 1: select 1 as ;
          ^
end;
ROLLBACK
\echo :ERROR
true
```

- The following is an example of using the special variable **COMMAND_ERROR_STOP**:

When **COMMAND_ERROR_STOP** is set to **on** and an error occurs during the meta-command execution, the error is reported and the meta-command execution is stopped.

When **COMMAND_ERROR_STOP** is set to **off** and an error occurs during the meta-command execution, related information is printed and the script continues to be executed.

```
\set COMMAND_ERROR_STOP on
\i /home/omm/copy_data.sql

select id, name from student;
```

When **COMMAND_ERROR_STOP** in the preceding script is set to **on**, an error message is displayed after the meta-command reports an error, and the script execution is stopped.

```
gsql:test.sql:2: /home/omm/copy_data.sql: Not a directory
```

When **COMMAND_ERROR_STOP** is set to **off**, an error message is displayed after the meta-command reports an error, and the **SELECT** statement continues to be executed.

```
gsql:test.sql:2: /home/omm/copy_data.sql: Not a directory
id | name
----+-----
 1 | Jack
(1 row)
```

- **SQL substitution**

gsql, like a parameter of a meta-command, provides a key feature that enables you to substitute a standard SQL statement for a gsql variable. gsql also provides a new alias or identifier for the variable. To replace the value of a variable using the SQL substitution method, add a colon (:) in front of the variable. For example:

```
\set foo 'HR.areaS'
select * from :foo;
area_id | area_name
-----+-----
 4 | Iron
 3 | Desert
```



```
1 | Wood
2 | Lake
(4 rows)
```

The above command queries the **HR.areaS** table.

NOTICE

The value of a variable is copied character by character, and even an asymmetric quote mark or backslash (\) is copied. Therefore, the input content must be meaningful.

- Prompt
The gsql prompt can be set using the three variables in [Table 3-3](#). These variables consist of characters and special escape characters.

Table 3-3 Prompt variables

Variable	Description	Example
PROMPT1	Specifies the normal prompt used when gsql requests a new command. The default value of <i>PROMPT1</i> is: %/R%#	<i>PROMPT1</i> can be used to change the prompt. <ul style="list-style-type: none"> • Change the prompt to [local]: \set PROMPT1 %M [local:/tmp/gaussdba_mppdb] • Change the prompt to name: \set PROMPT1 name name • Change the prompt to =: \set PROMPT1 %R =
PROMPT2	Specifies the prompt displayed when more command input is expected. For example, it is expected if a command is not terminated with a semicolon (;) or a quote (") is not closed.	<i>PROMPT2</i> can be used to display the prompt: \set PROMPT2 TEST select * from HR.areaS TEST; area_id area_name -----+----- 1 Wood 2 Lake 4 Iron 3 Desert (4 rows))
PROMPT3	Specifies the prompt displayed when the COPY statement (such as COPY FROM STDIN) is run and data input is expected.	<i>PROMPT3</i> can be used to display the COPY prompt. \set PROMPT3 '>>>>' copy HR.areaS from STDIN; Enter data to be copied followed by a newline. End with a backslash and a period on a line by itself. >>>>1 aa >>>>2 bb >>>>\.

The value of the selected prompt variable is printed literally. However, a value containing a percent sign (%) is replaced by the predefined contents

depending on the character following the percent sign (%). For details about the defined substitutions, see [Table 3-4](#).

Table 3-4 Defined substitutions

Symbol	Description
%M	Specifies the full host name (with domain name). The full name is [local] if the connection is over a Unix domain socket, or [local:/dir/name] if the Unix domain socket is not at the compiled default location.
%m	Specifies the host name truncated at the first dot. It is [local] if the connection is over a Unix domain socket.
%>	Specifies the number of the port that the host is listening on.
%n	Specifies the database session user name.
%/	Specifies the name of the current database.
%~	Is similar to %/. However, the output is tilde (~) if the database is your default database.
%#	Uses # if the session user is the database administrator. Otherwise, uses >.
%R	<ul style="list-style-type: none">• Normally uses = for <i>PROMPT1</i>, but ^ in single-line mode and ! if the session is disconnected from the database (which may occur if \connect fails).• For <i>PROMPT2</i>, the sequence is replaced by a hyphen (-), asterisk (*), single quotation mark ('), double quotation mark ("), or dollar sign (\$), depending on whether gsql is waiting for more input, or the query is not terminated, or the query is in the /* ... */ the comment, quotation mark, or dollar sign extension.
%x	Specifies the transaction status. <ul style="list-style-type: none">• An empty string when it is not in a transaction block• An asterisk (*) when it is in a transaction block• An exclamation mark (!) when it is in a failed transaction block• A question mark (?) when the transaction status is indeterminate (for example, indeterminate due to no connections).
%digits	Is replaced with the character with the specified byte.
%:name	Specifies the value of the <i>name</i> variable of gsql.
%command	Specifies command output, similar to ordinary "back-tick" ("^") substitution.

Symbol	Description
%[. . . %]	<p>Prompts can contain terminal control characters which, for example, change the color, background, or style of the prompt text, or change the title of the terminal window. For example:</p> <pre>potgres=> \set PROMPT1 '%[%033[1;33;40m%]%n@%/%R%[%033[0m%]%'</pre> <p>The output is a boldfaced (1;) yellow-on-black (33;40) prompt on VT100-compatible, color-capable terminals.</p>

Environment Variables

Table 3-5 Environment variables related to gsql

Name	Description
COLUMNS	If <code>\set columns</code> is set to 0 , this parameter controls the width of the wrapped format. This width determines whether the width output mode is changed to a vertical bar format in automatic expansion mode.
PAGER	<p>If the query result cannot be displayed within one page, the query result will be redirected to the command. You can use the <code>\pset</code> command to disable the pager. Typically, the more or less command is used for viewing the query result page by page. The default value is platform-associated.</p> <p>NOTE Display of the less command is affected by the <code>LC_CTYPE</code> environmental variable.</p>
PSQL_EDITOR	The <code>\e</code> and <code>\ef</code> commands use the editor specified by the environment variables. Variables are checked according to the list sequence. The default editor on Unix is vi.
EDITOR	
VISUAL	
PSQL_EDITOR_LINENUMBER_ARG	<p>When the <code>\e</code> or <code>\ef</code> command is used with a line number parameter, this variable specifies the command-line parameter used to pass the starting line number to the editor. For editors, such as Emacs or vi, this is a plus sign. A space is added behind the value of the variable if whitespace is required between the option name and the line number. For example:</p> <pre>PSQL_EDITOR_LINENUMBER_ARG = '+' PSQL_EDITOR_LINENUMBER_ARG='--line '</pre> <p>A plus sign (+) is used by default on Unix.</p>
PSQLRC	Specifies the location of the user's <code>.gsqlrc</code> file.
SHELL	Has the same effect as the <code>\!</code> command.

Name	Description
TMPDIR	Specifies the directory for storing temporary files. The default value is <code>/tmp</code> .

3.2 Instruction

Downloading and Installing gsql and Using It to Connect to the Cluster Database

For details about how to download and install gsql and connect it to the cluster database, see "Using the gsql CLI Client to Connect to a Cluster" in the *Data Warehouse Service (DWS) Management Guide*.

Example

The example shows how to spread a command over several lines of input. Pay attention to prompt changes:

```
postgres=# CREATE TABLE HR.areaS(  
postgres=# area_ID NUMBER,  
postgres=# area_NAME VARCHAR2(25)  
postgres-# )tablespace EXAMPLE;  
CREATE TABLE
```

View the table definition.

```
\d HR.areaS  
      Table "hr.areas"  
  Column |      Type      | Modifiers  
-----+-----+-----  
 area_id | numeric        | not null  
 area_name | character varying(25) |
```

Insert four lines of data into **HR.areaS**.

```
INSERT INTO HR.areaS (area_ID, area_NAME) VALUES (1, 'Wood');  
INSERT 0 1  
INSERT INTO HR.areaS (area_ID, area_NAME) VALUES (2, 'Lake');  
INSERT 0 1  
INSERT INTO HR.areaS (area_ID, area_NAME) VALUES (3, 'Desert');  
INSERT 0 1  
INSERT INTO HR.areaS (area_ID, area_NAME) VALUES (4, 'Iron');  
INSERT 0 1
```

Change the prompt.

```
\set PROMPT1 '%n@%m %~%R%#'  
dbadmin@[local] postgres=#
```

View the table.

```
dbadmin@[local] postgres=#SELECT * FROM HR.areaS;  
 area_id | area_name  
-----+-----  
      1 | Wood  
      4 | Iron  
      2 | Lake  
      3 | Desert  
(4 rows)
```

Run the `\pset` command to display the table in different ways.

```
dbadmin@[local] postgres=#\pset border 2
Border style is 2.
dbadmin@[local] postgres=#SELECT * FROM HR.areaS;
+-----+-----+
| area_id | area_name |
+-----+-----+
| 1 | Wood |
| 2 | Lake |
| 3 | Desert |
| 4 | Iron |
+-----+-----+
(4 rows)
dbadmin@[local] postgres=#\pset border 0
Border style is 0.
dbadmin@[local] postgres=#SELECT * FROM HR.areaS;
area_id area_name
-----
1 Wood
2 Lake
3 Desert
4 Iron
(4 rows)
```

Use the meta-command.

```
dbadmin@[local] postgres=#\a \t \x
Output format is unaligned.
Showing only tuples.
Expanded display is on.
dbadmin@[local] postgres=#SELECT * FROM HR.areaS;
area_id|2
area_name|Lake

area_id|1
area_name|Wood

area_id|4
area_name|Iron

area_id|3
area_name|Desert
dbadmin@[local] postgres=#
```

3.3 Online Help

Procedure

- When a database is being connected, run the following commands to obtain the help information:

```
gsql --help
```

The following information is displayed:

```
.....
Usage:
gsql [OPTION]... [DBNAME [USERNAME]]

General options:
-c, --command=COMMAND  run only single command (SQL or internal) and exit
-d, --dbname=DBNAME    database name to connect to (default: "postgres")
-f, --file=FILENAME    execute commands from file, then exit
.....
```

- After the database is connected, run the following commands to obtain the help information:

help

The following information is displayed:

You are using gsql, the command-line interface to gaussdb.

```
Type: \copyright for distribution terms
      \h for help with SQL commands
      \? for help with gsql commands
      \g or terminate with semicolon to execute query
      \q to quit
```

Task Example

Step 1 View the **gsql** help information. For details about the commands, see [Table 3-6](#).

Table 3-6 gsql online help

Description	Example
View copyright information.	<code>\copyright</code>
View the help information about SQL statements supported by GaussDB(DWS).	<p>View the help information about SQL statements supported by GaussDB(DWS). For example, view all SQL statements supported by GaussDB(DWS).</p> <pre>\h Available help: ABORT ALTER DATABASE ALTER DATA SOURCE</pre> <p>For example, view parameters of the CREATE DATABASE command:</p> <pre>\help CREATE DATABASE Command: CREATE DATABASE Description: create a new database Syntax: CREATE DATABASE database_name [[WITH] { [OWNER [=] user_name] [TEMPLATE [=] template] [ENCODING [=] encoding] [LC_COLLATE [=] lc_collate] [LC_CTYPE [=] lc_ctype] [DBCOMPATIBILITY [=] compatibility_type] [TABLESPACE [=] tablespace_name] [CONNECTION LIMIT [=] connlimit]} [...]];</pre>
View help information about gsql commands.	<p>For example, view commands supported by gsql.</p> <pre>\? General \copyright show PostgreSQL usage and distribution terms \g [FILE] or ; execute query (and send results to file or pipe) \h(\help) [NAME] help on syntax of SQL commands, * for all commands \q quit gsql</pre>

----End

3.4 Command Reference

For details about gsql parameters, see [Table 3-7](#), [Table 3-8](#), [Table 3-9](#), and [Table 3-10](#).

Table 3-7 Common parameters

Parameter	Description	Value Range
-c, --command=COMMAND	Specifies that gsql runs a string command and then exits.	-
-C, --set-file=FILENAME	Uses the file as the command source instead of interactive input. After processing the file, gsql does not exit and continues to process other contents.	An absolute path or relative path that meets the OS path naming convention
-d, --dbname=DBNAME	Specifies the name of the database to be connected.	A character string.
-D, --dynamic-param	Controls the generation of variables and the <code>{}</code> variable referencing method during SQL statement execution. For details, see Variable .	-
-f, --file=FILENAME	Specifies that files are used as the command source instead of interactively-entered commands. After the files are processed, exit from gsql. If <i>FILENAME</i> is - (hyphen), then standard input is read.	An absolute path or relative path that meets the OS path naming convention
-l, --list	Lists all available databases and then exits.	-
-v, --set, --variable=NAME=VALUE	Sets the gsql variable <i>NAME</i> to <i>VALUE</i> . For details about variable examples and descriptions, see Variable .	-
-X, --no-gsqlrc	Does not read the startup file (neither the system-wide gsqlrc file nor the user's ~/.gsqlrc file). NOTE The startup file is ~/.gsqlrc by default or it can be specified by the environment variable <i>PSQLRC</i> .	-

Parameter	Description	Value Range
-1 ("one"), --single-transaction	When gsql uses the -f parameter to execute a script, START TRANSACTION and COMMIT are added to the start and end of the script, respectively, so that the script is executed as one transaction. This ensures that the script is executed successfully. If the script cannot be executed, the script is invalid. NOTE If the script has used START TRANSACTION , COMMIT , and ROLLBACK , this parameter is invalid.	-
-, --help	Displays help information about gsql CLI parameters, and exits.	-
-V, --version	Prints the gsql version and exits.	-

Table 3-8 Input and output parameters

Parameter	Description	Value Range
-a, --echo-all	Prints all input lines to standard output as they are read. CAUTION When this parameter is used in some SQL statements, sensitive information, such as user passwords, may be disclosed. Use this parameter with caution.	-
-e, --echo-queries	Copies all SQL statements sent to the server to standard output as well. CAUTION When this parameter is used in some SQL statements, sensitive information, such as user passwords, may be disclosed. Use this parameter with caution.	-
-E, --echo-hidden	Echoes the actual queries generated by \d and other backslash commands.	-
-k, --with-key=KEY	Uses gsql to decrypt imported encrypted files. NOTICE For key characters, such as the single quotation mark (') or double quotation mark (") in shell commands, Linux shell checks whether the input single quotation mark (') or double quotation mark (") matches. If it does not match, Linux shell regards that the user input is unfinished and waits for more input instead of entering the gsql program.	-

Parameter	Description	Value Range
-L, --log-file=FILENAME	<p>Writes normal output destination and all query output into the FILENAME file.</p> <p>CAUTION</p> <ul style="list-style-type: none">When this parameter is used in some SQL statements, sensitive information, such as user passwords, may be disclosed. Use this parameter with caution.This parameter retains only the query result in the corresponding file, so that the result can be easily found and parsed by other invokers (for example, automatic O&M scripts). Logs about gsql operation are not retained.	An absolute path or relative path that meets the OS path naming convention
-m, --maintenance	<p>Allows a cluster to be connected when a two-phase transaction is being restored.</p> <p>NOTE</p> <p>The parameter is for engineers only. When this parameter is used, gsql can be connected to the standby server to check data consistency between the primary server and standby server.</p>	-
-n, --no-libedit	<p>Closes the command line editing.</p>	-
-o, --output=FILENAME	<p>Puts all query output into the FILENAME file.</p>	An absolute path or relative path that meets the OS path naming convention
-q, --quiet	<p>Indicates the quiet mode and no additional information will be printed.</p>	By default, gsql displays various information.
-s, --single-step	<p>Runs in single-step mode. This indicates that the user is prompted before each command is sent to the server. This parameter can also be used for canceling execution. This parameter can be used to debug scripts.</p> <p>CAUTION</p> <p>When this parameter is used in some SQL statements, sensitive information, such as user passwords, may be disclosed. Use this parameter with caution.</p>	-
-S, --single-line	<p>Runs in single-row mode where a new line terminates a SQL statement in the same manner as a semicolon does.</p>	-

Table 3-9 Parameters specifying output formats

Parameter	Description	Value Range
-A, --no-align	Switches to unaligned output mode.	The default output mode is aligned.
-F, --field-separator=S TRING	Specifies the field separator. The default is the vertical bar ().	-
-H, --html	Turns on the HTML tabular output.	-
-P, --pset=VAR[= ARG]	Specifies the print option in the \pset format in the command line. NOTE The equal sign (=), instead of the space, is used here to separate the name and value. For example, enter -P format=latex to set the output format to LaTeX .	-
-R, --record-separator=S TRING	Specifies the record separators.	-
-r	Enables the function of recording historical operations on the client.	This function is disabled by default.
-t, --tuples-only	Prints only tuples.	-
-T, --table-attr=TEXT	Specifies options to be placed within the HTML table tag. Use this parameter with the -H,--html parameter to specify the output to the HTML format.	-
-x, --expanded	Turns on the expanded table formatting mode.	-
-z, --field-separator-zero	Sets the field separator in the unaligned output mode to be blank. Use this parameter with the -A, --no-align parameter to switch to unaligned output mode.	-
-0, --record-separator-zero	Sets the record separator in the unaligned output mode to be blank. Use this parameter with the -A, --no-align parameter to switch to unaligned output mode.	-

Parameter	Description	Value Range
-g	Displays separators for all SQL statements and specified files. NOTE The -g parameter must be configured with the -f parameter.	-

Table 3-10 Connection parameters

Parameter	Description	Value Range
-h, --host=HOSTNAME	Specifies the host name of the machine on which the server is running or the directory for the Unix-domain socket.	If the host name is omitted, gsql connects to the server of the local host over the Unix domain socket or over TCP/IP to connect to local host without the Unix domain socket.
-p, --port=PORT	Specifies the port number of the database server. You can modify the default port number using the -p, --port=PORT parameter.	The default value is 8000 .
-U, --username=USERNAME	Specifies the user that accesses a database. NOTE <ul style="list-style-type: none">If a user is specified to access a database using this parameter, a user password must be provided together for identity verification. You can enter the password interactively or use the -W parameter to specify a password.To connect to a database, add an escape character before any dollar sign (\$) in the user name.	A string. The default user is the current user that operates the system.

Parameter	Description	Value Range
<code>-W, --password=PASS WORD</code>	<p>Specifies a password when the <code>-U</code> parameter is used to connect to a remote database.</p> <p>NOTE</p> <p>To connect to a database, add an escape character before any backslash (<code>\</code>) or back quote (<code>`</code>) in the password.</p> <p>If this parameter is not specified but database connection requires your password, you will be prompted to enter your password in interactive mode. The maximum length of the password is 999 bytes, which is restricted by the maximum value of the GUC parameter password max length.</p>	This parameter must meet the password complexity requirement.

3.5 Meta-Command Reference

This section describes meta-commands provided by gsql after the GaussDB(DWS) database CLI tool is used to connect to a database. A gsql meta-command can be anything that you enter in gsql and begins with an unquoted backslash.

Precautions

- The format of the gsql meta-command is a backslash (`\`) followed by a command verb, and then a parameter. The parameters are separated from the command verb and from each other by any number of whitespace characters.
- To include whitespace in a parameter, you can quote it with single quotation marks (`'`). To include single quotation marks in a parameter, add a backslash in front of it. Anything contained in single quotation marks is furthermore subject to C-like substitutions for `\n` (new line), `\t` (tab), `\b` (backspace), `\r` (carriage return), `\f` (form feed), `\digits` (octal), and `\xdigits` (hexadecimal).
- Within a parameter, text enclosed in double quotation marks (`"`) is taken as a command line input to the shell. The command output (with any trailing newline removed) is taken as a parameter.
- If an unquoted argument begins with a colon (`:`), the parameter is taken as a gsql variable and the value of the variable is used as the parameter value instead.
- Some commands take a SQL identifier, such as a table name, as a parameter. These parameters follow the SQL syntax rules: Unquoted letters are forced to lowercase, while double quotation marks (`"`) protect letters from case conversion and allow incorporation of whitespace into the identifier. Within double quotation marks, paired double quotation marks reduce to a single double quotation mark in the result name. For example, `FOO"BAR"BAZ` is interpreted as `fooBARbaz`, and `"Aweird""name"` becomes `A weird"name`.
- Parameter parsing stops when another unquoted backslash appears. An unquoted backslash is taken as the beginning of a new meta-command. The special sequence `\\` (two backslashes) marks the end of parameters and continues parsing SQL statements if any. In this way, SQL statements and gsql

commands can be freely mixed in a row. However, the parameters of a meta-command cannot continue beyond the end of a line in any situations.

Meta-command

For details about meta-commands, see [Table 3-11](#), [Table 3-12](#), [Table 3-13](#), [Table 3-14](#), [Table 3-16](#), [Table 3-18](#), [Table 3-19](#), [Table 3-20](#), and [Table 3-22](#).

NOTICE

FILE mentioned in the following commands indicates a file path. This path can be an absolute path such as **/home/gauss/file.txt** or a relative path, such as **file.txt**. By default, a **file.txt** is created in the path where the user runs gsql commands.

Table 3-11 Common meta-commands

Parameter	Description	Value Range
\copyright	Displays GaussDB(DWS) version and copyright information.	-
\g [FILE] or ;	Performs a query operation and sends the result to a file or pipe.	-
\h(\help) [NAME]	Provides syntax help on the specified SQL statement.	If the name is not specified, then gsql will list all the commands for which syntax help is available. If the name is an asterisk (*), the syntax help on all SQL statements is displayed.

Parameter	Description	Value Range
\parallel [on [num]]off]	<p>Controls the parallel execution function.</p> <ul style="list-style-type: none"> • on: The switch is enabled and the maximum number of concurrently executed tasks is num. • off: This switch is disabled. <p>NOTE</p> <ul style="list-style-type: none"> • Parallel execution is not allowed in a running transaction and a transaction is not allowed to be started during parallel execution. • Parallel execution of \d meta-commands is not allowed. • If SELECT statements are run concurrently, customers can accept the problem that the return results are displayed randomly but they cannot accept it if a core dump or process response failure occurs. • SET statements are not allowed in concurrent tasks because they may cause unexpected results. • Temporary tables cannot be created. If temporary tables are required, create them before parallel execution is enabled, and use them only in the parallel execution. Temporary tables cannot be created in parallel execution. • When \parallel is executed, <i>num</i> independent gsql processes can be connected to the database server. • The duration of all jobs in \parallel cannot exceed the value of session_timeout. Otherwise, the connection may be interrupted during concurrent execution. 	<p>The default value of <i>num</i> is 1024.</p> <p>NOTICE</p> <ul style="list-style-type: none"> • The maximum number of connections allowed by the server is determined based on max_connection and the number of current connections. • Set the value of <i>num</i> based on the allowed number of connections.
\q [value]	Exits the gsql program. In a script file, this command is run only when a script terminates. The exit code is determined by the value.	-

Table 3-12 Buffer query meta-commands

Parameter	Description
\e [FILE] [LINE]	Use an external editor to edit the query buffer or file.
\ef [FUNCNAME [LINE]]	Use an external editor to edit the function definition. If LINE is specified, the cursor will point to the specified line of the function body.

Parameter	Description
\p	Prints the current query buffer to the standard output.
\r	Resets (clears) the query buffer.
\w FILE	Outputs the current query buffer to a file.

Table 3-13 Input and output meta-commands

Parameter	Description
\copy { table [(column_list)] (query) } { from to } { filename stdin stdout pstdin pstdout } [with] [binary] [oids] [delimiter [as] 'character'] [null [as] 'string'] [csv [header] [quote [as] 'character'] [escape [as] 'character'] [force quote column_list *] [force not null column_list]]	<p>After logging in to the database on any psql client, you can import and export data. This is an operation of running the SQL COPY command, but not the server that reads or writes data to a specified file. Instead, data is transferred between the server and the local file system. This means that the accessibility and permissions of the file are the permissions of the local user rather than the server. The initial database user permission is not required.</p> <p>NOTE \copy only applies to small-batch data import with uniform formats but poor error tolerance capability. GDS or COPY is preferred for data import.</p>
\echo [STRING]	Writes a character string to the standard output.
\i FILE	Reads content from <i>FILE</i> and uses them as the input for a query.
\i+ FILE KEY	Runs commands in an encrypted file.
\ir FILE	Is similar to \i, but resolves relative path names differently.
\ir+ FILE KEY	Is similar to \i, but resolves relative path names differently.
\o [FILE]	Saves all query results to a file.
\qecho [STRING]	Prints a character string to the query result output.

 NOTE

In [Table 3-14](#), **S** indicates that the system object is displayed, and **+** indicates that additional object descriptions are displayed. **PATTERN** specifies the name of an object to be displayed.

Table 3-14 Information display meta-commands

Parameter	Description	Value Range	Example
\d[S+]	Lists all tables, views, and sequences of all schemas in the search_path. When objects with the same name exist in different schemas in the search_path, only the object in the schema that ranks first in the search_path is displayed.	-	Lists all tables, views, and sequences of all schemas in the search_path. <code>\d</code>
\d[S+] NAME	Lists the structure of specified tables, views, and indexes.	-	Lists the structure of table a . <code>\dtable+ a</code>
\d+[PATTERN]	Lists all tables, views, and indexes.	If PATTERN is specified, only tables, views, and indexes whose names match PATTERN are displayed.	Lists all tables, views, and indexes whose names start with f . <code>\d+ f*</code>
\da[S][PATTERN]	Lists all available aggregate functions, together with their return value types and the data types.	If PATTERN is specified, only aggregate functions whose names match PATTERN are displayed.	Lists all available aggregate functions whose names start with f , together with their return value types and the data types. <code>\da f*</code>
\db[+][PATTERN]	Lists all available tablespaces.	If PATTERN is specified, only tablespaces whose names match PATTERN are displayed.	Lists all available tablespaces whose names start with p . <code>\db p*</code>

Parameter	Description	Value Range	Example
\dc[S+] [PATTERN]	Lists all available conversions between character sets.	If PATTERN is specified, only conversions whose names match PATTERN are displayed.	Lists all available conversions between character sets. \dc *
\dC[+] [PATTERN]	Lists all type conversions.	If PATTERN is specified, only conversions whose names match PATTERN are displayed.	Lists all type conversion whose patten names start with c . \dC c*
\dd[S] [PATTERN]	Lists descriptions about objects matching PATTERN .	If PATTERN is not specified, all visible objects are displayed. The objects include aggregations, functions, operators, types, relations (table, view, index, sequence, and large object), and rules.	Lists all visible objects. \dd
\ddp [PATTERN]	Lists all default permissions.	If PATTERN is specified, only permissions whose names match PATTERN are displayed.	Lists all default permissions. \ddp
\dD[S+] [PATTERN]	Lists all available domains.	If PATTERN is specified, only domains whose names match PATTERN are displayed.	Lists all available domains. \dD
\ded[+] [PATTERN]	Lists all Data Source objects.	If PATTERN is specified, only objects whose names match PATTERN are displayed.	Lists all Data Source objects. \ded

Parameter	Description	Value Range	Example
<code>\det[+] [PATTERN]</code>	Lists all external tables.	If PATTERN is specified, only tables whose names match PATTERN are displayed.	Lists all external tables. <code>\det</code>
<code>\des[+] [PATTERN]</code>	Lists all external servers.	If PATTERN is specified, only servers whose names match PATTERN are displayed.	Lists all external servers. <code>\des</code>
<code>\deu[+] [PATTERN]</code>	Lists user mappings.	If PATTERN is specified, only information whose name matches PATTERN is displayed.	Lists user mappings. <code>\deu</code>
<code>\dew[+] [PATTERN]</code>	Lists foreign-data wrappers.	If PATTERN is specified, only data whose name matches PATTERN is displayed.	Lists foreign-data wrappers. <code>\dew</code>
<code>\df[antw][S+] [PATTERN]</code>	Lists all available functions, together with their parameters and return types. a indicates an aggregate function, n indicates a common function, t indicates a trigger, and w indicates a window function.	If PATTERN is specified, only functions whose names match PATTERN are displayed.	Lists all available functions, together with their parameters and return types. <code>\df</code>
<code>\dF[+] [PATTERN]</code>	Lists all text search configurations.	If PATTERN is specified, only configurations whose names match PATTERN are displayed.	Lists all text search configurations. <code>\dF+</code>

Parameter	Description	Value Range	Example
<code>\dFd[+]</code> [PATTERN]	Lists all text search dictionaries.	If PATTERN is specified, only dictionaries whose names match PATTERN are displayed.	Lists all text search dictionaries. <code>\dFd</code>
<code>\dFp[+]</code> [PATTERN]	Lists all text search parsers.	If PATTERN is specified, only analyzers whose names match PATTERN are displayed.	Lists all text search parsers. <code>\dFp</code>
<code>\dFt[+]</code> [PATTERN]	Lists all text search templates.	If PATTERN is specified, only templates whose names match PATTERN are displayed.	Lists all text search templates. <code>\dFt</code>
<code>\dg[+]</code> [PATTERN]	Lists all database roles. NOTE Since the concepts of "users" and "groups" have been unified into "roles", this command is now equivalent to <code>\du</code> . The two commands are all reserved for forward compatibility.	If PATTERN is specified, only roles whose names match PATTERN are displayed.	List all database roles whose names start with j and end with e . <code>\dg j?e</code>
<code>\dl</code>	This is an alias for <code>\lo_list</code> , which shows a list of large objects.	-	Lists all large objects. <code>\dl</code>
<code>\dL[S+]</code> [PATTERN]	Lists available procedural languages.	If PATTERN is specified, only languages whose names match PATTERN are displayed.	Lists available procedural languages. <code>\dL</code>
<code>\dn[S+]</code> [PATTERN]	Lists all schemas (namespace).	If PATTERN is specified, only schemas whose names match PATTERN are displayed. By default, only schemas you created are displayed.	Lists information about all schemas whose names start with d . <code>\dn+ d*</code>

Parameter	Description	Value Range	Example
<code>\do[S]</code> [PATTERN]	Lists available operators with their operand and return types.	If PATTERN is specified, only operators whose names match PATTERN are displayed. By default, only operators you created are displayed.	Lists available operators with their operand and return types. <code>\do</code>
<code>\dO[S+]</code> [PATTERN]	Lists collations.	If PATTERN is specified, only collations whose names match PATTERN are displayed. By default, only collations you created are displayed.	Lists collations. <code>\dO</code>
<code>\dp</code> [PATTERN]	Lists tables, views, and related permissions. The following result about <code>\dp</code> is displayed: rolename=xxxx/yyyy --Assigning permissions to a role =xxxx/yyyy --Assigning permissions to public xxxx indicates the assigned permissions, and yyyy indicates the roles that are assigned to the permissions. For details about permission descriptions, see Table 3-15 .	If PATTERN is specified, only tables and views whose names match PATTERN are displayed.	Lists tables, views, and related permissions. <code>\dp</code>
<code>\drds</code> [PATTERN1 [PATTERN2]]	Lists all modified configuration parameters. These settings can be for roles, for databases, or for both. PATTERN1 and PATTERN2 indicate a role pattern and a database pattern, respectively.	If PATTERN is specified, only collations whose names match PATTERN are displayed. If the default value is used or * is specified, all settings are listed.	Lists all modified configuration parameters of the database. <code>\drds *</code>

Parameter	Description	Value Range	Example
<code>\dT[S+]</code> [PATTERN]	Lists all data types.	If PATTERN is specified, only types whose names match PATTERN are displayed.	Lists all data types. <code>\dT</code>
<code>\du[+]</code> [PATTERN]	Lists all database roles. NOTE Since the concepts of "users" and "groups" have been unified into "roles", this command is now equivalent to <code>\dg</code> . The two commands are all reserved for forward compatibility.	If PATTERN is specified, only roles whose names match PATTERN are displayed.	Lists all database roles. <code>\du</code>
<code>\dE[S+]</code> [PATTERN] <code>\di[S+]</code> [PATTERN] <code>\ds[S+]</code> [PATTERN] <code>\dt[S+]</code> [PATTERN] <code>\dv[S+]</code> [PATTERN]	In this group of commands, the letters E, i, s, t, and v stand for a foreign table, index, sequence, table, or view, respectively. You can specify any or a combination of these letters sequenced in any order to obtain an object list. For example, <code>\dit</code> lists all indexes and tables. If a command is suffixed with a plus sign (+), physical dimensions and related descriptions of each object will be displayed. NOTE This version does not support sequences.	If PATTERN is specified, only objects whose names match PATTERN are displayed. By default, only objects you created are displayed. You can specify PATTERN or S to view other system objects.	Lists all indexes and views. <code>\div</code>
<code>\dx[+]</code> [PATTERN]	Lists installed extensions.	If PATTERN is specified, only extensions whose names match PATTERN are displayed.	Lists installed extensions. <code>\dx</code>
<code>\l[+]</code>	Lists the names, owners, character set encoding, and permissions of all databases on the server.	-	Lists the names, owners, character set encoding, and permissions of all databases on the server. <code>\l</code>

Parameter	Description	Value Range	Example
\sf[+] FUNCN AME	Shows function definitions. NOTE If the function name contains parentheses, enclose the function name with quotation marks and add the parameter type list following the double quotation marks. Also enclose the list with parentheses.	-	Assume a function function_a and a function func()name. This parameter will be as follows: <pre>\sf function_a \sf "func()name"(argtype1, argtype2)</pre>
\z [PATTER N]	Lists all tables, views, and sequences in the database and their access permissions.	If a pattern is given, it is a regular expression, and only matched tables, views, and sequences are displayed.	Lists all tables, views, and sequences in the database and their access permissions. <pre>\z</pre>

Table 3-15 Permission descriptions

Parameter	Description
r	SELECT: allows users to read data from specified tables and views.
w	UPDATE: allows users to update columns for specified tables.
a	INSERT: allows users to insert data to specified tables.
d	DELETE: allows users to delete data from specified tables.
D	TRUNCATE: allows users to delete all data from specified tables.
x	REFERENCES: allows users to create foreign key constraints.
t	TRIGGER: allows users to create a trigger on specified tables.
X	EXECUTE: allows users to use specified functions and the operators that are realized by the functions.

Parameter	Description
U	USAGE: <ul style="list-style-type: none"> For procedural languages, allows users to specify a procedural language when creating a function. For schemas, allows users to access objects includes in specified schemas. For sequences, allows users to use the NEXTVAL function.
C	CREATE: <ul style="list-style-type: none"> For databases, allows users to create schemas within a database. For schemas, allows users to create objects in a schema. For tablespaces, allows users to create tables in a tablespace and set the tablespace to default one when creating databases and schemas.
c	CONNECT: allows users to access specified databases.
T	TEMPORARY: allows users to create temporary tables.
A	ANALYZE ANALYSE: allows users to analyze tables.
arwdDxtA	ALL PRIVILEGES: grants all available permissions to specified users or roles at a time.
*	Authorization options for preceding permissions

Table 3-16 Formatting meta-commands

Parameter	Description
\a	Controls the switchover between unaligned mode and aligned mode.
\C [STRING]	Sets the title of any table being printed as the result of a query or cancels such a setting.
\f [STRING]	Sets a field separator for unaligned query output.
\H	<ul style="list-style-type: none"> If the text format schema is used, switches to the HTML format. If the HTML format schema is used, switches to the text format.
\pset NAME [VALUE]	Sets options affecting the output of query result tables. For details about the value of NAME , see Table 3-17 .

Parameter	Description
\t [on off]	Switches the information and row count footer of the output column name.
\T [STRING]	Specifies attributes to be placed within the table tag in HTML output format. If the parameter is not configured, the attributes are not set.
\x [on off auto]	Switches expanded table formatting modes.

Table 3-17 Adjustable printing options

Option	Description	Value Range
border	The value must be a number. In general, a larger number indicates wider borders and more table lines.	<ul style="list-style-type: none"> The value is an integer greater than 0 in HTML format. The value range in other formats is as follows: <ul style="list-style-type: none"> 0: no border 1: internal dividing line 2: table frame
expanded (or x)	Switches between regular and expanded formats.	<ul style="list-style-type: none"> When expanded format is enabled, query results are displayed in two columns, with the column name on the left and the data on the right. This format is useful if the data does not fit the screen in the normal "horizontal" format. The expanded format is used when the query output is wider than the screen. Otherwise, the regular format is used. The regular format is effective only in the aligned and wrapped formats.

Option	Description	Value Range
fieldsep	Specifies the field separator to be used in unaligned output format. In this way, you can create tab- or comma-separated output required by other programs. To set a tab as field separator, type <code>\pset fieldsep '\t'</code> . The default field separator is a vertical bar (' ').	-
fieldsep_zero	Sets the field separator to be used in unaligned output format to zero bytes.	-
footer	Enables or disables the display of table footers.	-
format	Selects the output format. Unique abbreviations are allowed. (That means a single letter is sufficient.)	Value range: <ul style="list-style-type: none"> • unaligned: Write all columns of a row on one line, separated by the currently active column separator. • aligned: This format is standard and human-readable. • wrapped: This format is similar to aligned, but includes the packaging cross-line width data value to suit the width of the target field output. • html: This format output table to the markup language for a document. The output is not a complete document. • latex: This format output table to the markup language for a document. The output is not a complete document. • troff-ms: This format output table to the markup language for a document. The output is not a complete document.

Option	Description	Value Range
null	Sets a character string to be printed in place of a null value.	By default, nothing is printed, which can easily be mistaken for an empty character string.
numericlocale	Enables or disables the display of a locale-specific character to separate groups of digits to the left of the decimal marker.	<ul style="list-style-type: none"> ● on: The specified separator is displayed. ● off: The specified separator is not displayed If this parameter is ignored, the default separator is displayed.
pager	Controls the use of a pager for query and gsql help outputs. If the PAGER environment variable is set, the output is piped to the specified program. Otherwise, a platform-dependent default is used.	<ul style="list-style-type: none"> ● on: The pager is used for terminal output that does not fit the screen. ● off: The pager is not used. ● always: The pager is used for all terminal output regardless of whether it fits the screen.
recordsep	Specifies the record separator to be used in unaligned output format.	-
recordsep_zero	Specifies the record separator to be used in unaligned output format to zero bytes.	-
tableattr (or T)	Specifies attributes to be placed inside the HTML table tag in HTML output format (such as cellpadding or bgcolor). Note that you do not need to specify border here because it has been used by <code>\pset border</code> . If no value is given, the table attributes do not need to be set.	-
title	Specifies the table title for any subsequently printed tables. This can be used to give your output descriptive tags. If no value is given, the title does not need to be set.	-

Option	Description	Value Range
tuples_only (or t)	Enables or disables the tuples-only mode. Full display may show extra information, such as column headers, titles, and footers. In tuples_only mode, only the table data is displayed.	-

Table 3-18 Connection meta-commands

Parameter	Description	Value Range
\c[onnect] [DBNAME]- USER - HOST - PORT -]	Connects to a new database. (The current database is gaussdb .) If a database name contains more than 63 bytes, only the first 63 bytes are valid and are used for connection. However, the database name displayed in the gsql CLI is still the name before the truncation. NOTE If the database login user is changed during reconnection, you need to enter the password of the new user. The maximum length of the password is 999 bytes, which is restricted by the maximum value of the GUC parameter password max length .	-
\encoding [ENCODING]	Sets the client character set encoding.	This command shows the current encoding if it has no parameter.
\conninfo	Outputs information about the current database connection.	-

Table 3-19 OS meta-commands

Parameter	Description	Value Range
\cd [DIR]	Changes the current working directory.	An absolute path or relative path that meets the OS path naming convention
\setenv NAME [VALUE]	Sets the NAME environment variable to VALUE . If VALUE is not provided, do not set the environment variable.	-

Parameter	Description	Value Range
<code>\timing [on off]</code>	Toggles a display of how long each SQL statement takes, in milliseconds.	<ul style="list-style-type: none">The value on indicates that the setting is enabled.The value off indicates that the setting is disabled.
<code>\! [COMMAND]</code>	Escapes to a separate Unix shell or runs a Unix command.	-

Table 3-20 Variable meta-commands

Parameter	Description
<code>\prompt [TEXT] NAME</code>	Prompts the user to use texts to specify a variable name.
<code>\set [NAME [VALUE]]</code>	Sets the <i>NAME</i> internal variable to VALUE . If more than one value is provided, <i>NAME</i> is set to the concatenation of all of them. If only one parameter is provided, the variable is set with an empty value. Some common variables are processed in another way in gsql , and they are the combination of uppercase letters, numbers, and underscores. Table 3-21 describes a list of variables that are processed in a way different from other variables.
<code>\set-multi NAME [VALUE]</code> <code>\end-multi</code>	Sets the internal variable <i>NAME</i> to <i>VALUE</i> that can consist of multiple lines of character strings. When \set-multi is used, the second parameter must be provided. For details, see the following example of using the \set-multi meta-command. NOTE The meta-commands in \set-multi and \end-multi will be ignored.
<code>\unset NAME</code>	Deletes the variable name of gsql .

\set-multi meta-command example

The file **test.sql** is used as an example.

```
\set-multi multi_line_var
select
  id,name
from
  student;
\end-multi
\echo multi_line_var is "${multi_line_var}"
\echo -----
```

```
\echo result is
${multi_line_var}
```

gsql -d gaussdb -p 25308 --dynamic-param -f test.sql execution result:

```
multi_line_var is "select
id,name
from
student;"
-----
result is
id | name
---+-----
 1 | Jack
 2 | Tom
 3 | Jerry
 4 | Danny
(4 rows)
```

Run the **\set-multi \end-multi** command to set the variable **multi_line_var** to a SQL statement and obtain the variable through dynamic variable parsing.

The file **test.sql** is used as an example.

```
\set-multi multi_line_var
select 1 as id;
select 2 as id;
\end-multi
\echo multi_line_var is "${multi_line_var}"
\echo -----
\echo result is
${multi_line_var}
```

gsql -d -p 25308 --dynamic-param -f test.sql execution result:

```
multi_line_var is "select 1 as id;
select 2 as id;"
-----
result is
id
----
 1
(1 row)

id
----
 2
(1 row)
```

Run the **\set-multi \end-multi** command to set the variable **multi_line_var** to two SQL statement and obtain the variable through dynamic variable parsing. Because the content in the variable ends with a semicolon (;), gsql sends the SQL statement and obtains the printed execution result.

Table 3-21 Common \set commands

Command	Description	Value Range
\set VERBOSITY value	This variable can be set to default , verbose , or terse to control redundant lines of error reports.	Value range: default , verbose , terse

Command	Description	Value Range
\set ON_ERROR_STOP P value	If this variable is set, the script execution stops immediately. If this script is invoked from another script, that script will be stopped immediately as well. If the primary script is invoked using the -f option rather than from one gsql session, gsql will return error code 3, indicating the difference between the current error and critical errors. (The error code for critical errors is 1.)	Value range: on/off, true/false, yes/no, 1/0

Command	Description	Value Range
<code>\set RETRY</code> [<code>retry_times</code>]	<p>Determines whether to enable the retry function if statement execution encounters errors. The parameter retry_times specifies the maximum number of retry times and the default value is 5. Its value ranges from 5 to 10. If the retry function has been enabled, when you run the <code>\set RETRY</code> command again, the retry function will be disabled.</p> <p>The configuration file retry_errcodes.conf shows a list of errors. If these errors occur, retry is required. This configuration file is placed in the same directory as that for executable gsql programs. This configuration file is configured by the system rather than by users and cannot be modified by the users.</p> <p>The retry function can be used in the following 13 error scenarios:</p> <ul style="list-style-type: none">• YY001: TCP communication errors. Print information: Connection reset by peer. (reset between CN and DN)• YY002: TCP communication errors. Print information: Connection reset by peer. (reset between DN and DN)• YY003: Lock timeout. Print information: Lock wait timeout.../wait transaction xxx sync time exceed xxx.• YY004: TCP communication errors. Print information: Connection timed out.• YY005: Failed to issue SET commands. Print information: ERROR SET query.• YY006: Failed to apply for memory. Print information: memory is temporarily unavailable.• YY007: Communication library error. Print information: Memory allocate error.• YY008: Communication library error. Print information: No data in buffer.• YY009: Communication library error. Print information: Close because release memory.• YY010: Communication library error. Print information: TCP disconnect.• YY011: Communication library error. Print information: SCTP disconnect.	Value range of retry_times : 5 to 10

Command	Description	Value Range
	<ul style="list-style-type: none">● YY012: Communication library error. Print information: Stream closed by remote.● YY013: Communication library error. Print information: Wait poll unknown error.● YY014: Invalid snapshot. Print information: snapshot invalid.● YY015: Failed to receive connection. Print information: Connection receive wrong.● 53200: Out of memory. Print information: Out of memory.● 08006: GTM error. Print information: Connection failure.● 08000: Failed to communicate with DNs due to connection errors. Print information: Connection exception.● 57P01: System shutdown by administrators. Print information: Admin shutdown.● XX003: Remote socket is disabled. Print information: Stream remote close socket.● XX009: Duplicate query IDs. Print information: Duplicate query id.● YY016: Concurrent stream query and update. Print information: Stream concurrent update. <p>If an error occurs, gsql queries connection status of all CNs and DNs. If the connection status is abnormal, gsql sleeps for 1 minute and tries again. In this case, the retries in most of the primary/standby switchover scenarios are involved.</p> <p>NOTE</p> <ol style="list-style-type: none">1. Statements in transaction blocks cannot be retried upon a failure.2. Retry is not supported if errors are found using ODBC or JDBC.3. For SQL statements with unlogged tables, the retry is not supported if a node is faulty.4. If a CN or GTM is faulty, the retry on the gsql client is not supported.5. For gsql client faults, the retry is not supported.	

Table 3-22 Large object meta-commands

Parameter	Description
<code>\lo_list</code>	Shows a list of all GaussDB(DWS) large objects stored in the database, as well as the comments provided for them.

Table 3-23 Flow control meta-commands

Parameter	Description	Value Range
<code>\if</code> EXPR <code>\elif</code> EXPR <code>\else</code> <code>\endif</code>	<p>This set of meta-commands can implement nested conditional blocks:</p> <ul style="list-style-type: none">• A conditional block starts with <code>\if</code> and ends with <code>\endif</code>.• Any number of <code>\elif</code> clauses or a single <code>\else</code> clause can exist between <code>\if</code> and <code>\endif</code>.• The <code>\if</code> and <code>\elif</code> commands support Boolean expression calculations and can check whether two strings are equal.• <code>\elif</code> cannot be used between <code>\else</code> and <code>\endif</code>.	<ul style="list-style-type: none">• The Boolean expression calculation is the same as that of gsql: true/false, yes/no, on/off, and 1/0. Any other value is considered as true.• The operator and the string must be separated using spaces.• Number comparison and string comparison are supported. The comparison rules are controlled by the inherent variable COMPARE_STRATEGY. For details, see Table 3-2. In the default comparison rule, single quotation marks (') are used to separate strings and numbers. For details about the examples of different rules, see \if conditional block comparison rules and examples.• The following operators can be used to compare the values of numbers and strings and perform equality comparison: <code><</code>, <code><=</code>, <code>></code>, <code>>=</code>, <code>=</code>, <code>!=</code>, and <code><></code>.

Parameter	Description	Value Range
<p>\goto LABEL \label LABEL</p>	<p>This set of meta-commands can be used to implement unconditional redirections:</p> <ul style="list-style-type: none"> • The \label meta-command is used to create a label. • The \goto meta-command is used to redirect upward or downward. <p>NOTE</p> <ul style="list-style-type: none"> • The interactive mode is not supported. • The \label meta-command is not supported in the \if statement block. • To avoid unexpected results, you are not advised to use the \goto and \label commands in transactions or PL/SQL statement blocks. 	<ul style="list-style-type: none"> • The label value is case sensitive. • The value of a label can contain uppercase letters, lowercase letters, digits, and underscores (_). • The maximum length of a label is 32 characters (including \0). If the length exceeds 32 characters, the label will be truncated and an alarm will be generated. • If the label name following \label appears repeatedly in the same session, an error is reported.

Parameter	Description	Value Range
<code>\for</code> <code>\loop</code> <code>\exit-for</code> <code>\end-for</code>	<p>This set of meta-commands can be used to implement loops:</p> <ul style="list-style-type: none">• The loop block starts with \for and ends with \end-for.• The condition between \for and \loop is a loop condition. Only SQL statements are supported. Variable iteration is not supported. For example, \for (i=0; i<100; ++i) is not supported.• If there are multiple SQL statements in the loop condition, the execution result of the last SQL statement is used as the loop condition. The SQL statement used as a loop condition cannot end with a semicolon (;).• The loop body exists between \loop and \end-for. You can run \exit-for to exit the loop.• The \for loop block supports multi-layer nesting. <p>NOTE</p> <ul style="list-style-type: none">• The interactive mode is not supported.• \for loop blocks cannot be used in \parallel.• To avoid unexpected results, you are not advised to use the \for loop block in transactions or PL/SQL statement blocks.• The \label meta-command is not supported in the \for loop block.• Anonymous blocks cannot be used between \for and \loop.	-

An example of using flow control meta-commands is as follows:

- **\if** conditional block use example:

The file **test.sql** is used as an example.

```
SELECT 'Jack' AS "Name";

\if ${ERROR}
  \echo 'An error occurred in the SQL statement'
  \echo ${LAST_ERROR_MESSAGE}
\elif '${Name}' == 'Jack'
  \echo 'I am Jack'
```

```
\else
  \echo 'I am not Jack'
\endif
```

gsql -d -p 25308 --dynamic-param -f test.sql execution result:

```
Name
-----
Jack
(1 row)

I am Jack
```

The preceding execution result indicates that the first SQL statement is successfully executed and the **Name** variable is set. Therefore, the **\elif** branch is executed and the output is **I am Jack**. For details about the usage of the special variables **ERROR** and **LAST_ERROR_MESSAGE**, see [Table 3-2](#).

- **\if** conditional block comparison rules and examples
 - **default:** Specifies the default comparison policy. Only strings or numbers can be compared, and strings cannot be compared with numbers. Parameters inside single quotation marks (') are identified as strings, and parameters outside single quotation marks (') are identified as numbers.

The file **test.sql** is used as an example.

```
\set Name 'Jack'
\set ID 1002

-- Parameters inside single quotation marks (') are identified as strings for comparison.
\if '${Name}' != 'Jack'
  \echo 'I am not Jack'
-- Without single quotation marks ('), parameters are identified as numbers for comparison.
\elif ${ID} > 1000
  \echo 'Jack'id is bigger than 1000'
\else
  \echo 'error'
\endif
```

gsql -d -p 25308 --dynamic-param -f test.sql execution result:

```
Jack'id is bigger than 1000
```

If single quotation marks (') are used on one side of the operator and not used on the other side, the comparison is performed between a string and a number. Such comparison is not supported and an error is reported.

```
postgres=> \set Name 'Jack'
postgres=> \if ${Name} == 'Jack'
ERROR: left[Jack] is a string without quote or number, and right['Jack'] is a string with quote, \if or \elif does not support this expression.
WARNING: The input with quote are treated as a string, and the input without quote are treated as a number.
postgres@> \endif
```

- **natural:** The default comparison policy is supported, and parameters that contain dynamic variables can also be identified as strings. When one side of the comparison operator is a number, try to convert the other side to a number, and then compare the numbers on both sides. If the conversion fails, an error is reported and the comparison result is false.
 - Parameters that contain dynamic variables can be identified as strings when single quotation marks (') are used, for example, 'Jack', or the string contains a dynamic variable (**\${VAR}** or **:VAR**), for example, **\${Name}_data**. If both of the preceding conditions are met, for example, **'\${Name}_data'**, parameters that contain dynamic variables can also be identified as strings.

- For parameters that cannot be identified as strings, try to identify them as numbers. If a parameter cannot be converted to a number, an error is reported. For example, **1011Q1** does not use single quotation marks (') or contain dynamic variables, and cannot be converted to a number.
- If one side of the comparison operator is not identified as a string or number, the comparison fails and an error is reported.
- If one side of the comparison operator is identified as a number, the comparison is performed based on numbers. If the other side cannot be converted to a number, an error is reported.
- If both sides of the comparison operator are identified as strings, the comparison is performed based on strings.

The **test.sql** file is an example of comparing strings.

```
\set COMPARE_STRATEGY natural
SELECT 'Jack' AS "Name";

-- The comparison result is equivalent to that of '${Name}' > 'Jack'.
\if ${Name} == 'Jack'
  \echo 'I am Jack'
\else
  \echo 'I am not Jack'
\endif
```

gsql -d -p 25308 --dynamic-param -f test.sql execution result:

```
Name
-----
Jack
(1 row)

I am Jack
```

The **test.sql** file is an example of comparing numbers.

```
\set COMPARE_STRATEGY natural
SELECT 1022 AS id;

-- If ${id} == '01022' is used, the result is not equal because strings on both sides are compared.
\if ${id} == 01022
  \echo 'id is 1022'
\else
  \echo 'id is not 1022'
\endif
```

gsql -d -p 25308 --dynamic-param -f test.sql execution result:

```
id
-----
1022
(1 row)

id is 1022
```

Examples of comparison errors are shown as follows.

```
-- One side of the operator cannot be identified as a string or number.
postgres=> \set COMPARE_STRATEGY natural
postgres=> \if ${Id} > 123sd
ERROR: The right[123sd] can not be treated as a string or a number. A numeric string should contain only digits and one decimal point, and a string should be enclosed in quote or contain dynamic variables, please check it.
-- Numbers on one side of the operator cannot be correctly converted.
postgres=> \set COMPARE_STRATEGY natural
postgres=> \if ${Id} <> 11101.1.1
ERROR: The right[11101.1.1] can not be treated as a string or a number. A numeric string should
```

contain only digits and one decimal point, and a string should be enclosed in quote or contain dynamic variables, please check it.

- **equal:** Only the equality comparison is supported. The comparison is performed based on strings.

The file **test.sql** is used as an example.

```
\set COMPARE_STRATEGY equal
SELECT 'Jack' AS "Name";

\if ${ERROR}
  \echo 'An error occurred in the SQL statement'
-- If the value is set to equal, only the equality comparison is supported. An error is reported when
the values are compared, and there is no delimiter. The following comparison result is equivalent to
that of ${Name} == Jack.
\elif '${Name}' == 'Jack'
  \echo 'I am Jack'
\else
  \echo 'I am not Jack'
\endif
```

gsql -d -p 25308 --dynamic-param -f test.sql execution result:

```
Name
-----
Jack
(1 row)

I am Jack
```

- **\goto \label** redirection example:

The file **test.sql** is used as an example.

```
\set Name Tom

\goto TEST_LABEL
SELECT 'Jack' AS "Name";

\label TEST_LABEL
\echo ${Name}
```

gsql -d -p 25308 --dynamic-param -f test.sql execution result:

```
Tom
```

The preceding execution result indicates that the **\goto** meta-command directly executes the **\echo** command without re-assigning a value to the variable **Name**.

- Example of using **\if** conditional block and the **\goto \label** together

The file **test.sql** is used as an example.

```
\set Count 1

\label LOOP
\if ${Count} != 3
  SELECT ${Count} + 1 AS "Count";
  \goto LOOP
\endif

\echo Count = ${Count}
```

gsql -d -p 25308 --dynamic-param -f test.sql execution result:

```
Count
-----
  2
(1 row)

Count
-----
  3
```

```
(1 row)
```

```
Count = 3
```

The preceding execution result indicates that a simple loop is implemented through the combination of the `\if` conditional block and `\goto label`.

- Example of Using `\for` Loop Blocks

To demonstrate this function, the example data is as follows:

```
create table student (id int, name varchar(32));
insert into student values (1, 'Jack');
insert into student values (2, 'Tom');
insert into student values (3, 'Jerry');
insert into student values (4, 'Danny');
```

```
create table course (class_id int, class_day varchar(5), student_id int);
insert into course values (1004, 'Fri', 2);
insert into course values (1003, 'Tue', 1);
insert into course values (1003, 'Tue', 4);
insert into course values (1002, 'Wed', 3);
insert into course values (1001, 'Mon', 2);
```

`\for` loop use sample file **test.sql**:

```
\for
select id, name from student order by id limit 3 offset 0
\loop
  \echo -[ RECORD ]+-----
  \echo id '\t' ${id}
  \echo name '\t' ${name}
\end-for
```

gsql -d -p 25308 --dynamic-param -f test.sql execution result:

```
-[ RECORD ]+-----
id   | 1
name  | Jack
-[ RECORD ]+-----
id   | 2
name  | Tom
-[ RECORD ]+-----
id   | 3
name  | Jerry
```

The preceding execution result indicates that the loop block is used to traverse the execution result of the SQL statement. More statements can appear between `\loop` and `\end-for` to implement complex logic.

If the SQL statement used as a loop condition fails to be executed or the result set is empty, the statement between `\loop` and `\end-for` will not be executed.

The file **test.sql** is used as an example.

```
\for
select id, name from student_error order by id limit 3 offset 0
\loop
  \echo -[ RECORD ]+-----
  \echo id '\t' ${id}
  \echo name '\t' ${name}
\end-for
```

gsql -d -p 25308 --dynamic-param -f test.sql execution result:

```
gsql:test.sql:3: ERROR: relation "student_error" does not exist
LINE 1: select id, name from student_error order by id limit 3 offse...
      ^
```

The preceding command output indicates that the **student_error** table does not exist. Therefore, the SQL statement fails to be executed, and the statement between `\loop` and `\end-for` is not executed.

- **\exit-for** exits the loop.

The file **test.sql** is used as an example.

```
\for
select id, name from student order by id
\loop
  \echo ${id} ${name}
  \if ${id} == 2
    \echo find id(2), name is ${name}
    \exit-for
  \endif
\end-for
```

gsql -d -p 25308 --dynamic-param -f test.sql execution result:

```
1 Jack
2 Tom
find id(2), name is Tom
```

If the **student** table contains more than two rows of data and **id** is set to **2**, run the **\exit-for** command to exit the loop. This process is also used together with the **\if** condition block.

- **\for** loop nesting

The file **test.sql** is used as an example.

```
\for
select id, name from student order by id limit 2 offset 0
\loop
  \echo ${id} ${name}
  \for
  select
  class_id, class_day
  from course
  where student_id = ${id}
  order by class_id
  \loop
    \echo ' ${class_id}, ${class_day}
  \end-for
\end-for
```

gsql -d -p 25308 --dynamic-param -f test.sql execution result:

```
1 Jack
  1003, Tue
2 Tom
  1001, Mon
  1004, Fri
```

Obtain the information about Jack and Tom in the **course** table through the two-layer loop.

PATTERN

The various **\d** commands accept a **PATTERN** parameter to specify the object name to be displayed. In the simplest case, a pattern is just the exact name of the object. The characters within a pattern are normally folded to lower case, similar to those in SQL names. For example, **\dt FOO** will display the table named **foo**. As in SQL names, placing double quotation marks (") around a pattern prevents them being folded to lower case. If you need to include a double quotation mark (") in a pattern, write it as a pair of double quotation marks (") within a double-quote sequence, which is in accordance with the rules for SQL quoted identifiers. For example, **\dt "FOO"BAR"** will be displayed as a table named **FOO"BAR** instead of **foo"bar**. You cannot put double quotation marks around just part of a pattern, which is different from the normal rules for SQL names. For example, **\dt FOO"FOO"BAR** will be displayed as a table named **fooFOObar** if just part of a pattern is quoted.

Whenever the **PATTERN** parameter is omitted completely, the `\d` commands display all objects that are visible in the current schema search path, which is equivalent to using an asterisk (*) as the pattern. An object is regarded to be visible if it can be referenced by name without explicit schema qualification. To see all objects in the database regardless of their visibility, use a dot within double quotation marks (*.*) as the pattern.

Within a pattern, the asterisk (*) matches any sequence of characters (including no characters) and a question mark (?) matches any single character. This notation is comparable to Unix shell file name patterns. For example, `\dt int*` displays tables whose names begin with **int**. But within double quotation marks, the asterisk (*) and the question mark (?) lose these special meanings and are just matched literally.

A pattern that contains a dot (.) is interpreted as a schema name pattern followed by an object name pattern. For example, `\dt foo*.bar*` displays all tables (whose names include **bar**) in schemas starting with **foo**. If no dot appears, then the pattern matches only visible objects in the current schema search path. Again, a dot within double quotation marks loses its special meaning and is matched literally.

Advanced users can use regular-expression notations, such as character classes. For example, `[0-9]` can be used to match any number. All regular-expression special characters work as specified in "POSIX regular expressions" in the *Developer Guide*, except the following characters:

- A dot (.) is used as a separator.
- An asterisk (*) is translated into an asterisk prefixed with a dot (.*), which is a regular-expression marking.
- A question mark (?) is translated into a dot (.).
- A dollar sign (\$) is matched literally.

You can write `?`, `(R+|)`, `(R|)`, and `R` to the following pattern characters: `.`, `R*`, and `R?`. The dollar sign (\$) does not need to work as a regular-expression character since the pattern must match the whole name, which is different from the usual interpretation of regular expressions. In other words, the dollar sign (\$) is automatically appended to your pattern. If you do not expect a pattern to be anchored, write an asterisk (*) at its beginning or end. All regular-expression special characters within double quotation marks lose their special meanings and are matched literally. Regular-expression special characters in operator name patterns (such as the `\do` parameter) are also matched literally.

3.6 Troubleshooting

Low Connection Performance

- The database kernel slowly runs the initialization statement.
Problems are difficult to locate in this scenario. Try using the **strace** Linux trace command.

```
strace gsql -U MyUserName -W {password} -d postgres -h 127.0.0.1 -p 23508 -r -c '\q'
```

The database connection process will be printed on the screen. If the following statement takes a long time to run:

```
sendto(3, "Q\0\0\0\25SELECT VERSION()\0", 22, MSG_NOSIGNAL, NULL, 0) = 22  
poll({fd=3, events=POLLIN|POLLERR}, 1, -1) = 1 ({{fd=3, revents=POLLIN}})
```

It indicates that **SELECT VERSION()** statement was run slowly.

After the database is connected, you can run the **explain performance select version()** statement to find the reason why the initialization statement was run slowly. For details, see "Introduction to the SQL Execution Plan" in the *Developer Guide*.

An uncommon scenario is that the disk of the machine where the CN resides is full or faulty, affecting queries and leading to user authentication failures. As a result, the connection process is suspended. To solve this problem, simply clear the data disk space of the CN.

- TCP connection is set up slowly.

Adapt the steps of troubleshooting slow initialization statement execution. Use **strace**. If the following statement was run slowly:

```
connect(3, {sa_family=AF_FILE, path="/home/test/tmp/gaussdb_llt1/s.PGSQL.61052"}, 110) = 0
```

Or

```
connect(3, {sa_family=AF_INET, sin_port=htons(61052), sin_addr=inet_addr("127.0.0.1")}, 16) = -1  
EINPROGRESS (Operation now in progress)
```

It indicates that the physical connection between the client and the database was set up slowly. In this case, check whether the network is unstable or has high throughput.

Problems in Setting Up Connections

- gsql: could not connect to server: No route to host
This problem occurs generally because an unreachable IP address or port number was specified. Check whether the values of **-h** and **-p** parameters are correct.
- gsql: FATAL: Invalid username/password,login denied.
This problem occurs generally because an incorrect user name or password was entered. Contact the database administrator to check whether the user name and password are correct.
- The "libpq.so" loaded mismatch the version of gsql, please check it.
This problem occurs because the version of **libpq.so** used in the environment does not match that of **gsql**. Run the **ldd gsql** command to check the version of the loaded **libpq.so**, and then load correct **libpq.so** by modifying the environment variable **LD_LIBRARY_PATH**.
- gsql: symbol lookup error: xxx/gsql: undefined symbol: libpqVersionString
This problem occurs because the version of **libpq.so** used in the environment does not match that of **gsql** (or the PostgreSQL **libpq.so** exists in the environment). Run the **ldd gsql** command to check the version of the loaded **libpq.so**, and then load correct **libpq.so** by modifying the environment variable **LD_LIBRARY_PATH**.
- gsql: connect to server failed: Connection timed out
Is the server running on host "xx.xxx.xxx.xxx" and accepting TCP/IP connections on port xxxx?
This problem is caused by network connection faults. Check the network connection between the client and the database server. If you cannot ping

from the client to the database server, the network connection is abnormal. Contact network management personnel for troubleshooting.

```
ping -c 4 10.10.10.1
PING 10.10.10.1 (10.10.10.1) 56(84) bytes of data.
From 10.10.10.1: icmp_seq=2 Destination Host Unreachable
From 10.10.10.1: icmp_seq=2 Destination Host Unreachable
From 10.10.10.1: icmp_seq=3 Destination Host Unreachable
From 10.10.10.1: icmp_seq=4 Destination Host Unreachable
--- 10.10.10.1 ping statistics ---
4 packets transmitted, 0 received, +4 errors, 100% packet loss, time 2999ms
```

- gsql: FATAL: permission denied for database "postgres"

DETAIL: User does not have CONNECT privilege.

This problem occurs because the user does not have the permission to access the database. To solve this problem, perform the following steps:

- a. Connect to the database as the system administrator **dbadmin**.

```
gsql -d postgres -U dbadmin -p 8000
```

- b. Grant the users with the access permission to the database.

```
GRANT CONNECT ON DATABASE postgres TO user1;
```

NOTE

Common misoperations may also cause a database connection failure, for example, entering an incorrect database name, user name, or password. In this case, the client tool will display the corresponding error messages.

```
gsql -d postgres -p 8000
gsql: FATAL: database "postgres" does not exist
```

```
gsql -d postgres -U user1 -W gauss@789 -p 8000
gsql: FATAL: Invalid username/password,login denied.
```

- gsql: FATAL: sorry, too many clients already, active/non-active: 197/3.

This problem occurs because the number of system connections exceeds the allowed maximum. Contact the database administrator to release unnecessary sessions.

You can check the number of connections as described in [Table 3-24](#).

You can view the session status in the **PG_STAT_ACTIVITY** view. To release unnecessary sessions, use the `pg_terminate_backend` function.

```
select datid,pid,state from pg_stat_activity;
```

```
datid | pid | state
-----+-----+-----
13205 | 139834762094352 | active
13205 | 139834759993104 | idle
(2 rows)
```

The value of pid is the thread ID of the session. Terminate the session using its thread ID.

```
SELECT PG_TERMINATE_BACKEND(139834759993104);
```

If information similar to the following is displayed, the session is successfully terminated:

```
PG_TERMINATE_BACKEND
-----
t
(1 row)
```

Table 3-24 Viewing the numbers of connections

Description	Command
View the upper limit of a user's connections.	<p>Run the following command to view the upper limit of user USER1's connections. -1 indicates that no connection upper limit is set for user USER1.</p> <pre>SELECT ROLNAME,ROLCONNLIMIT FROM PG_ROLES WHERE ROLNAME='user1'; rolname rolconnlimit -----+----- user1 -1 (1 row)</pre>
View the number of connections that have been used by a user.	<p>Run the following command to view the number of connections that have been used by user user1. 1 indicates the number of connections that have been used by user user1.</p> <pre>SELECT COUNT(*) FROM V\$SESSION WHERE USERNAME='user1'; count ----- 1 (1 row)</pre>
View the upper limit of connections to database.	<p>Run the following command to view the upper limit of connections used by postgres. -1 indicates that no upper limit is set for the number of connections that have been used by postgres.</p> <pre>SELECT DATNAME,DATCONNLIMIT FROM PG_DATABASE WHERE DATNAME='postgres'; datname datconnlimit -----+----- postgres -1 (1 row)</pre>
View the number of connections that have been used by a database.	<p>Run the following command to view the number of connections that have been used by postgres. 1 indicates the number of connections that have been used by postgres.</p> <pre>SELECT COUNT(*) FROM PG_STAT_ACTIVITY WHERE DATNAME='postgres'; count ----- 1 (1 row)</pre>
View the total number of connections that have been used by users.	<p>Run the following command to view the number of connections that have been used by users:</p> <pre>SELECT COUNT(*) FROM PG_STAT_ACTIVITY; count ----- 10 (1 row)</pre>

- gsql: wait xxx.xxx.xxx.xxx:xxxx timeout expired

When **gsql** initiates a connection request to the database, a 5-minute timeout period is used. If the database cannot correctly authenticate the client request and client identity within this period, **gsql** will exit the connection process for the current session, and will report the above error.

Generally, this problem is caused by the incorrect host and port (that is, the *xxx* part in the error information) specified by the **-h** and **-p** parameters. As a result, the communication fails. Occasionally, this problem is caused by network faults. To resolve this problem, check whether the host name and port number of the database are correct.

- gsql: could not receive data from server: Connection reset by peer.

Check whether CN logs contain information similar to "FATAL: cipher file "/data/coordinator/server.key.cipher" has group or world access". This error is usually caused by incorrect tampering with the permissions for data directories or some key files. For details about how to correct the permissions, see related permissions for files on other normal instances.

- gsql: FATAL: GSS authentication method is not allowed because XXXX user password is not disabled.

In **pg_hba.conf** of the target CN, the authentication mode is set to **gss** for authenticating the IP address of the current client. However, this authentication algorithm cannot authenticate clients. Change the authentication algorithm to **sha256** and try again. For details, see "Configuration File Reference" in the *Developer Guide*.

NOTE

- Do not modify the configurations of database cluster hosts in the **pg_hba.conf** file. Otherwise, the database may become faulty.
- You are advised to deploy service applications outside the database cluster.

Other Faults

- There is a core dump or abnormal exit due to the bus error.

Generally, this problem is caused by changes in loading the shared dynamic library (.so file in Linux) during process running. Alternatively, if the process binary file changes, the execution code for the OS to load machines or the entry for loading a dependent library will change accordingly. In this case, the OS kills the process for protection purposes, generating a core dump file.

To resolve this problem, try again. In addition, do not run service programs in a cluster during O&M operations, such as an upgrade, preventing such a problem caused by file replacement during the upgrade.

NOTE

A possible stack of the core dump file contains `dl_main` and its function calling. The file is used by the OS to initialize a process and load the shared dynamic library. If the process has been initialized but the shared dynamic library has not been loaded, the process cannot be considered completely started.

4 Data Studio - Integrated Database Development Tool

4.1 About Data Studio

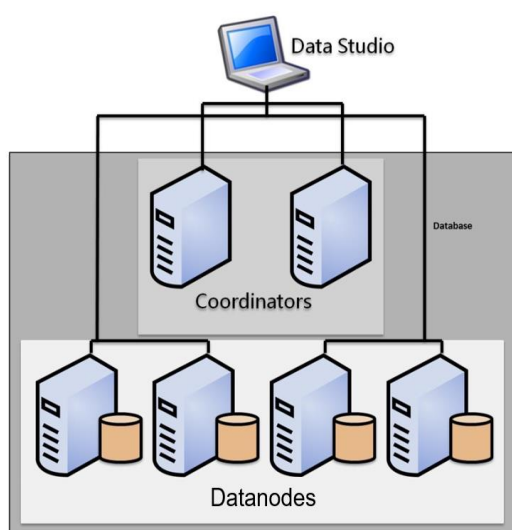
4.1.1 Overview

Data Studio shows major database features using a GUI to simplify database development and application building.

Data Studio allows database developers to create and manage database objects, such as databases, schemas, functions, stored procedures, tables, sequences, columns, indexes, constraints, and views, execute SQL statements or SQL scripts, edit and execute PL/SQL statements, as well as import and export table data.

Data Studio also allows database developers to debug and fix defects in the PL/SQL code using debugging operations such as **Step Into**, **Step Out**, **Step Over**, **Continue**, and **Terminate**.

The following figure shows the operating environment of the database and Data Studio.



Helpful Links

[Downloading Client Tools](#)

4.1.2 Constraints and Limitations

This section describes the constraints and limitations for using Data Studio.

Object Browser Filter Tree

The filter count and filter status are not displayed in the filter tree.

Character Encoding

If the SQL statement, DDL, object name, or data to be viewed contains Chinese characters, and the OS supports GBK, set the encoding mode to **GBK**. For details, see [Session Setting](#).

Connection Management

On the **Advanced** tab of the **New Connection** and **Edit Connection** pages, commas (,) are used as separators in the **include** and **exclude** columns. Therefore, a schema name that contains a comma (,) is not supported.

Database Tables

- On the **Index** tab of the table creation wizard, the sequence of the selected columns in the list view cannot be retained after columns are deleted.
- The message dialog box is displayed only when the Data Studio window is the active window of the current operating system (OS).
- The limitations of [editing table data](#) are as follows:
 - Expression values cannot be entered on the **Edit Table Data** tab.
 - Only obtained records can be edited.
 - When you edit the filter criteria of a table, the search content in the HTML tags, such as <, &, and >, is not highlighted.
 - In the prompt message, cells containing an ampersand (&) are not displayed, and cells containing two consecutive ampersands (&) are displayed as one &.
 - The cursor does not move to the new row. You need to click the desired cell.

Function/Procedure

A function or procedure created in **SQL Terminal** or **Create Function/Procedure** wizard must end with a slash (/). Otherwise, the statement is considered as single query and an error may be reported during execution.

General

- A maximum of 100 tab pages can be opened at a time in the editing area. The actual number of tab pages displayed depends on the available resources of the host.

- The name of a database object can contain a maximum of 64 characters (only in TXT format). Database objects include databases, schemas, functions, stored procedures, tables, sequences, constraints, indexes, and views. But there is no limit to the number of characters used in expressions and descriptions of Data Studio.
- A maximum of 300 **Result** tabs can be opened on the instance that you have logged in to in Data Studio.
- If large objects are loaded in the **Object Browser** and **Search Object** windows, the object loading may be slow and Data Studio may fail to respond.
- Adjusting the cell width may cause Data Studio to fail to respond.
- A maximum of 1000 characters can be displayed in a cell of the table. The excess characters are displayed as ellipsis (...).
 - If you copy the data from a cell in a table or the **Result** tab to any editor, such as SQL terminal/PLSQL source editor, notepad, or any other external editor application, all data is pasted.
 - If you copy the data from a cell in a table or the **Result** tab to an editable cell, the cell displays only the first 1000 characters and the excess characters are displayed as
 - When the data of a table or the **Result** tab is exported, the exported file contains all the data.

Security

Data Studio validates SSL connection parameters only for the first time of connection. If **Enable SSL** is selected, the same SSL connection parameters are used when a new connection is opened.

NOTE

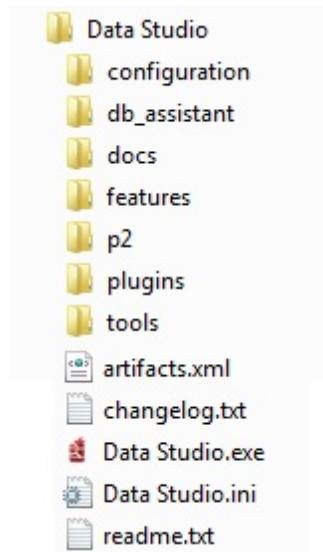
- If **Enable SSL** is not selected during connecting to Data Studio, data is not encrypted by default.
- If the security file is damaged during the SSL connection, Data Studio cannot perform any database operations. To resolve this problem, delete the security folder in the corresponding configuration folder and restart Data Studio.

SQL Terminal

- If a SQL file containing a large number of SQL statements is opened, the error of insufficient memory may occur. For details, see [Troubleshooting](#).
- Data Studio does not disable the **Auto Suggest** and hyperlink features in the commented text in **SQL Terminal**.
- The hyperlink feature is not supported if the schema or table name contains spaces or periods (.).
- The **Auto Suggest** feature is not supported if the object name contains single quotation marks (') or double quotation marks (").
- Data Studio only supports the basic formatting of simple **SELECT** statements, and may fail to process complex queries.

4.1.3 Structure of the Release Package

The following figure shows the structure of the Data Studio release package.



Folder/File	Description
configuration	Contains information about the application startup and the required Eclipse plug-in path.
db_assistant	Contains files related to the SQL Assistant function.
docs	<ul style="list-style-type: none">• Contains <i>Data Studio User Manual</i>.• Contains copyright notices, licenses, and written offer of the open source software used in Data Studio.
features	Contains Eclipse (such as the rich client platform, RCP) and Data Studio features.
p2	Contains files required for providing and managing Eclipse- and Equinox-based applications.
plugins	Contains the required Eclipse and Data Studio plug-ins.
tools	Contains tools that Data Studio depends on.

Folder/File	Description
UserData <ul style="list-style-type: none">• Autosave• Logs• Preferences• Profile<ul style="list-style-type: none">- History• Security	<p>Contains folders of each OS user of Data Studio.</p> <p>Autosave: contains the information of queries and functions/procedures that are automatically saved</p> <p>Logs: contains the Data Studio.log file that logs all the operations performed in Data Studio</p> <p>Preferences: contains the Preferences.prefs file that stores the custom preferences</p> <p>Profile: contains the connection.properties and Profiles.txt files, as well as SQL History, to manage connection information in Data Studio</p> <p>Security: contains the files required for the management security of Data Studio</p> <p>NOTE</p> <ul style="list-style-type: none">• The UserData folder is created after the first user opens an instance using Data Studio.• The Logs folder, language, memory settings and log level are common for all users.• After Data Studio is started, the Logs, Preferences, Profile, and Security folders, as well as the Data Studio.log, Preferences.prefs, connection.properties, and Profiles.txt files, are created.• If the Logs folder path is specified in the Data Studio.ini file, logs are created in the specified path.• When you cannot log in to Data Studio due to a damaged security key, perform the following steps to generate a new security key:<ol style="list-style-type: none">1. Delete the Security folder in Data Studio > UserData.2. Restart Data Studio.
artifacts.xml	Contains the product build information.
changelog.txt	Contains the detailed log changes of the current release.
Data Studio.exe/DataStudio.sh	Allows you to connect to a server and perform operations, such as managing database objects, editing or executing PL/SQL programs.

Folder/File	Description
<i>Data Studio.ini</i>	Contains the configuration information for running Data Studio.
<i>readme.txt</i>	Contains the features or fixed issues of the current release.

4.1.4 System Requirements

This section describes the minimum system requirements for using Data Studio.

Software Requirements

OS

The following table lists the OS requirements of Data Studio.

Table 4-1 Supported OSs and corresponding installation packages

Server	OS	Supported Version
General-purpose x86 servers	Windows	Windows 7 (64 bit)
		Windows 10 (64 bit)
		Windows 2012 (64 bit)
		Windows 2016 (64 bit)
	SUSE Linux Enterprise Server 12	SP0 (SUSE 12.0)
		SP1 (SUSE 12.1)
		SP2 (SUSE 12.2)
		SP3 (SUSE 12.3)
		SP4 (SUSE 12.4)
	CentOS	7.4 (CentOS7.4)
		7.5 (CentOS7.5)
		7.6 (CentOS7.6)
TaiShan ARM server	NeoKylin	7.0

Browser

The following table lists the browser requirement of Data Studio.

OS	Version
Windows	Internet Explorer 11 or later

Other software requirements

The following table lists the software requirement of Data Studio.

Table 4-2 Data Studio software requirement

Software	Specifications
Java	Open JDK 1.8 or later corresponding to the OS bit is recommended.
GTK	For Linux OSs, GTK 2.24 or later is required.
GNU libc	DDL can be displayed, imported, exported; and data operations can be performed only in libc 2.17 and later in GN.

Table 4-3 Supported database versions

Database	Version
GaussDB(DWS)	1.2.x 1.5.x 8.0.x 8.1.x 8.2.x

NOTE

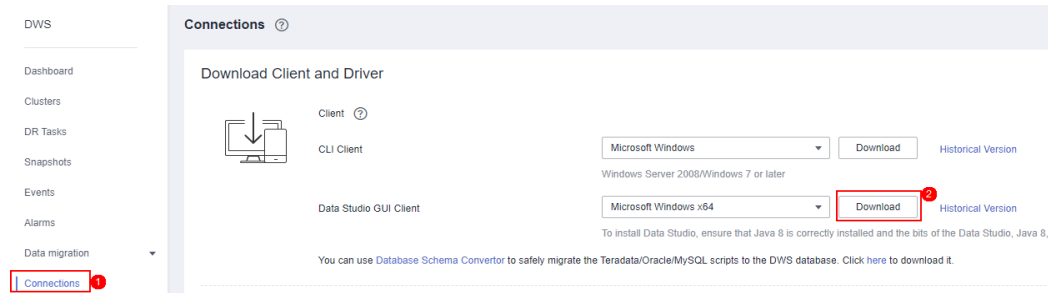
The recommended minimum screen resolution is 1080 x 768. If the resolution is lower than this value, the page display will be abnormal.

4.2 Installing and Configuring Data Studio

This section describes how to install and configure Data Studio, and how to configure servers for debugging PL/SQL Functions.

Installation Preparations

On the **Connections** page of the GaussDB(DWS) console, download the Data Studio GUI client.



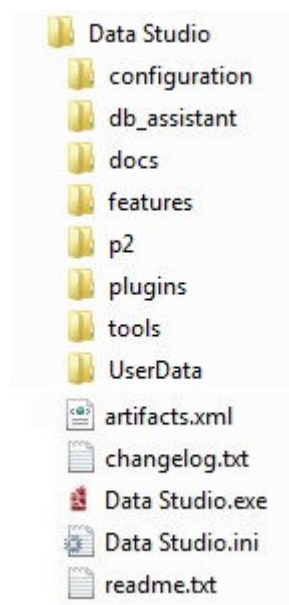
Installing Data Studio

You can run Data Studio after decompressing the installation package.

Perform the following steps to install Data Studio:

- Step 1** Decompress the required package (32-bit or 64-bit) to the **Program Files** or **Program Files (x86)** folder. If another folder is used, the administrator should control the user permission for accessing the folder.

The following files and folders are obtained after decompression:



- Step 2** Locate and double-click **Data Studio.exe** to start Data Studio client.

NOTE

The **UserData** folder is created after the first user opens the instance using Data Studio. See [Quick Start](#) to rectify any error that occurs when Data Studio is started.

----End

See [Adding a Connection](#) to create a database connection.

Configuring Data Studio

Configure Data Studio using **Data Studio.ini** file.

 NOTE

Restart Data Studio to view parameter changes. Invalid parameters added to the configuration file are ignored by Data Studio. All the following parameters are optional.

Table 1 Configuration parameters lists the configuration parameters of Data Studio.

Table 4-4 Configuration parameters

Parameter	Description	Value Range	Default Value
-startup	Defines the JAR files required to load Data Studio. This information varies based on the version used.	N/A	<i>plugins/org.eclipse.equinox.launcher_1.3.100.v20150511-1540.jar</i>
--launcher.library	Specifies the library required for loading Data Studio. The library varies depending on the Data Studio version.	N/A	<i>plugins/org.eclipse.equinox.launcher.win32.win32.x86_1.1.300.v20150602-1417</i> or <i>plugins/org.eclipse.equinox.launcher.win32.win32.x86_64_1.1.300.v20150602-1417</i> depending on the installation package used
-clearPersistedState	Used to remove any cached content on the GUI and reload Data Studio.	N/A	N/A NOTE You are advised to add this parameter.
-consoleLineCount	Specifies the maximum number of rows to be displayed in the Messages window.	1-5000	1000
-logfolder	Used to create a log folder. You can specify the path to save logs. If the default value . is used, the folder is created in the Data Studio \UserData\Username \logs directory. For details, see Setting the Location of the Created Log File .	N/A	-

Parameter	Description	Value Range	Default Value
-loginTimeout	Specifies the waiting time for creating a connection, in second. Within the period specified by this parameter, Data Studio continuously attempts to connect to the database. If the connection times out, the system displays a message indicating that the connection times out or the connection fails.	N/A	180
-data	Specifies the instance data location of a session.	N/A	@none
@user.home/ MyAppWorkspac e	Specifies the location where Eclipse workspace is created when Data Studio is being started. @user.home refers to C:/Users/Username . Eclipse log files are stored in @user.home/MyAppWorkspace/.metadata .	N/A	N/A
-detailLogging	Defines the criteria for logging error messages. True: All error messages are logged. False: Only error messages explicitly specified by Data Studio are logged. For details, see Fault Logging . This parameter is not added by default and can be configured manually if logging is required.	True/False	False

Parameter	Description	Value Range	Default Value
-logginglevel	Used to create a log file based on the specified value. If the value is out of range or empty, the default value WARN is used. For details, see Different Types of Log Levels . This parameter is not added by default and can be configured manually if logging is required.	FATAL, ERROR, WARN, INFO, DEBUG, TRACE, ALL, and OFF	WARN
-focusOnFirstResult	Used for the auto-positioning of the Result tab. False: The auto-positioning to the last opened Result tab is enabled. True: The auto-positioning function is disabled.	True/False	False
NOTE <ul style="list-style-type: none">All the preceding parameters must be added in front of -vmargs.-startup and --launcher.library must be the first and second parameters, respectively.			
-vmargs	Specifies the starting location of VM parameters. NOTE -vmargs must locate at the end of the configuration file.	N/A	N/A
-vm	Specifies the file name, for example, <i>javaw.exe</i> , and the relative path to Java.	N/A	N/A
-Dosgi.requiredJavaVersion	Specifies the earliest Java version required for running Data Studio. Do not change the value of this parameter.	N/A	1.5 NOTE The recommended Java version is 1.8.

Parameter	Description	Value Range	Default Value
-Xms	Specifies the initial heap size occupied by Data Studio. The value must be a multiple of 1024 and greater than 40 MB and less than or equal to the value of -Xmx . At the end of the value, add the letter k or K to indicate kilobytes, m or M to indicate megabytes, g or G to indicate gigabytes. Examples are as follows: -Xms40m -Xms120m For details, see Java documentation.	N/A	-Xms40m
-Xmx	Specifies the maximum heap size occupied by Data Studio. The value can be modified based on the available RAM space. At the end of the value, add the letter k or K to indicate kilobytes, m or M to indicate megabytes, g or G to indicate gigabytes. Examples are as follows: -Xmx1200m -Xmx1000m For details, see Java documentation.	N/A	-Xmx1200m
- OLTPVersionOldS T	Used to configure the earlier OLTP versions. You can log in to gsql and run SELECT VERSION() to update the OLTPVersionOldST parameter in the .ini file using the obtained version number.	-	-

Parameter	Description	Value Range	Default Value
- OLTPVersionNew ST	Used to configure the latest OLTP version. You can log in to gsql and run SELECT VERSION() to update the OLTPVersionNewST parameter in the .ini file using the obtained version number.	-	-
-testability	Used to enable the testability feature. When this function is enabled in the current version: <ul style="list-style-type: none">You can press Ctrl +Space to copy the content of the latest Auto Suggest operation.When Include Analyze is selected, Execution Plan and Cost is displayed in tree and graphical view. This parameter is not available by default and needs to be added manually.	True/False	False
-Duser.language	Specifies the language settings of Data Studio. Add this parameter after the language settings are changed.	zh/en	N/A
-Duser.country	Specifies the country/region settings of Data Studio. Add this parameter after the language settings are changed.	CN/IN	N/A
- Dorg.osgi.framew ork.bundle.parent =ext	Specifies the class loader used for boot delegation.	boot/app/ ext	boot

Parameter	Description	Value Range	Default Value
- Dosgi.framework. extensions=org.e clipse.fx.osgi	Specifies a list of framework extension names. The framework extension is a fragment of the system bundle (org.eclipse.osgi). You can use other classes provided by this framework.	N/A	N/A

NOTE

- You are not allowed to modify the following settings:
Dorg.osgi.framework.bundle.parent=ext
Dosgi.framework.extensions=org.eclipse.fx.osgi
- If you receive the message **SocketException: Bad Address: Connect:**
Check whether the client is connected to the server using the IPv6 or IPv4 protocol. You can also establish the connection by configuring the following parameters in the .ini file:
-Djava.net.preferIPv4Stack=true
-Djava.net.preferIPv6Stack=false

[Table 4-5](#) lists the supported communication scenarios.

The first row and first column indicate the types of nodes that attempt to communicate with each other. **x** indicates that the nodes can communicate with each other.

Table 4-5 Communication scenarios

Node	V4 Only	V4/V6	V6 Only
V4 only	x	x	No communication possible
V4/V6	x	x	x
V6 only	No communication possible	x	x

Setting the Location of the Created Log File

Step 1 Open the **Data Studio.ini** file.

Step 2 Specify a log file path using the **-logfolder** parameter.

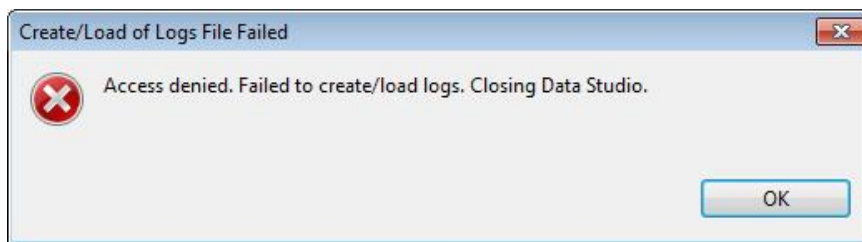
For example:

-logfolder=c:\test1

In this example, the **Data Studio.log** file is created in the **c:\test1\Username\logs** path.

NOTE

If you do not have the permission for accessing the path specified in the **Data Studio.ini** file, Data Studio is closed and the following dialog box is displayed.



----End

The **Data Studio.log** file will be created in the **Data Studio\UserData\Username\logs** path if:

- The path of the **Data Studio.ini** file is not specified.
For example, the value of **-logfolder=** is empty.
- The specified path does not exist.

NOTE

For details about server logs, see the server manual.

You can use any text editor to open and view the **Data Studio.log** file.

Fault Logging

Configure the **-detailLogging** parameter to determine whether to log errors, exceptions, or stack running details of throwables.

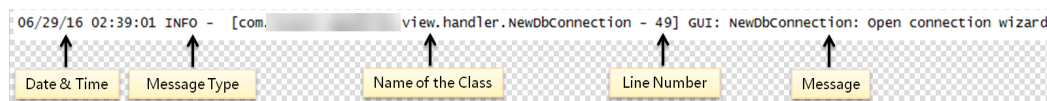
For example, set **-detailLogging** to **False**.

If the value of **-detailLogging** is set to **True**, errors, exceptions, or stack running details of throwables will be logged.

If the value of **-detailLogging** is set to **False**, errors, exceptions, or stack running details of throwables will not be logged.

Log Message Description

The log message is described as follows:



When the size of the **Data Studio.log** file reaches 10,000 KB (the maximum value), the system automatically creates a file and saves it as **Data Studio.log.1**. Logs in **Data Studio.log** are stored in **Data Studio.log.1**. When the size of **Data Studio.log** reaches the maximum again, the system automatically creates a file and saves it as **Data Studio.log.2**. The latest logs are continuously written to **Data Studio.log**. This process continues till the size of **Data Studio.log.5** reaches maximum, and the cycle restarts. Data Studio deletes the earliest log file **Data**

Studio.log.1. For example, **Data Studio.log.5** is renamed to **Data Studio.log.4**, **Data Studio.log.4** to **Data Studio.log.3**, and so on.

 **NOTE**

To enable performance logging in server logs, enable the parameter **log_min_messages** and set the parameter to **debug1** in the configuration file **data/postgresql.conf**, that is, **log_min_messages = debug1**.

Different Types of Log Levels

Different types of log levels that are displayed in **Data Studio.log** are as follows:

- **TRACE:** Provides more detailed information than the **DEBUG** level.
- **DEBUG:** Indicates the granular information events and is useful for application debugging.
- **INFO:** Displays the messages of application progresses.
- **WARN:** Indicates a potentially hazardous situation.
- **ERROR:** Indicates error events.
- **FATAL:** Indicates an event that causes the application to stop.
- **ALL:** Indicates that all the log levels are enabled.
- **OFF:** Indicates that all the log levels are disabled.

 **NOTE**

- If you enter an invalid value of log level, the log level will be set to **WARN**.
- If you do not specify the log level, the log level will be set to **WARN**.

The logger outputs all messages equal to or greater than its log level.

The log levels of the Log4j framework are as follows.

Table 4-6 Log levels

-	FATAL	ERROR	WARN	INFO	DEBUG	TRACE
OFF	x	x	x	x	x	x
FATAL	√	x	x	x	x	x
ERROR	√	√	x	x	x	x
WARN	√	√	√	x	x	x
INFO	√	√	√	√	x	x
DEBUG	√	√	√	√	√	x
TRACE	√	√	√	√	√	√
ALL	√	√	√	√	√	√
√- Creating a log file x - Not creating a log file						

4.3 Quick Start

This section describes how to start Data Studio.

Prerequisites

The **StartDataStudio.bat** batch file checks the version of Operating System (OS), Java and Data Studio as a prerequisite to run Data Studio.

- Step 1** In the **Release package** navigate to **Tools** folder, locate and double-click **StartDataStudio.bat** to execute and check Java version compatibility.

The batch file checks the version compatibility and will launch Data Studio or display appropriate message based on the OS, Java and Data Studio version installed.

If the Java version installed is earlier than 1.8, then **error message** is displayed.

The scenarios checked by the batch file to confirm the required versions of the OS and Java for Data Studio:

DS Installation (32-bit/64-bit)	OS (Bit)	Java (bit)	Outcome
32	32	32	Launches Data Studio.
32	64	32	Launches Data Studio.
32	64	64	Error Message is displayed.
64	32	32	Error Message is displayed.
64	64	32	Error Message is displayed.
64	64	64	Launches Data Studio.

----End

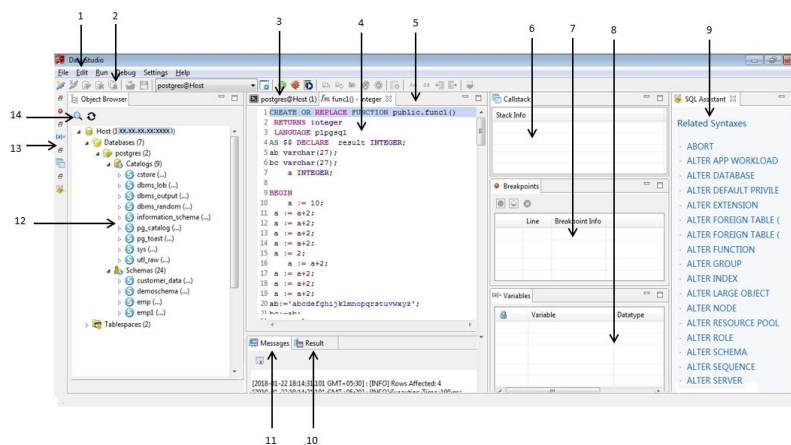
4.4 Data Studio GUI

This section describes the Data Studio GUI.

The Data Studio GUI contains the following:

1. **Main Menu** provides basic operations of Data Studio.
2. **Toolbar** contains the access to frequently used operations.
3. **SQL Terminal** tab is used to execute SQL statements and functions/procedures.
4. **PL/SQL Viewer** tab displays the information of functions/procedures.


5. **Editor Area** is used to perform edit operations.
6. **Callstack** pane displays the call stack.
7. **Breakpoints** pane displays all the breakpoints that have been set.
8. **Variables** pane displays variables and their values.
9. **SQL Assistant** tab displays suggestion or reference for the information entered in **SQL Terminal** and **PL/SQL Viewer**.
10. **Result** tab displays the result of an executed SQL statement or function/procedure.
11. **Message** tab displays the process output, standard output, standard input, and standard errors.
12. **Object Browser** tab displays the hierarchical tree structure of database connections and the database objects that users can access. All created schemas, except the public schemas, are grouped under **Catalogs** by default, and user schemas are grouped under **Schemas** of the corresponding database.
13. **Minimized Window Panel** is used to open **Callstack**, **Breakpoints**, and **Variables** panes. This pane is displayed only when **Callstack**, **Breakpoints**, or **Variables** pane minimized or all three are minimized.
14. **Search Toolbar** is used to search for objects in **Object Browser** tab.



4.5 Data Studio Menus

4.5.1 File

The **File** menu contains database connection options. Click **File** in the main menu or press **Alt+F** to open the **File** menu.

Function	Button	Shortcut Key	Description
Creating a connection		Ctrl+N	Creates a database connection in the Object Browser and SQL Terminal tabs.

Function	Button	Shortcut Key	Description
Deleting a connection		-	Deletes the selected database connection from Object Browser .
Opening a connection		-	Connects to the database.
Disconnecting from the database		Ctrl+Shift+D	Disconnects from the specified database.
Disconnecting all connections		-	Disconnects all the databases of a specified connection.
Opening		Ctrl+O	Loads SQL queries in SQL Terminal .
Saving SQL scripts		Ctrl+S	Saves the SQL scripts of the SQL Terminal to a SQL file.
Saving SQL scripts to a new file		CTRL+ALT+S	Saves the SQL scripts in SQL Terminal to a new SQL file.
Exiting	-	Alt+F4	Exits from Data Studio and disconnects from the database. NOTE Any unsaved changes will be lost.

Stopping Data Studio

Perform the following steps to stop Data Studio:

Step 1 Click .

Alternatively, choose **File > Exit**.

The **Exit Application** dialog box is displayed prompting you to take the required actions.

Step 2 Click the corresponding button as required.

- **Force Exit:** Exits the application without saving the SQL execution history.

 NOTE

If you click **Force Exit**, the SQL execution history that is not saved may be lost.

- **Graceful Exit:** Saves the SQL execution history that has not been saved to the disk before exiting.
- **Cancel:** Cancels the exit from the application.

----End


4.5.2 Edit

The **Edit** menu contains clipboard, **Format**, **Find and Replace**, and **Search Objects** operations to use in the **PL/SQL Viewer** and **SQL Terminal** tab. Press **Alt +E** to open the **Edit** menu.

Function	Shortcut Key	Description
Cut	Ctrl+X	Cuts the selected text.
Copy	Ctrl+C	Copies the selected text or object name.
Paste	Ctrl+V	Pastes the selected text or object name.
Format	Ctrl+Shift+F	Formats all SQL statements and functions/procedures.
Select all	Ctrl+A	Selects all the text in SQL Terminal .
Find and replace	Ctrl+F	Finds and replaces text in SQL Terminal .
Search for objects	Ctrl+Shift+S	Searches for objects within a connected database.
Undo	Ctrl+Z	Undoes the previous operation.
Redo	Ctrl+Y	Redoes the previous operation.
Uppercase	Ctrl+Shift+U	Changes the selected text to uppercase.
Lowercase	Ctrl+Shift+L	Changes the selected text to lowercase.
Go to row	Ctrl+G	Redirects to a specific row in SQL Terminal or PL/SQL Viewer .

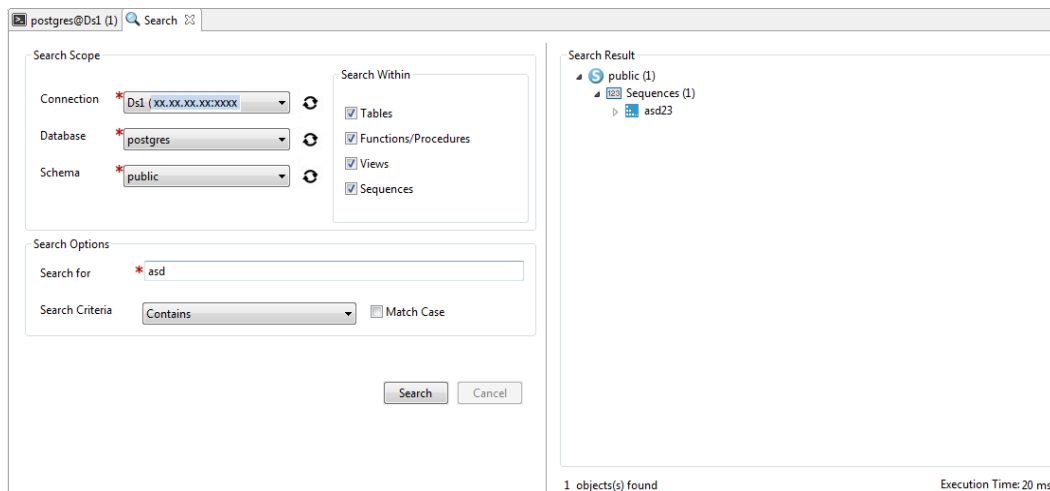
Function	Shortcut Key	Description
Comment/Uncomment lines	Ctrl+/ 	Comments or uncomments all selected rows.
Comment/Uncomment blocks	Ctrl+Shift+/ 	Comments or uncomments all selected rows or blocks.

Search Objects

You can choose **Search Objects** to search for objects from **Object Browser** based on the search criteria. Specifically, you can choose **Edit > Search Objects** or click  in the **Object Browser** toolbar. The search result is displayed in a tree structure, similar to that in **Object Browser**. Operations in the right-click menu, except for **Refresh**, can be performed on objects in the search result. After the page is refreshed, objects that have been deleted or renamed or whose schemas have been set can be viewed only from the primary object browser. Right-click options on group names, such as tables, schemas, and views, cannot be performed on objects in the search result. Only objects that you have the permission to access will be displayed in **Search Scope**.

NOTE

You can view newly added objects in the **Search** window by clicking **Refresh** at the end of the object type.



Supported search options

Search Option	Search Behavior
Contains	Text that contains the searched content will be displayed.
Starts With	Text that starts with the searched content will be displayed.

Search Option	Search Behavior
Exact Word	Text that matches exactly with the searched content will be displayed.
Regular Expression	<p>When regular expression text is used, text that meets the search criteria is searched for in Object Browser. Select Regular Expression from the Search Criteria drop-down list. For more information, see POSIX Regular Expressions rules.</p> <p>Examples are as follows:</p> <ul style="list-style-type: none"> • Enter ^a to search for all objects that start with a. • Enter ^[^A-Za-z]+\$ to search for objects that do not contain letters. • Enter ^[^0-9]+\$ to search for objects that do not contain digits. • Enter ^[a-t][^r-z]+\$ to search for objects that start with a letter from a to t and do not contain letters from r to z. • Enter ^e.*a\$ to search for objects that start with e and end with a. • Enter ^[a-z]+\$ and select Match Case to search for objects that contain only lowercase letters. • Enter ^[A-Z]+\$ and select Match Case to search for objects that contain only uppercase letters. • Enter ^[A-Za-z]+\$ and select Match Case to search for objects that contain uppercase and lowercase letters. • Enter ^[A-Za-z0-9]+\$ and select Match Case to search for objects that contain uppercase and lowercase letters and digits. • Enter ^".*\$ to search for objects that are put in double quotation marks (").

Search with underscores (_) or percentage (%)



Search Value	Search Behavior
_	<p>The underscore (_) in text is considered the wildcard of a single character. Search criteria such as Regular Expression, Starts With, and Exact Word are not applicable to text that contains underscores (_).</p> <p>Examples are as follows:</p> <ul style="list-style-type: none"> • Enter _ed to search for objects that start with a single character followed by ed. • Enter D_t_e to search for objects that contain d, followed by a single character, t, single character, and e.



Search Value	Search Behavior
%	<p>The percentage (%) in text is considered the wildcard of multiple characters. Search criteria such as Regular Expression, Starts With, and Exact Word are not applicable to text that contains percentage (%).</p> <p>Examples are as follows:</p> <ul style="list-style-type: none">• Enter _%ed to search for objects that contain ed.• Enter D%t%e to search for objects that contain d, followed by any number of characters, t, any number of characters, and e.

If you select **Match Case** and perform the search, the system searches for the content that matches the case of the search text.

4.5.3 Run







The **Run** menu contains options of performing a database operation in the **PL/SQL Viewer** tab and executing SQL statements in the **SQL Terminal** tab. Press **Alt+R** to open the **Run** menu.

Function	Button	Shortcut Key	Description
Executing the specified function/procedure		Ctrl+E	Starts to execute the specified function/procedure in normal mode. Displays the result in the Result tab. Displays information about the actions performed in the Messages tab.
Compiling/Execution a statement		Ctrl+Enter	Compiles a function/procedure. Executes SQL statements in SQL Terminal .

Function	Button	Shortcut Key	Description
Compiling/ Executing statements in a new tab		Ctrl+Alt+Enter	Retains the current tab and executes statements in a new tab. This function is disabled if Retain Current is selected.
Canceling the query		Shift+Esc	Canceling the query that is being executed. Displays the result in the Result tab. Displays information about the actions performed in the Messages tab.

4.5.4 Debug

The **Debug** menu contains debugging operations in the **PL/SQL Viewer** and **SQL Terminal** tabs. Press **Alt+D** to open the **Debug** menu.

Function	Button	Shortcut Key	Description
Debugging		Ctrl+D	Starts the debugging process.
Proceeding		F9	Continues the debugging.
Terminating		F10	Terminates the debugging.
Step Into		F7	Steps into the debugging process.
Step Over		F8	Steps over the debugging process.
Step Out		Shift+F7	Steps out of the debugging process.

4.5.5 Settings

The **Settings** menu contains the option of changing the language. Press **Alt+G** to open the **Settings** menu.

Function	Shortcut Key	Description
Language	-	Sets the language for the Data Studio GUI.
Preferences	-	Sets the user preferences in Data Studio.

4.5.6 Help

The **Help** menu contains the user manual and version information of Data Studio. Press **Alt+H** to open the **Help** menu.

Function	Shortcut Key	Description
User manual	F1	Opens the user manual of Data Studio.
About Data Studio	-	Displays the current version and copyright information of Data Studio.

NOTE

- Visit <https://java.com/en/download/help/path.xml> to set the Java Home path.

4.6 Data Studio Toolbar

The following figure shows the Data Studio Toolbar.



The toolbar contains the following operations:

- **Adding a Connection**
- **Removing a Connection**
- **Connecting to a Database**
- **Disconnecting a Database**
- **Disconnecting All Databases**
- **Opening SQL Scripts**
- **Saving SQL Scripts**
- **Connection Profile Drop-down List**

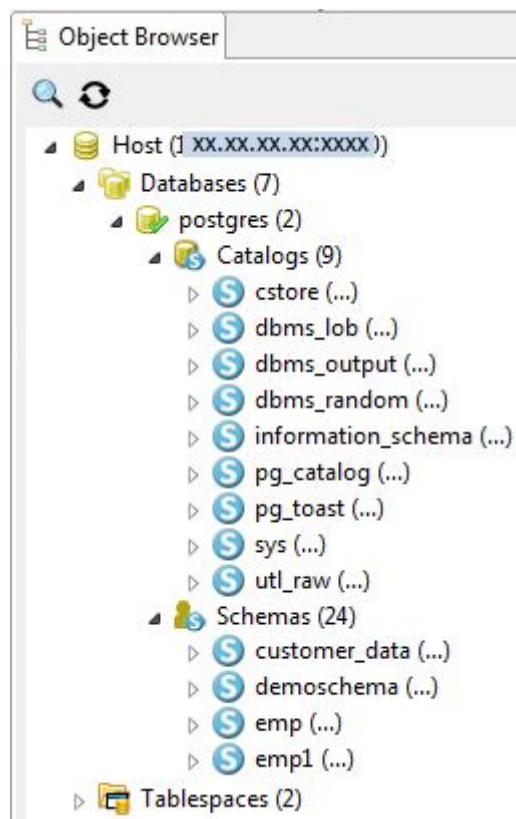
- [Opening New SQL Terminal Tabs](#)
- [Executing a DB Object](#)
- [Debugging a DB Object](#)
- [Editing a Function/Procedure](#)
- [Step Into](#)
- [Step Out](#)
- [Step Over](#)
- [Terminating Debugging](#)
- [Continuing Debugging](#)
- [Execution Plan and Cost](#)
- [Viewing the Query Execution Plan and Cost Graphically](#)
- [Formatting](#)
- [Uppercase](#)
- [Lowercase](#)
- [SQL Assistant](#)

4.7 Data Studio Right-Click Menus

This section describes the right-click menus of Data Studio.

Object Browser Pane

The following figure shows the **Object Browser** pane.



Right-clicking a connection name allows you to select **Rename Connection**, **Edit Connection**, **Remove Connection**, **Properties**, and **Refresh** options.

Menu Item	Shortcut Key	Description
Rename Connection	-	Renames a connection.
Edit Connection	-	Modifies connection details.
Remove Connection	-	Removes the existing database connection.
Properties	-	Shows the details of a connection.
Refresh	F5	Refreshes a connection.

Right-clicking the **Databases** tab allows you to select **Create Database**, **Disconnect All**, and **Refresh** options.

Menu Item	Shortcut Key	Description
Create Database	-	Creates a database of this connection.
Disconnect All	-	Disconnects all the databases of this connection.
Refresh	F5	Refreshes a database group.

Right-clicking an active database allows you to select **Disconnect from DB**, **Open Terminal**, **Properties**, and **Refresh** options.

Menu Item	Shortcut Key	Description
Disconnect from DB	Ctrl+Shift+D	Disconnects from a database.
Open Terminal	Ctrl+T	Opens a terminal of this connection.
Properties	-	Displays the properties of a database.
Refresh	F5	Refreshes a database.

Right-clicking an inactive database allows you to select **Connect to DB**, **Rename Database**, and **Drop Database** options.

Menu Item	Shortcut Key	Description
Connect to DB	-	Connects to a database.
Rename Database	-	Renames a database.
Drop Database	-	Drops a database.

Right-clicking the **Catalogs** tab allows you to select the **Refresh** option.

Menu Item	Shortcut Key	Description
Refresh	F5	Refreshes a function/procedure.

Right-clicking the **Schemas** tab allows you to select **Create Schema**, **Grant/Revoke**, and **Refresh** options.

Menu Item	Shortcut Key	Description
Create Schema	-	Creates a schema.
Grant/Revoke	-	Grants or revokes permissions on a schema group.
Refresh	F5	Refreshes a schema.

Right-clicking a schema allows you to select **Export DDL**, **Export DDL and Data**, **Rename Schema**, **Drop Schema**, **Grant/Revoke**, and **Refresh** options.

Menu Item	Shortcut Key	Description
Export DDL	-	Exports DDL of a schema.
Export DDL and Data	-	Exports DDL and data of a schema.
Rename Schema	-	Renames a schema.
Drop Schema	-	Drops a schema.
Grant/Revoke	-	Grants or revokes permissions on a schema.
Refresh	F5	Refreshes a schema.

Right-clicking **Functions/Procedures** allows you to select **Create PL/SQL Function**, **Create PL/SQL Procedure**, **Create SQL Function**, **Create C Function**, **Grant/Revoke**, and **Refresh** options.

Menu Item	Shortcut Key	Description
Create PL/SQL Function	-	Creates a PL/SQL function.
Create PL/SQL Procedure	-	Creates a PL/SQL procedure.
Create SQL Function	-	Creates a SQL function.
Create C Function	-	Creates a C function.
Grant/Revoke	-	Grants or revokes permissions on a function/procedure.
Refresh	F5	Refreshes a function/procedure.

Right-clicking **Tables** allows you to select **Create table**, **Create partitioned table**, **Grant/Revoke**, and **Refresh** options.

Menu Item	Shortcut Key	Description
Create table	-	Creates an ordinary table.
Create partitioned table	-	Creates a partitioned table.
Grant/Revoke	-	Grants or revokes permissions on a table.
Refresh	F5	Refreshes a table.

Right-clicking **Views** allows you to select **Create View**, **Grant/Revoke**, and **Refresh** options.

Menu Item	Shortcut Key	Description
Create View	-	Creates a view.
Grant/Revoke	-	Grants or revokes permissions on a view.
Refresh	F5	Refreshes a view.

Right-clicking the **PL/SQL Viewer** tab allows you to select **Cut**, **Copy**, **Paste**, **Select All**, **Comment/Uncomment Lines**, **Comment/Uncomment Block**, **Compile**, **Execute**, **Add Variable To Monitor**, **Debug with Rollback**, and **Debug** options.

Right-Click Option	Shortcut Key	Description
Cut, Copy, Paste	Ctrl+X, Ctrl +C, Ctrl+V	Specifies clipboard operations.
Select All	Ctrl+A	Selects options in the PL/SQL Viewer tab.
Comment/Uncomment Lines	-	Comments or uncomments all selected rows.
Comment/Uncomment Block	-	Comments or uncomments all selected rows or blocks.
Compile	-	Compiles a function/procedure.
Execute	-	Executes a function/procedure.
Add Variable To Monitor	-	Adds variables to the monitor window.
Debug with Rollback	-	Debugs a function/procedure and rolls back the changes after the debugging is complete.
Debug	-	Debugs a function/procedure.

Right-clicking the **SQL Terminal** tab allows you to select **Cut, Copy, Paste, Select All, Execute Statement, Open, Save, Find and Replace, Execution Plan, Comment/Uncomment Lines, Save As, Format** , and **Cancel** options.

Right-Click Option	Shortcut Key	Description
Cut, Copy, Paste	Ctrl+X, Ctrl +C, Ctrl+V	Specifies clipboard operations.
Select All	-	Selects all text.
Execute Statement	-	Executes a query.
Open	-	Opens a file.
Save	-	Saves a query.
Find and Replace	-	Finds and replaces text in the SQL Terminal tab.
Execution Plan	-	Executes a query.
Comment/Uncomment Lines	Ctrl+/ 	Comments or uncomments all selected rows.
Comment/Uncomment Block	Ctrl+Shift+/ 	Comments or uncomments all selected rows or blocks.
Cancel	-	Cancels the execution.

Right-Click Option	Shortcut Key	Description
Save As	CTRL+ALT+S	Saves the query to a new file.
Format	CTRL+SHIFT +F	Formats the selected SQL statements using the rules configured in the query.

Right-clicking the **Messages** tab allows you to select **Copy**, **Select All**, and **Clear** options.

Right-Click Option	Shortcut Key	Description
Copy	Ctrl+C	Copies the text.
Select All	Ctrl+A	Selects all text.
Clear	-	Clears the text.

4.8 Connection Profiles

4.8.1 Overview

When Data Studio is started, the **New Database Connection** dialog box is displayed by default. To perform database operations, Data Studio must be connected to at least one database.

Enter the connection parameters to create a connection between Data Studio and a database server. Hover the mouse cursor over the connection name to view the database information.


NOTE

You need to fill in all mandatory parameters that are marked with asterisks (*).

4.8.2 Adding a Connection

Perform the following steps to create a database connection.

Step 1 Choose **File > New Connection** from the main menu.

Alternatively, click  on the toolbar, or press **Ctrl+N** to connect to the database. The **New Database Connection** dialog box is displayed.

NOTE

If the preference file is damaged or the preference settings are invalid during connection creation, an error message will be displayed indicating that the preferred value is invalid and prompting you to restore the default preference settings. Click **OK** to complete the operation of creating a database connection.

Step 2 The table in the left of the dialog box lists the details of existing connections and server information.



 **NOTE**

The server information will be displayed only after the connection succeeds.

- You can populate connection parameters, such as **Connection Name**, **Host**, and **Host Port**, by double-clicking the connection name.

 **NOTE**

If the password or key for any of the existing connections is damaged, you need to enter the password for whichever connection you use.

- If you click , different pop-up messages based on the connection statuses of database will be displayed.
 - If the database connection is active, the **Remove Connection Confirmation** dialog box is displayed. Click **Yes** to disconnect all databases.
 - If the database connection is not active, the **Remove Connection** dialog box is displayed.
- If you click  without selecting a connection name, a dialog box is displayed prompting you to select at least one connection.

Step 3 Configure the following parameters to create a database connection.

 **NOTE**

- Click **Clear** to clear all fields in the **New Database Connection** dialog box.
- Press **Ctrl+V** to paste data in the **New Database Connection** dialog box. Right-click options are not available in the dialog boxes of Data Studio.

Field Name	Description	Example
Database Type	Specifies the database type.	-
Connection Name	Specifies the connection name.	My_Connection_DB

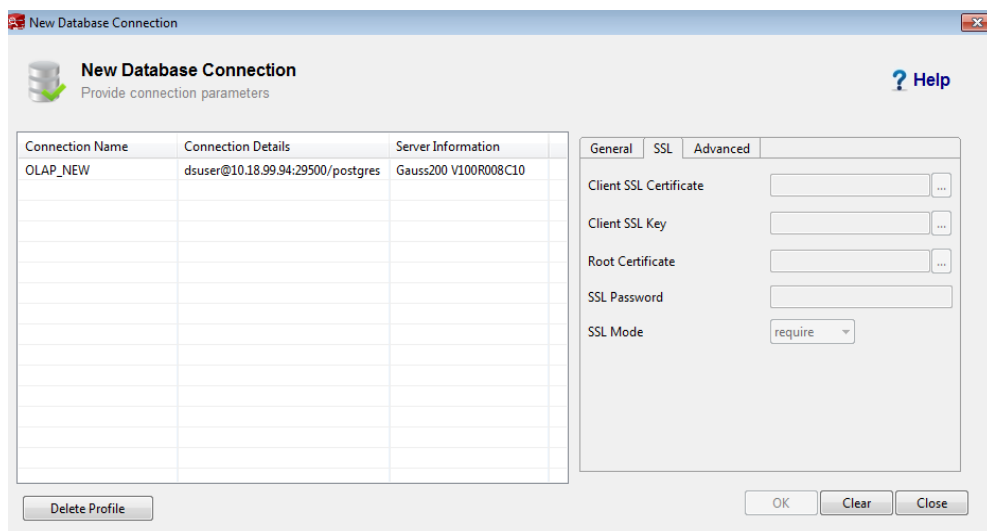
Field Name	Description	Example
Host	<p>Specifies the host IP address (IPv4) or database domain name.</p> <p>NOTE</p> <ul style="list-style-type: none">• If domain name length is greater than 25 characters, the complete domain name will not be displayed. For example, <i>test1(db.dws...com:25xxx)</i> cannot be displayed completely.• Once the connection is created, hover the cursor over the connection name to see the server IP and version.• The value of this field will be identified as an IP address if it contains only digits with three periods (.). Otherwise, it will be identified as a domain name.• A domain name must meet the following requirements:<ul style="list-style-type: none">- Starts with a letter.- Contains only letters, digits, hyphens (-), and periods (.) and cannot contain any other special character.- Cannot contain spaces or tabs.- Contains 1 to 253 characters and a maximum of 63 characters between periods.	db.dws.mycloud.com 10.xx.xx.xx
Host Port	Specifies the port address.	8000
Database Name	Specifies the database name.	gaussdb
User Name	Specifies the username for connecting to the selected database.	-
Password	Specifies the password for connecting to the selected database. The password is masked.	-

- In the **Save Password** drop-down list, select one of the following options:
 - **Permanently**: The password is saved even after you exit the database. This option is unavailable upon the first connection creation. To hide or view this option, see [Save Password Permanently](#).
 - **Current Session Only**: The password is saved only for the current session.




- **Do Not Save:** The password is not saved. If you select this option, Data Studio will prompt you to enter the password for the following operations:
 - **Creating a Database**
 - **Renaming a Database**
 - **Debugging a PL/SQL Function**
 - **Using SQL Terminals**
- The **Enable SSL** option is selected by default.

Step 4 Perform the following steps to enable SSL:

1. Select the **Enable SSL** option.
2. Click the **SSL** tab.



3. Provide the files listed in **SSL Certificates** to use secure connections.

- Click  of **Client SSL Certificate** and select a client SSL certificate.
- Click  of **Client SSL Key** and select a client SSL key.
- Click  of **Root Certificate** and select a root certificate.
- Select an SSL mode from the **SSL Mode** drop-down list. Refer to table below for description of different SSL modes.

NOTE

- If **SSL Mode** is set to **verify-ca** or **verify-full**, **Root Certificate** must be selected.
- Data Studio prompts you to enter the client key upon the first access to the **gs_dump** feature.

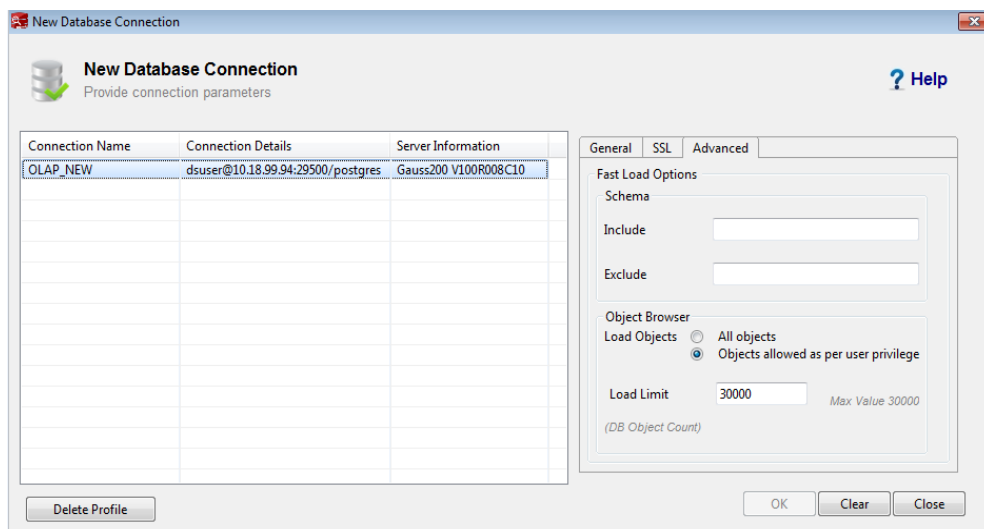
SSL Mode	Description
require	The certificate will not be verified as the used SSL factory does not need to be verified.
verify-ca	The certificate authority (CA) will be verified using the corresponding SSL factory.
verify-full	The CA and database will be verified using the corresponding SSL factory.

NOTE

- You can a valid **Client SSL Certificate** and **Client SSL Key** to export DDL and data from Data Studio using secure connections.
- If the selected **Client SSL Certificate** and **Client SSL Key** are invalid, the export will fail. For details, see [Troubleshooting](#).
- If you deselect **Enable SSL** and proceed, the **Connection Security Alert** dialog box is displayed. Refer to [Security Disclaimer](#) to determine whether to display this dialog box.
 - **Continue**: continues to use insecure connections
 - **Cancel**: enables SSL
 - **Do not show again**: The **Connection Security Alert** dialog box is not displayed for the subsequent connections of logged Data Studio instances.
- For details, see the server manual.

Step 5 Perform the following steps to set **Fast Load Options**:

1. Click the **Advanced** tab.



2. When creating a connection, enter the schema names separated by commas in the **Include** field to load these schemas preferentially.

3. When creating a connection, enter the schema names separated by commas in the **Exclude** field to avoid loading these schemas preferentially.
4. Select either of the following options for **Load Objects**:
 - **All objects**: loads all objects
 - **Objects allowed as per user privilege**: loads only objects that the user has permissions for accessing. For details about the minimum permissions for accessing objects listed in **Object Browser**, see [Table 4-28](#).

 **NOTE**

The default value is **Objects allowed as per user privilege**.

5. Enter the number of database objects that can be loaded in **Load Limit**. The maximum number is 30,000.

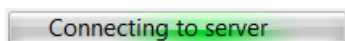
 **NOTE**

- If the number of object types (such as tables and views) of the schema entered in **Include** is greater than the value of **Load Limit**, only the parent objects of the schema will be loaded. This indicates that child objects containing more than three parameters will not be loaded, such as columns, constraints, indexes, and functions.
- Schema names provided in **Include** and **Exclude** are validated.
- If you cannot access the schema specified in **Include**, an error message of the schema will be displayed during connection.
- If you cannot access the schema specified in **Exclude**, the schema will not be loaded in **Object Browser** after the connection is created.

Step 6 Click **OK**.

The status of the completed operation is displayed in the status bar.

When Data Studio is connecting to the database, the connection status is displayed as follows:



Once the connection is created, all schemas will be displayed in the **Object Browser** pane.

 **NOTE**

- Data Studio allows you to login even if the password has expired with a message informing that some operations may not work as expected. For details, see [Password Expiry](#).
- To cancel the connection, see [Canceling the Connection](#).
- PostgreSQL schema names are not displayed in the **Object Browser** pane.

----End

Canceling the Connection

Perform the following steps to cancel the connection:

Step 1 Click **Cancel**.

The **Cancel Connection** dialog box is displayed.

Step 2 Click **Yes**.

A confirmation dialog box is displayed.

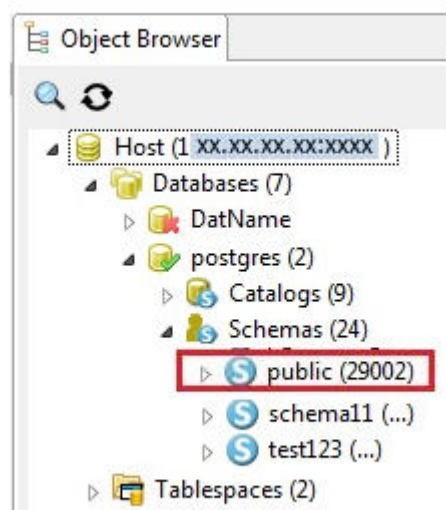
Step 3 Click **OK**.

----End

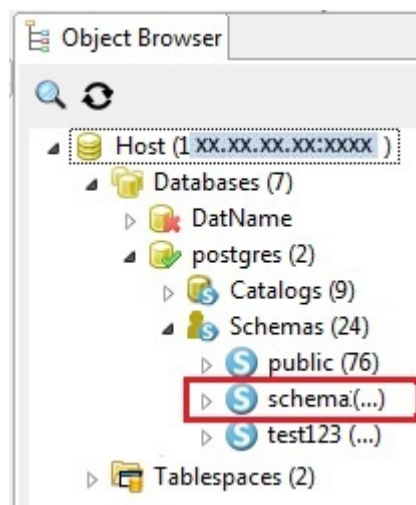
Lazy Loading

The lazy loading feature allows objects to be loaded only when you need.

When you connect to a database only child objects of the schema saved under **search_path** will be loaded, as shown in the following figure.




Unloaded schemas are displayed as *Schema name (...)*.



To load child objects, expand the schema. You will see that the objects under the schema are loading.



NOTE

If you try to load an unloaded object while another object is being loaded, a pop-up message is displayed indicating that another object is being loaded. The  next to the unloaded object will disappear, and will be displayed again when you refresh the object or database level to load the object.

Expand a schema to load and view the child objects. You can load child objects of only one schema at a time in **Object Browser**.

If you modify **search_path** after creating a connection, the modification will take effect only after the database is reconnected. The Auto Suggest feature is applicable to keywords, data types, schema names, table names, views, and table aliases of all schema objects that you have permissions for accessing.

A maximum of 50,000 objects will be loaded in the **Object Browser** pane within one minute.

The database connection timeout interval defaults to 3 minutes (180 seconds). If the connection fails within this interval, a timeout error is displayed.

You can set the **loginTimeout** value in the **Data Studio.ini** file located in the **Data Studio** directory.

NOTE

When you log in to Data Studio, **pg_catalog** is loaded automatically.

4.8.3 Renaming a Connection

Perform the following steps to rename a database connection.

Step 1 In the **Object Browser** pane, right-click the selected connection name and select **Rename Connection**.

A **Rename Connection** dialog box is displayed prompting you to enter the new connection name.

Step 2 Enter the new connection name. Click **OK** to rename the connection.

The status of the completed operation is displayed in the status bar.

 **NOTE**

The new connection name must be unique. Otherwise, the rename operation will fail.

----End

4.8.4 Editing a Connection

Perform the following steps to edit the properties of a database connection.

Step 1 In the **Object Browser** pane, right-click the selected connection name and select **Edit Connection**.

To edit an active connection, you need to disable the connection and then open the connection with the new properties. A warning message about connection resetting is displayed.

The **Edit Connection** dialog box is displayed.

Step 2 Click **OK** to proceed or **Cancel** to exit the operation.

 **NOTE**

The **Connection Name** cannot be modified.

Step 3 Edit the connection parameters. For details, see [Adding a Connection](#).

Step 4 Click **OK** to save the updated connection information.

 **NOTE**

- You can click **Clear** to clear all fields in the **Edit Database Connection** dialog box.
- If you click **OK** without modifying any connection parameters, a dialog box is displayed, indicating that the modification is not saved. After the connection parameters are modified, a dialog box is displayed.
- You can still log in to Data Studio even if the password has expired, but a message indicating that some operations may not be performed normally will be displayed. For details, see [Password Expiry](#).
- Cancel the connection by referring to [Canceling the Connection](#).

If SSL is not enabled, a **Connection Security Alert** dialog box is displayed.

Step 5 Click **Continue** to proceed with insecure connections or click **Cancel** to return to the **Edit Connection** dialog box to enable SSL.

 **NOTE**

If you select **Do not show again**, the **Connection Security Alert** dialog box is not displayed for the subsequent connections of logged Data Studio instances.

A dialog box is displayed asking users to confirm whether the database whose connection has been edited is deleted.

Step 6 Click **Yes** to update the connection information and reconnect the connection with the updated parameters.

The status of the completed operation is displayed in the status bar.

----End

4.8.5 Removing a Connection

Follow the steps below to remove an existing database connection:

Step 1 Right-click the selected connection name and select **Remove Connection**.

A confirmation dialog box is displayed to remove the connection.

Step 2 Click **Yes** to remove the server connection.

The status bar displays the status of the completed operation.

This action will remove the connection from the **Object Browser**. Any unsaved data will be lost.

----End

4.8.6 Viewing Connection Properties

Follow the steps below to view the properties of a connection:

Step 1 Right-click the selected connection and select **Properties**.

The status bar displays the status of the completed operation.

Properties of the selected connection is displayed.

NOTE

If the property of a connection is modified for the connection that is already opened, then open the properties of the connection again to view the updated information on the same opened window.

----End

4.8.7 Refreshing a Database Connection

Perform the following steps to refresh a database connection.

Step 1 In the **Object Browser** pane, right-click the selected connection name and select **Refresh** or press **F5**.

The status of the completed operation is displayed in the status bar.

----End

The time taken to refresh a database depends on the number of objects in the database. Therefore, perform this operation as required on large databases.

- If you right-click the connection name and select **Refresh**, the connection will be refreshed and updated with the latest content on the server.
- If you right-click **Function/Procedure** and select **Refresh**, all functions/procedures and tables under the schema will be refreshed and updated with the latest content on the server.

If a stored procedure has been deleted from the database before the refresh operation, this stored procedure will be deleted from **Object Browser** only when the refresh operation is performed.

- If you right-click a specific function/procedure and select **Refresh**, this function/procedure will be refreshed and updated with the latest content on the server.
- If you refresh the entire database or connection, all child objects of schemas in **search_path**, as well as the schemas already expanded by the user, will be loaded again.
- If you reconnect to the database, only schema objects saved under **search_path** will be loaded. Objects that have been expanded will not be loaded.
- A database and multiple objects under it cannot be refreshed simultaneously.

Exporting/Importing Connection Details

Data Studio allows you to export or import connection details from the connection dialog for future reference.

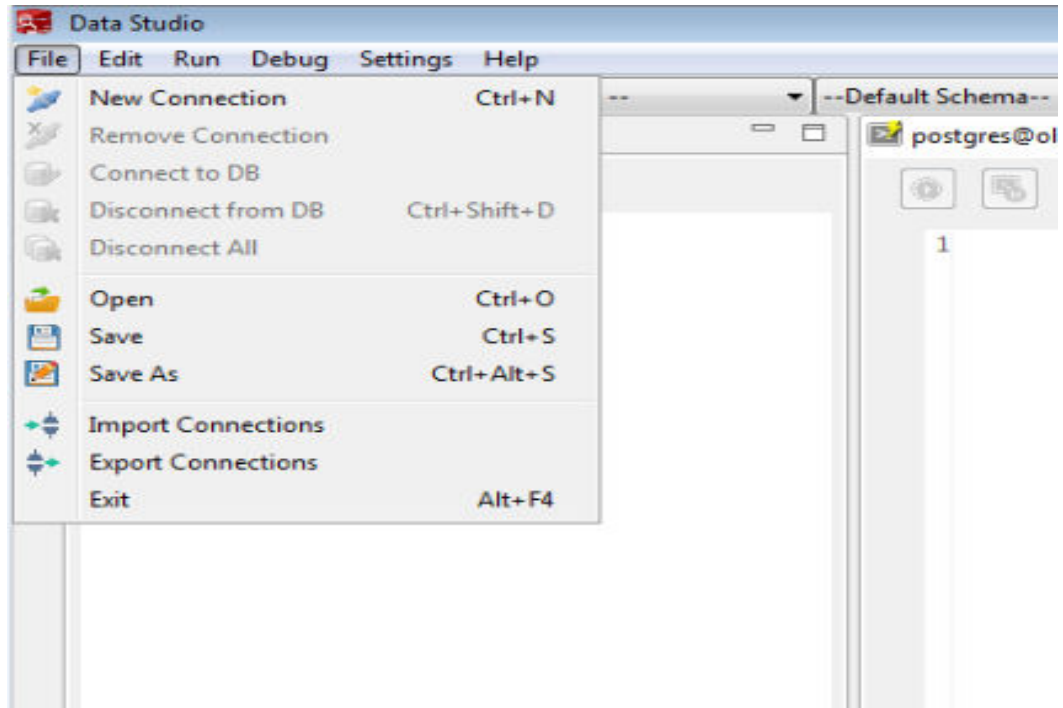
The following parameters can be exported:

- SSL Mode
- Connection name
- Server IP
- Server Port
- Database Name
- Username
- cSSLCertificatePath
- cSSLKeyPath
- profileId
- rootCertFilePathText
- connectionDriverName
- schemaExclusionList
- schemaInclusionList
- loadLimit
- privilegeBasedObAccess
- databaseVersion
- savePrdOption
- dbType
- version

Perform the following steps to import or export a connection configuration file:

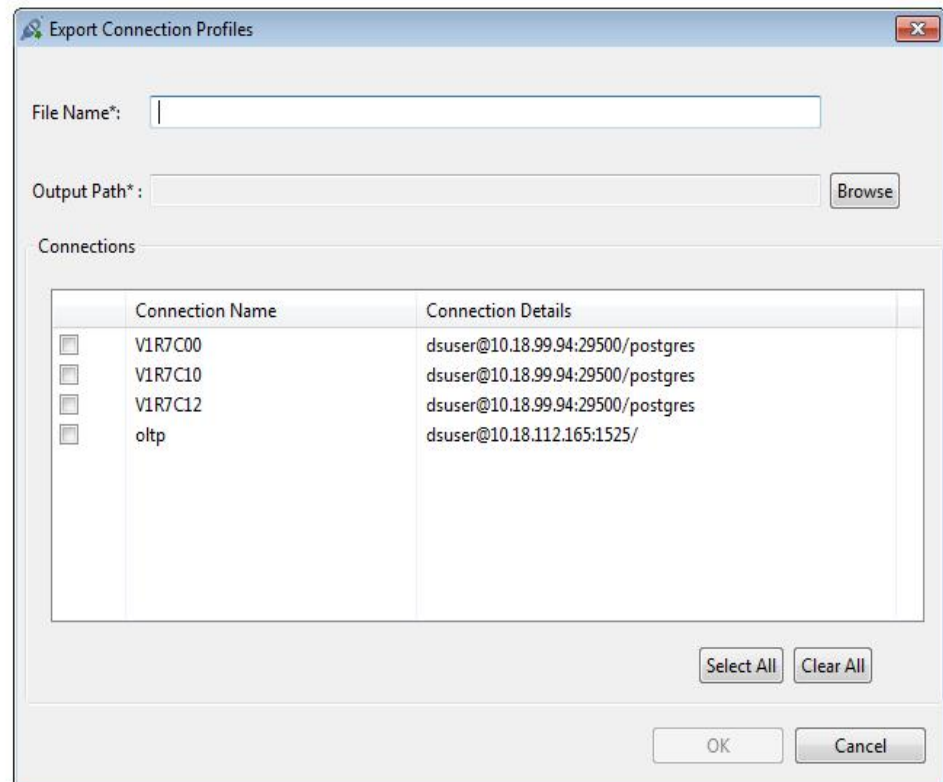
Step 1 Click **File** in the menu bar.

The following window is displayed:



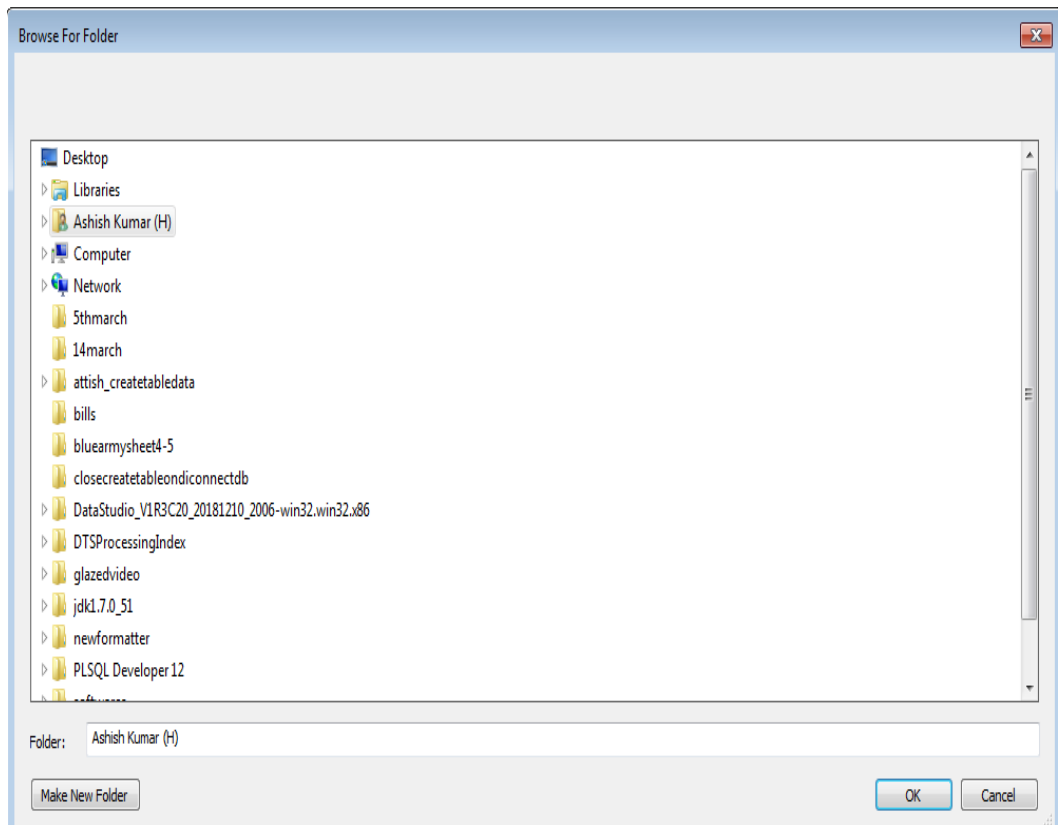
Step 2 Select **Export Connections** to export a connection configuration file.

The **Export Connection Profiles** dialog box is displayed. You can select the connections to be exported in this dialog box.

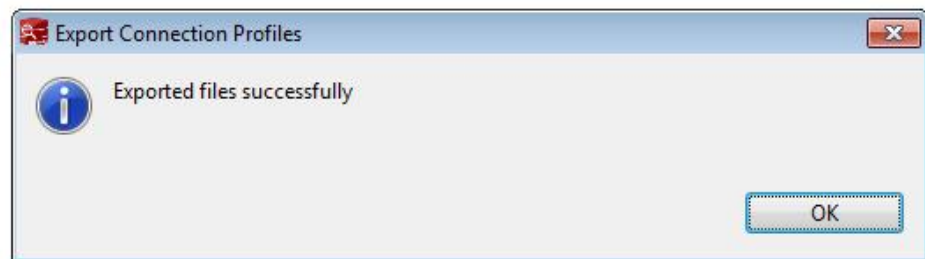


Select the connections you want to export and enter the name of the file where the exported connections will be saved. Click **OK**.

Select the location where you want to save the file and click **OK**.

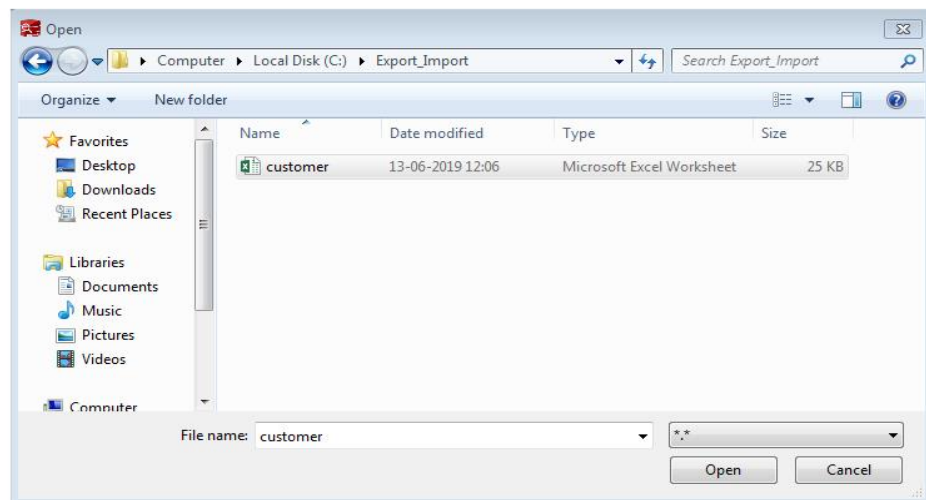


The following dialog box is displayed after the connections are exported.

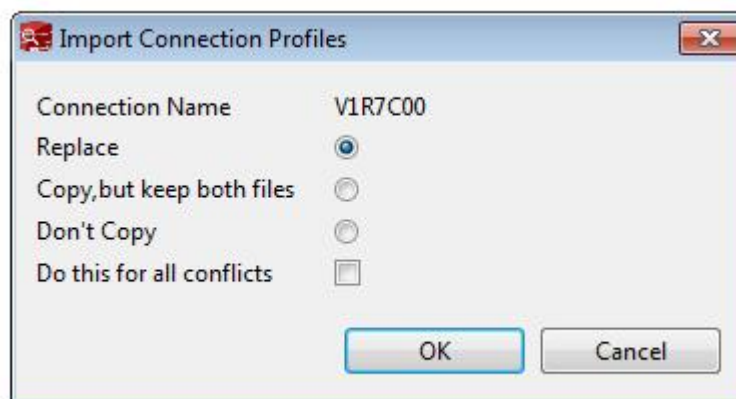


Step 3 Select **Import Connections** to import a connection configuration file.

Step 4 Select the file you want to import and click **Open**.



If the connections to be imported match the existing ones, a dialog box is displayed as follows.



- **Replace:** The imported connection configuration file will be replaced with the existing one.
- **Copy, but keep both files:** The imported connection configuration file will be renamed.
- **Don't Copy:** The existing connection configuration file will remain unchanged.
- **Do this for all conflicts:** The same operation will be repeated for all the matches.

Click any of the preceding options as required and click **OK**.

----End

 **NOTE**

Password and **SSL password** parameters will not be exported.

4.9 Databases

4.9.1 Creating a Database

A relational database is a database that has a set of tables which is manipulated in accordance with the relational model of data. It contains a set of data objects used to store, manage, and access data. Examples of such data objects are tables, views, indexes, functions and so on.

Follow the steps below to create a database:

- Step 1** In the **Object Browser** pane, right-click the selected **Databases** group and select **Create Database**.

 **NOTE**

This operation can be performed only when there is at least one active database.

A **Create Database** dialog box is displayed prompting you to provide the necessary information to create the database.

- Step 2** Enter the database name. Refer to the server manual for database naming rules.
- Step 3** Select the required type of encoding character set from the **Database Encoding** drop-down list.

The database supports **UTF-8**, **GBK**, **SQL_ASCII**, and **LATIN1** types of encoding character sets. Creating the database with other encoding character sets may result in erroneous operations.

- Step 4** Select the **Connect to the DB** check box and click **OK**.

The status bar displays the status of the completed operation.

You can view the created database in the **Object Browser**. The system related schema present in the server is automatically added to the new database.


 **NOTE**

Data Studio allows you to login even if the password has expired with a message informing that some operations may not work as expected when no other database is connected in that connection profile. Refer to [Password Expiry](#) for information to change this behavior.

----End

Cancelling Connection

Follow the steps below to cancel the connection operation:

- Step 1** Double-click the status bar to open the **Progress View** tab.
- Step 2** In the **Progress View** tab, click .
- Step 3** In the **Cancel Operation** dialog box, click **Yes**.

The status bar displays the status of the cancelled operation.

----End

4.9.2 Disconnect All

You can disconnect all the databases from a connection.

Follow the steps below to disconnect all the databases from a connection:

- Step 1** In the **Object Browser** pane, right-click the selected the **Databases** group and select **Disconnect All**. This will disconnect all the databases under that connection.

 **NOTE**

This operation can be performed only when there is at least one active database.

A confirmation dialog box is displayed to disconnect all databases for the connection.

- Step 2** Click **Yes** to disconnect.

The status of the completed operation is displayed in the status bar.

Data Studio populates all the connection parameters (except password) that were provided during the last successful connection with the database. To reconnect, you need to enter only the password in the connection wizard.

----End

4.9.3 Connecting to a Database

You can connect to the database.

Follow the steps below to connect a database:

- Step 1** In the **Object Browser** pane, right-click the selected database name and select **Connect to DB**.

 **NOTE**

This operation can be performed only on an inactive database.

The database is connected.

The status bar displays the status of the completed operation.

 **NOTE**

- Data Studio allows you to login even if the password has expired with a message informing that some operations may not work as expected when no other database is connected in that connection profile. Refer to [Password Expiry](#) for information to change this behavior.
- Refer to [Cancelling Connection](#) section to cancel the connection to database.

----End

4.9.4 Disconnecting a Database

You can disconnect the database.

Follow the steps below to disconnect a database:

- Step 1** In the **Object Browser** pane, right-click the selected database name and select **Disconnect from DB**.

 **NOTE**

This operation can be performed only on an active database.

A confirmation dialog box is displayed to disconnect database.

- Step 2** Click **Yes** to disconnect.

The database is disconnected.

The status bar displays the status of the completed operation.

----End

4.9.5 Renaming a Database

Follow the steps below to rename a database:

- Step 1** In the **Object Browser** pane, right-click the selected database and select **Rename Database**.

 **NOTE**

This operation can be performed only on an inactive database.

A **Rename Database** dialog box is displayed prompting you to provide the necessary information to rename the database.

- Step 2** Enter the new database name. Select the **Connect to the DB?** check box and click **OK**.

A confirmation dialog box is displayed to rename the database.

- Step 3** Click **OK** to rename the database.

The status bar displays the status of the completed operation.

You can view the renamed database in the **Object Browser**.

 **NOTE**

Refer to [Cancelling Connection](#) section to cancel the connection to database.

----End

4.9.6 Dropping a Database

Individual or batch drop can be performed on databases. Refer to [Batch Dropping Objects](#) section for batch drop.

Follow the steps below to drop a database:

- Step 1** In the **Object Browser** pane, right-click the selected database and select **Drop Database**.

 **NOTE**

This operation can be performed only on an inactive database.

A confirmation dialog box is displayed to drop the database.

Step 2 Click **OK** to drop the database.

A popup message and the status bar display the status of the completed operation.

----End

4.9.7 Viewing Properties of a Database

Follow the steps below to view the properties of a database:

Step 1 Right-click the selected database and select **Properties**.

 **NOTE**

This operation can be performed only on an active database.

The status bar displays the status of the completed operation.

The properties of the selected database are displayed.

 **NOTE**

If the property of a database is modified for the database that is already opened, then refresh and open the properties of the database again to view the updated information on the same opened window.

----End

4.10 Schemas

4.10.1 Overview

This section describes working with database schemas. All system schemas are grouped under **Catalogs** and user schemas under **Schemas**.

4.10.2 Creating a Schema

In relational database technology, schemas provide a logical classification of objects in the database. Some of the objects that a schema may contain include functions/procedures, tables, sequences, views, and indexes.

Follow the steps below to define a schema:

Step 1 In the **Object Browser** pane, right-click the selected **Schemas** group and select **Create Schema**.

 **NOTE**

Only refresh can be performed on **Catalogs** group.

Step 2 Enter the schema name and click **OK**. You can create the schema only if the database connection is active.

You can view the new schema in the **Object Browser** pane.

The status bar displays the status of the completed operation.

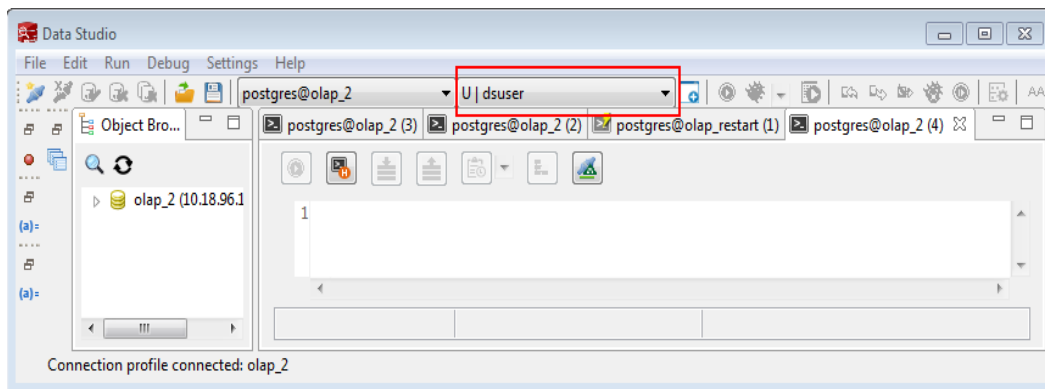
----End

You can perform the following actions on a schema:

- Refreshing a schema - To refresh a schema, right-click the selected **Schema Name** and select **Refresh Schema**. All the objects under that schema will be refreshed.
- Renaming a schema (Refer to [Renaming a Schema](#) for more details)
- Dropping a schema (Refer to [Dropping a Schema](#) for more details)
- Exporting DDL (Refer to [Exporting Schema DDL](#) for more details)
- Exporting DDL and data (Refer to [Exporting Schema DDL and Data](#) for more details)
- Grant/Revoke privilege (Refer to [Granting/Revoking a Privilege](#) for more details)

Displaying the Default Schema

Data studio displays default schema of the user in the toolbar.



When a create query without mentioning the schema name is executed from SQL Terminal, the corresponding objects are created under the default schema of the user.

When a select query is executed in SQL terminal without mentioning the schema name, the default schemas are searched to find these objects.

When Data Studio starts, the default schemas are set to **<username>**, public schemas in same priority.

If another schema is selected in the drop-down, the selected schema will be set as the default schema, overriding previous setting.

The selected schema is set as the default schema for all active connections of the database (selected in database list drop-down).

NOTE

This feature is not available for OLTP database.

4.10.3 Exporting Schema DDL

You can export the schema DDL to export the DDL of functions/procedures, tables, sequences, and views of the schema.

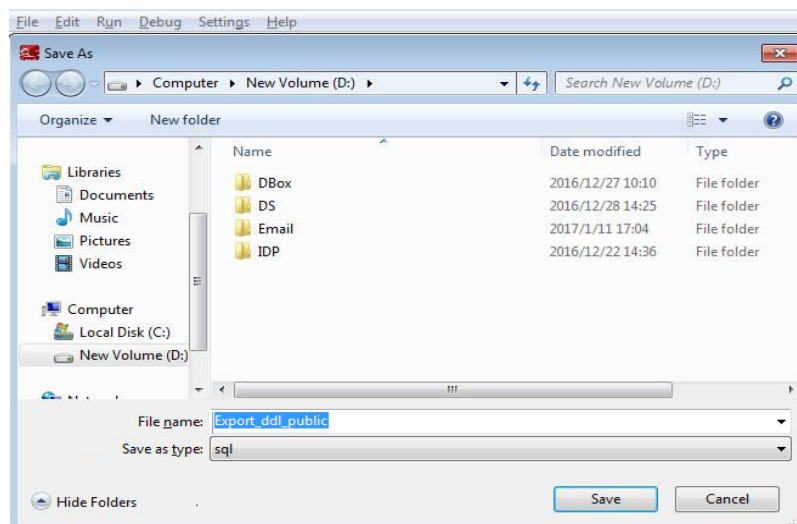
Perform the following steps to export the schema DDL:

Step 1 In the **Object Browser** pane, right-click the selected schema and select **Export DDL**.

The **Data Studio Security Disclaimer** dialog box is displayed. You can close the dialog box. For details, see [Security Disclaimer](#).


Step 2 Click **OK**.

The **Save As** dialog box is displayed.



Step 3 In the **Save As** dialog box, select the location to save the DDL and click **Save**. The status bar displays the operation progress.

NOTE

- To cancel the export operation, double-click the status bar to open the **Progress View** tab and click . For details, see [Canceling Table Data Export](#).
- If the file name contains characters that are not supported by Windows, the file name will be different from the schema name.
- The MS Visual C Runtime file (**msvcrt100.dll**) is required for this operation. For details, see [Troubleshooting](#).

The **Data Exported Successfully** dialog box and status bar display the status of the completed operation.

Database Encoding	File Encoding	Support for Exporting DDL
UTF-8	UTF-8	Yes
	GBK	Yes
	LATIN1	Yes
GBK	GBK	Yes
	UTF-8	Yes
	LATIN1	No
LATIN1	LATIN1	Yes
	GBK	No
	UTF-8	Yes

 **NOTE**

You can select multiple objects and export their DDL. [Batch Export](#) lists the objects whose DDL cannot be exported.

----End

4.10.4 Exporting Schema DDL and Data

The exported schema DDL and data include the following:

- DDL of functions/procedures
- DDL and data of tables
- DDL of views
- DDL of sequences

Perform the following steps to export the schema DDL and data:

Step 1 In the **Object Browser** pane, right-click the selected schema and select **Export DDL and Data**.

The **Data Studio Security Disclaimer** dialog box is displayed.


You can close the dialog box. For details, see [Security Disclaimer](#).

Step 2 Click **OK**.

The **Save As** dialog box is displayed.

Step 3 In the **Save As** dialog box, select the location to save the DDL and data and click **Save**. The status bar displays the operation progress.

 NOTE

- To cancel the export operation, double-click the status bar to open the **Progress View** tab and click . For details, see [Canceling Table Data Export](#).
- If the file name contains characters that are not supported by Windows, the file name will be different from the schema name.
- The MS Visual C Runtime file (**msvcrt100.dll**) is required for this operation. For details, see [Troubleshooting](#).

The **Data Exported Successfully** dialog box and status bar display the status of the completed operation.

Database Encoding	File Encoding	Support for Exporting DDL
UTF-8	UTF-8	Yes
	GBK	Yes
	LATIN1	Yes
GBK	GBK	Yes
	UTF-8	Yes
	LATIN1	No
LATIN1	LATIN1	Yes
	GBK	No
	UTF-8	Yes

 NOTE

You can select multiple objects and export their DDL and data. **Batch Export** lists the objects whose DDL and data cannot be exported.

----End

4.10.5 Renaming a Schema

Follow the steps to rename a schema:

Step 1 In the **Object Browser** pane, right-click the selected schema and select **Rename Schema**.

Step 2 Enter the schema name and click **OK**.

You can view the renamed schema in the **Object Browser**.

The status bar displays the status of the completed operation.

----End

4.10.6 Supporting Sequence DDL

Data Studio provides the option to show sequence DDL or allow users to export sequence DDL. It provides "Show DDL", "Export DDL", "Export DDL and Data"

Follow the steps to access the feature:

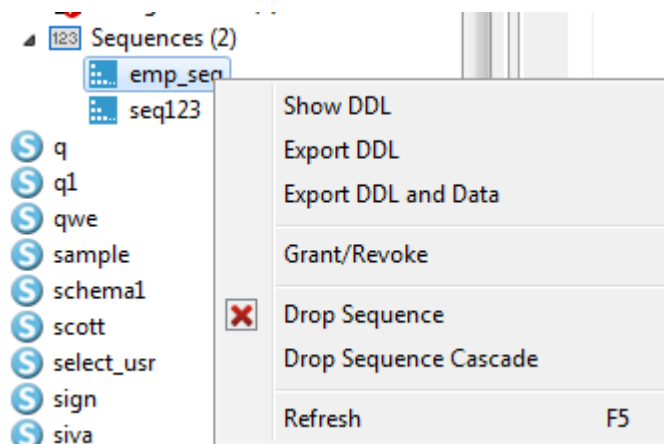
Step 1 In **Object Browser**, right click on any object under **Sequences**. A menu option will appear

Step 2 Select **Show DDL** option to see the DDL statements.

Or Select the **Export DDL** menu option to export DDL statements.

Or Select the **Export DDL and Data** menu option to export DDL statements and the select statement.

Refer to the following image:



NOTE

Only the sequence owner or sysadmin or has the **select** privilege of the sequence, then only the operation can be performed.

----End

4.10.7 Granting/Revoking a Privilege

Follow the steps below to grant/revoke a privilege:

Step 1 Right-click the schema group and select the **Grant/Revoke**.

The **Grant/Revoke** dialog is displayed.

Step 2 Select the objects to grant/revoke privilege from the **Object Selection** tab and click **Next**.

Step 3 Select the role from the **Role** drop-down in the **Privilege Selection** tab.

Step 4 Select **Grant/Revoke** in the **Privilege Selection** tab.

Step 5 Select/unselect the required privileges in the **Privilege Selection** tab.

In **SQL Preview** tab, you can view the SQL query automatically generated for the inputs provided.

Step 6 Click **Finish**.

----End

4.10.8 Dropping a Schema

Individual or batch dropping can be performed on schemas. Refer to [Batch Dropping Objects](#) section for batch dropping.

Follow the steps below to drop a schema:

Step 1 In the **Object Browser** pane, right-click the selected schema and select **Drop Schema**.

A confirmation dialog to drop the schema is displayed.

Step 2 Click **OK** to drop the schema. This action will remove the schema from the **Object Browser**.

A popup message and the status bar display the status of the completed operation.

----End

4.11 Creating a Function/Procedure

Perform the following steps to create a function/procedure and SQL function:

Step 1 In the **Object Browser** pane, right-click **Functions/Procedures** under the schema where you want to create the function/procedure. Then select **Create PL/SQL Function**, **Create SQL Function**, **Create PL/SQL Procedure**, or **Create C Function** as required.

The selected template is displayed in the new tab of Data Studio.

Step 2 Add the function/procedure by right-clicking the tab and selecting **Compile**, or choosing **Run > Compile/Execute Statement** from the main menu, or pressing **Ctrl+Enter** to compile the procedure.

The **Created function/procedure Successfully** dialog box is displayed, and the new function/procedure is displayed under the **Object Browser** pane. Click **OK** to close the **NewObject()** tab and add the debugging object to **Object Browser**.

Refer to [Executing SQL Queries](#) for information on reconnection options if connection is lost during execution.

Step 3 The asterisk (*) next to the procedure name indicates that the procedure is not compiled or added to **Object Browser**.

Refresh **Object Browser** by pressing **F5** to view the newly added debugging object.

NOTE

- C functions do not support debugging operations.
- A pop-up message displays the status of the completed operation, which is not displayed in the status bar.

----End

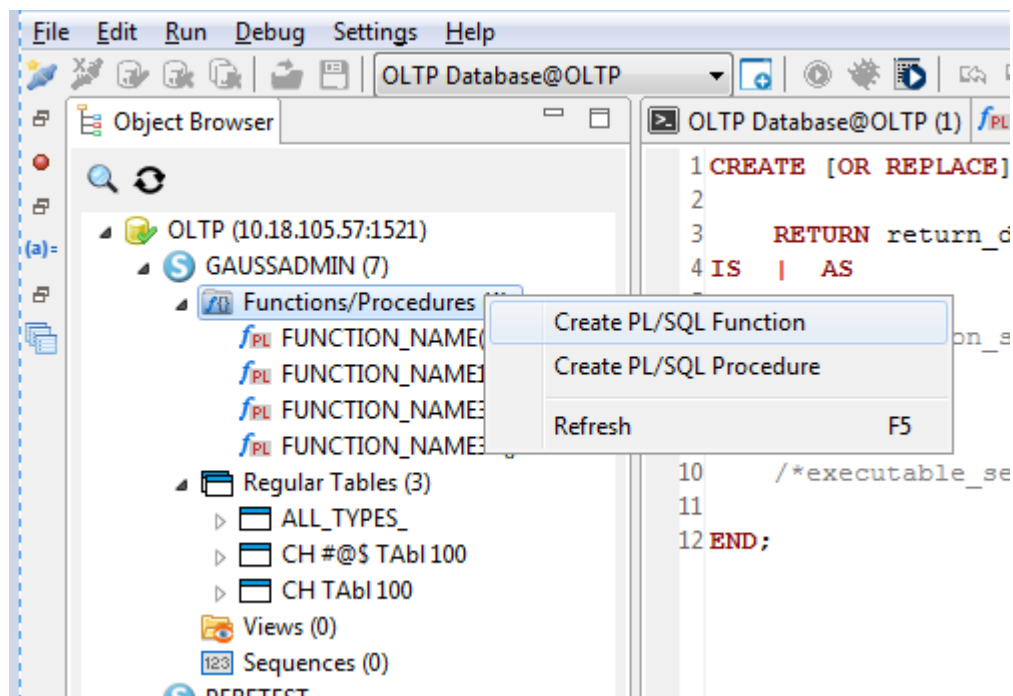
Compiling a Function

When a user creates a PL/SQL object from the template or by editing an existing PL/SQL object, the created PL/SQL object will be displayed in a new tab page.

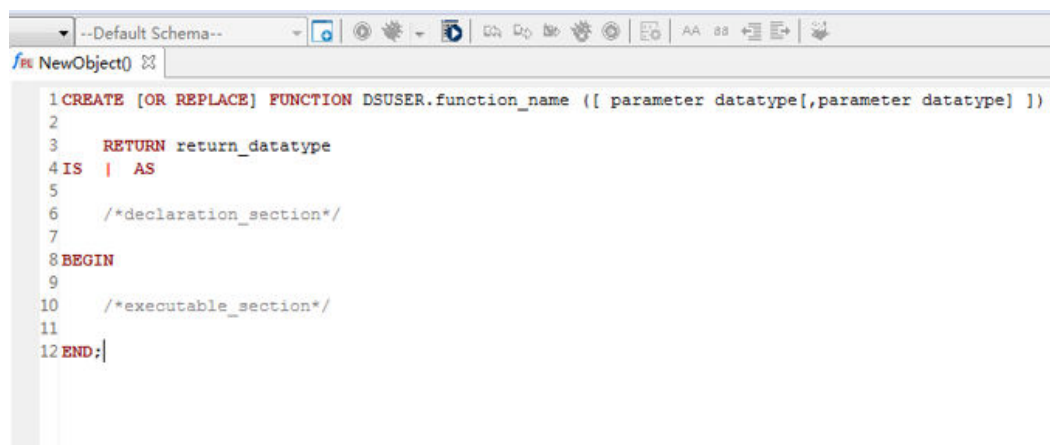
Perform the following steps to compile a created function:

Step 1 Select **Functions/Procedures** from the **Object Browser** tab page.

Step 2 Right-click **Functions/Procedures** and a menu is displayed.

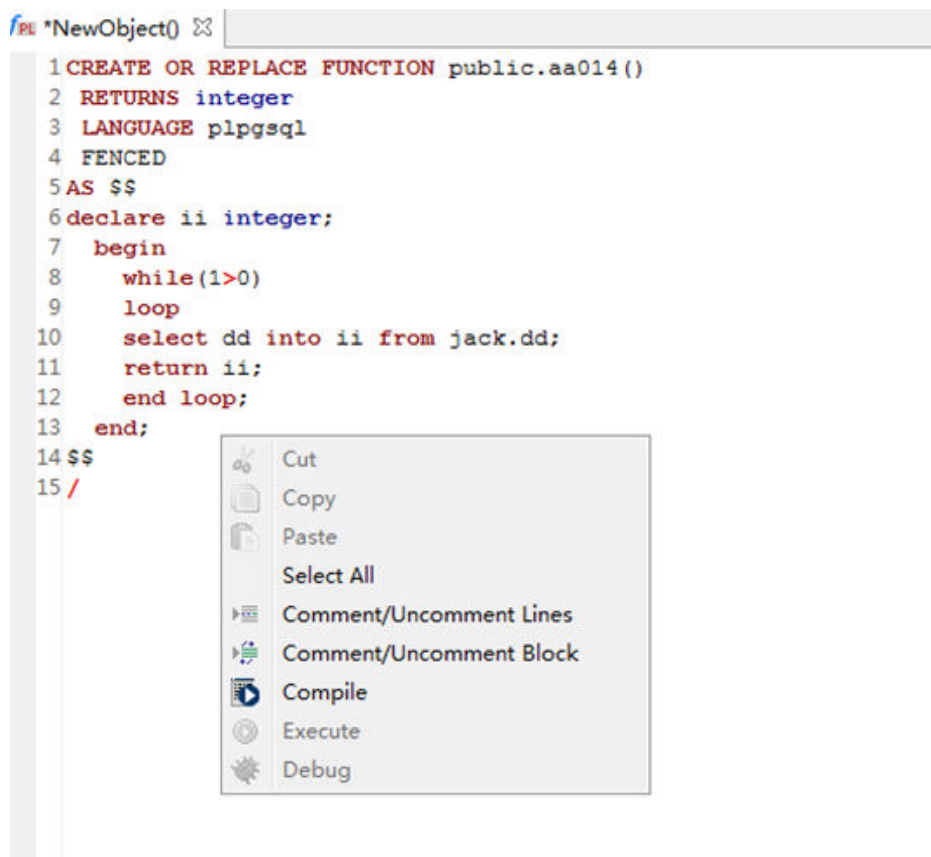


Step 3 Click **Create PL/SQL Function** and a new tab page is opened.

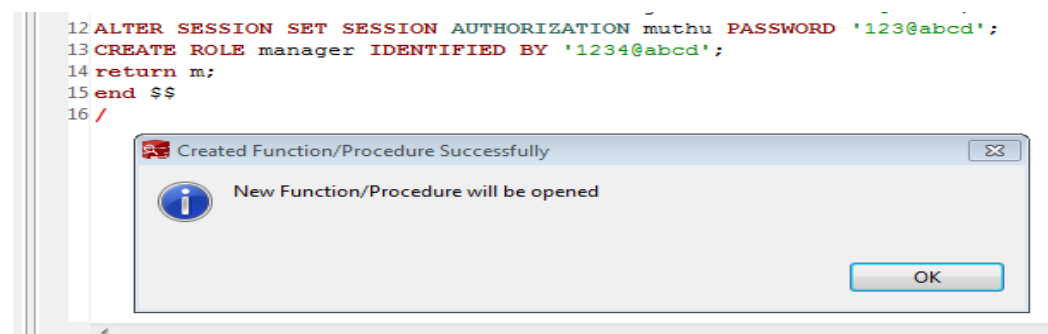


Step 4 Edit the code.

Step 5 Right-click the blank area of the tab page and a menu is displayed.



Step 6 Click **Compile**. A pop-up message is displayed as follows.



The function is displayed in a new tab page.

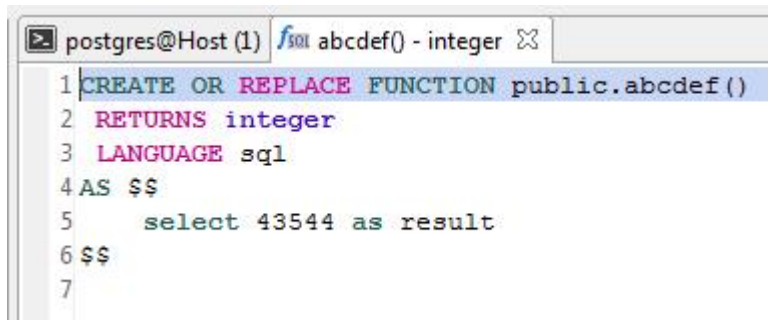
----End

4.12 Editing a Function/Procedure

Perform the following steps to edit a function/procedure or SQL function:

Step 1 In the **Object Browser** pane, double-click or right-click the required function/procedure or SQL function and select **View Source**. You must refresh **Object Browser** to view the latest DDL.

The selected function/procedure or SQL function is displayed in the **PL/SQL Viewer** tab page.



```
postgres@Host (1) /sql abcdef() - integer
1 CREATE OR REPLACE FUNCTION public.abcdef()
2 RETURNS integer
3 LANGUAGE sql
4 AS $$
5     select 43544 as result
6 $$
7
```

If multiple functions/procedures or SQL functions have the same schema, name, and input parameters, only one of them can be opened at a time.

Step 2 After editing or updating, compile and execute the PL/SQL program or SQL function. For details, see [Executing a Function/Procedure](#).

If you execute the function/procedure or SQL function before compilation, the **Source Code Change** dialog box is displayed.

Step 3 Click **Yes** to compile and execute the PL/SQL function/procedure.

The status of the completed operation is displayed in the **Message** tab page.

Refer to [Executing SQL Queries](#) for information on reconnect option in case connection is lost during execution.

Step 4 After compiling the function/procedure or SQL function, press **F5** to refresh **Object Browser** to view the updated code.

----End

4.13 Granting/Revoking a Permission (Function/Procedure)

Perform the following steps to grant or revoke a permission:

Step 1 Right-click **Function/Procedure Group** and select **Grant/Revoke**.

The **Grant/Revoke** dialog box is displayed.

Step 2 Open the **Object Selection** tab to select the desired objects, and click **Next**.

The **Privilege Selection** tab is displayed.

Step 3 Select a role from the **Role** drop-down list.

Step 4 Select **Grant/Revoke**.

Step 5 Select or deselect the required permissions.

The **SQL Preview** tab displays the SQL query automatically generated after the preceding operations.

Step 6 Click **Finish**.

----End

 **NOTE**

This feature is only supported in online analytical processing (OLAP), not in online transaction processing (OLTP).

4.14 Debugging a PL/SQL Function

4.14.1 Overview

During debugging, if the connection is lost but the database remains connected to **Object Browser**, the **Connection Error** dialog box is displayed with the following options:

- **Yes**: creates the connection again and restarts the debugging
- **No**: disconnects the database from **Object Browser**

 **NOTE**

SQL language function cannot be debugged.

4.14.2 Using Breakpoints

Topics in this section include:

- [Using the Breakpoints Pane](#)
- [Setting or Adding a Breakpoint on a Line](#)
- [Enabling or Disabling a Breakpoint on a Line](#)
- [Removing a Breakpoint from a Line](#)
- [Changing Source Code](#)
- [Debugging a PL/SQL Program Using a Breakpoint](#)

A breakpoint is used to stop a PL/SQL program on the line where the breakpoint is set. You can use breakpoints to control the execution and debug the procedure.

- When a line with a breakpoint set is reached, the PL/SQL program on this line will be stopped, and you can perform other debugging operations. Data Studio supports the following breakpoint-related operations:
 - Setting or creating a breakpoint on a line
 - Enabling or disabling the breakpoint on a line
 - Removing the breakpoint from a line
- A disabled breakpoint will not stop a PL/SQL program.

When you run a PL/SQL program, the execution stops on each line with a breakpoint set. In this case, Data Studio retrieves information about the current program state, such as the values of the program variables.

Perform the following steps to debug a PL/SQL program:

Step 1 Set a breakpoint on the line where PL/SQL program needs to be stopped.

Step 2 Start the debugging session.

When a line with a breakpoint set is reached, monitor the program state in the **Debugging** pane, and continue to execute the program.

Step 3 Close the debugging session.

----End




Data Studio provides debugging options in the toolbar that help you step through the debugging objects.

Using the Breakpoints Pane

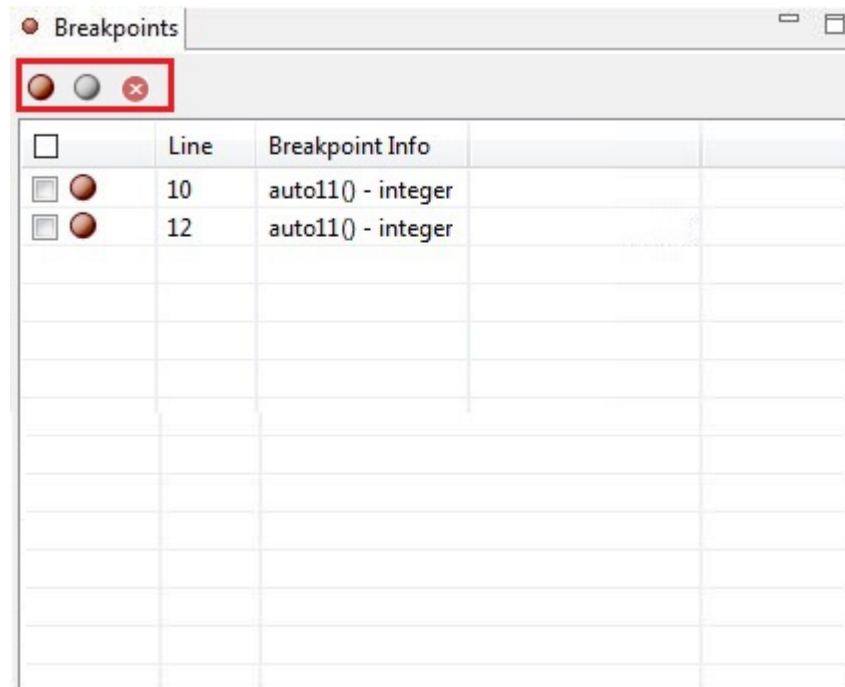
You can view and manage all breakpoints in the **Breakpoints** pane. Click the breakpoint option at the minimized pane to open the **Breakpoints** pane.

The **Breakpoints** pane lists all lines with a breakpoint set and the debugging object names.

You can enable or disable all the breakpoints by clicking in the **Breakpoints** pane. In the **Breakpoints** pane, you can select the breakpoint check box and click

 ,  , or  to enable, disable or remove a specific breakpoint.

In the **PL/SQL Viewer** pane, double-click the required breakpoint in the **Breakpoint Info** column to locate the breakpoint.




 NOTE

- When a breakpoint is disabled, the program will not be stopped at the breakpoint. The breakpoint will be retained and can be enabled later.
- A removed breakpoint cannot be restored.
- Press **Alt+Y** to copy the content of the **Breakpoints** pane.

Setting or Adding a Breakpoint on a Line

Perform the following steps to set or add a breakpoint on a line:

Step 1 Open the PL/SQL function on the line where you want to add a breakpoint.




Step 2 In the **PL/SQL Viewer** pane, double-click the breakpoint ruler on the left of the line number. If  is displayed, the breakpoint has been added.

 NOTE

If the function is not interrupted or stopped during debugging, the breakpoint set for the function will not be validated.


----End

Enabling or Disabling a Breakpoint on a Line

Once a breakpoint is set, you can temporarily disable it by selecting the corresponding check box in the **Breakpoints** pane and clicking  at the top of **Breakpoints**. A disabled breakpoint will be grayed out as  in **PL/SQL Viewer** and **Breakpoints** panes. To enable a disabled breakpoint, select the corresponding check box and click .

Removing a Breakpoint from a Line

You can remove an unused breakpoint using the same method as that for creating a breakpoint.

In the **PL/SQL Viewer** pane, open the function in which you want to remove the breakpoint. Double-click  in **PL/SQL Viewer** to remove the breakpoint.

You can also enable or disable breakpoints in **PL/SQL Viewer** using the preceding method.

Changing Source Code

If you debug an object after changing the source code obtained from the server, Data Studio displays an error.

You are advised to refresh the object and debug it again.

 NOTE

If you change the source code obtained from the server and execute or debug the source code without setting a breakpoint, the result of the source code obtained from the server will be displayed on Data Studio. You are advised to refresh the source code before executing or debugging it.

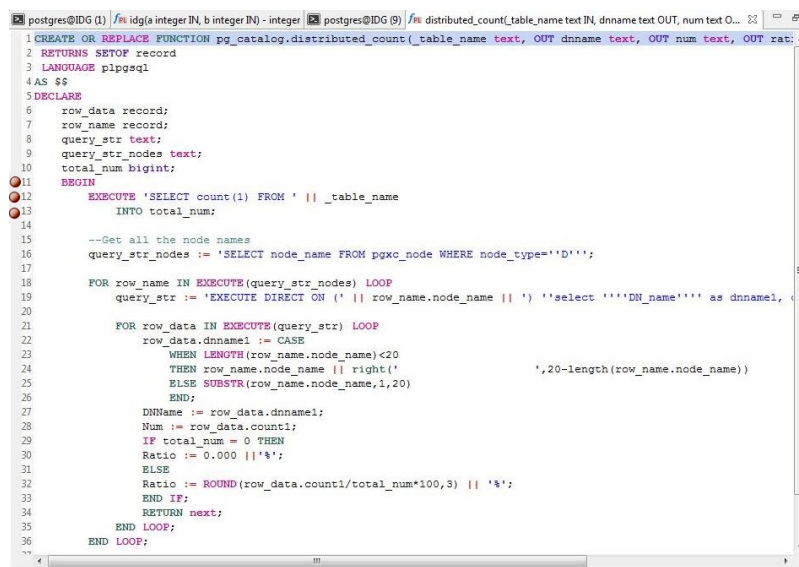
Debugging a PL/SQL Program Using a Breakpoint

Perform the following steps to debug a PL/SQL program using a breakpoint:

Step 1 Open the PL/SQL program and create a breakpoint on the line to be debugged.

An example is as follows:

Lines 11, 12, 13



```
1 CREATE OR REPLACE FUNCTION pg_catalog.distributed_count(_table_name text, OUT dname text, OUT num text, OUT rat
2 RETURNS SETOF record
3 LANGUAGE plpgsql
4 AS $$
5 DECLARE
6     row_data record;
7     row_name record;
8     query_str text;
9     query_str_nodes text;
10    total_num bigint;
11 BEGIN
12     EXECUTE 'SELECT count(1) FROM ' || _table_name
13     INTO total_num;
14
15     --Get all the node names
16     query_str_nodes := 'SELECT node_name FROM pgxc_node WHERE node_type='D''';
17
18     FOR row_name IN EXECUTE(query_str_nodes) LOOP
19         query_str := 'EXECUTE DIRECT ON (' || row_name.node_name || ') 'select ''DN_name'' as dname1,
20
21         FOR row_data IN EXECUTE(query_str) LOOP
22             row_data.dname1 := CASE
23                 WHEN LENGTH(row_name.node_name)<20
24                 THEN row_name.node_name || right(' ',20-length(row_name.node_name))
25                 ELSE SUBSTR(row_name.node_name,1,20)
26             END;
27             dName := row_data.dname1;
28             Num := row_data.count1;
29             IF total_num = 0 THEN
30                 Ratio := 0.000 ||'%';
31             ELSE
32                 Ratio := ROUND(row_data.count1/total_num*100,3) || '%';
33             END IF;
34             RETURN next;
35         END LOOP;
36     END LOOP;
```


Step 2 To start debugging, click  or press **Ctrl+D**, or right-click the selected PL/SQL program in **Object Browser** and click **Debug**. In the **Debug Function/Procedure** dialog box, enter the parameter information.

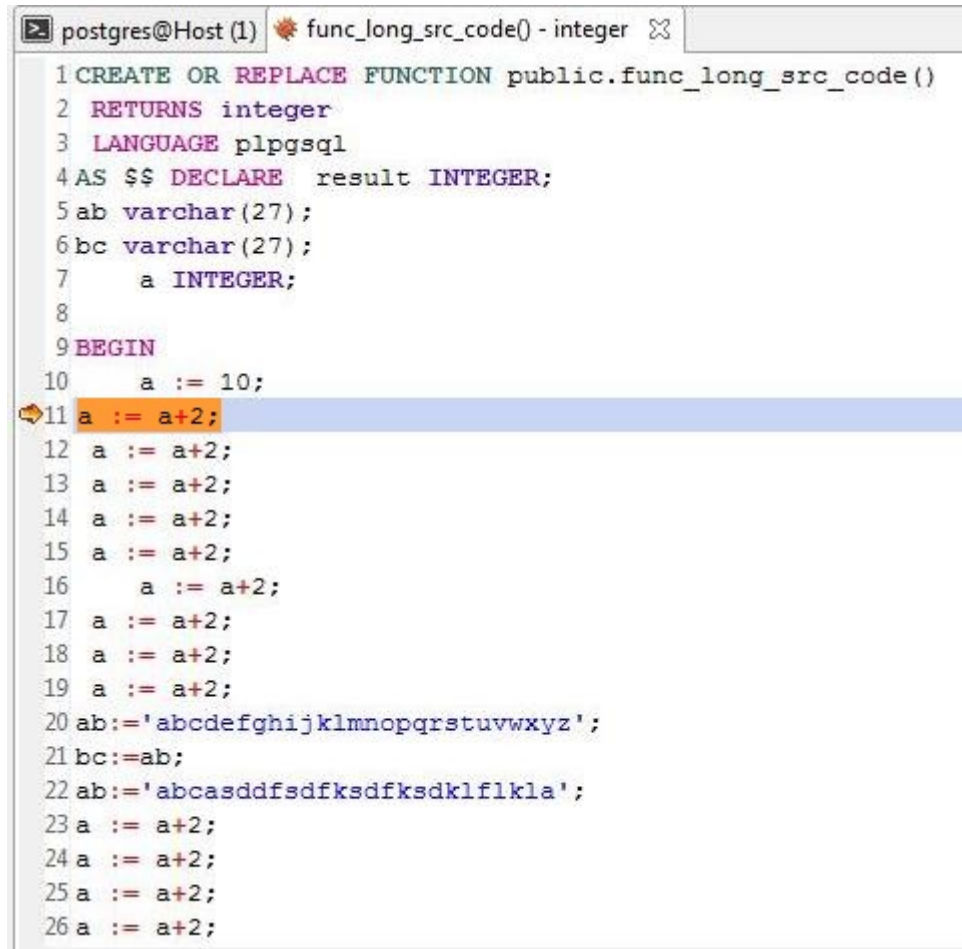
 NOTE

If no parameter is entered, the **Debug Function/Procedure** dialog box will not be displayed.


Step 3 Enter the information and click **OK**. Single quotation marks (') are mandatory for the parameters of **varchar** and **date** data types, but not mandatory for the parameters of **numeric** data type.

To set the parameter to **NULL**, enter **NULL** or **null**.

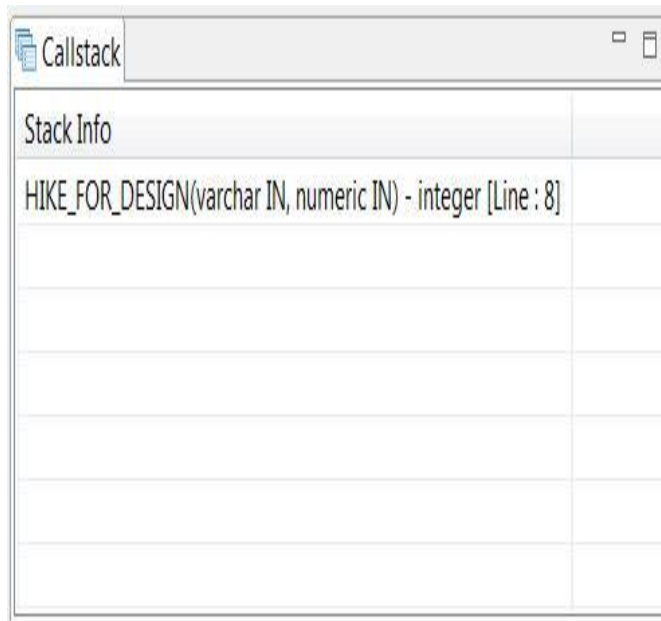
After clicking **Debug**, you will see  pointing to the line where the breakpoint is set. This line is the first line where the execution resumes.



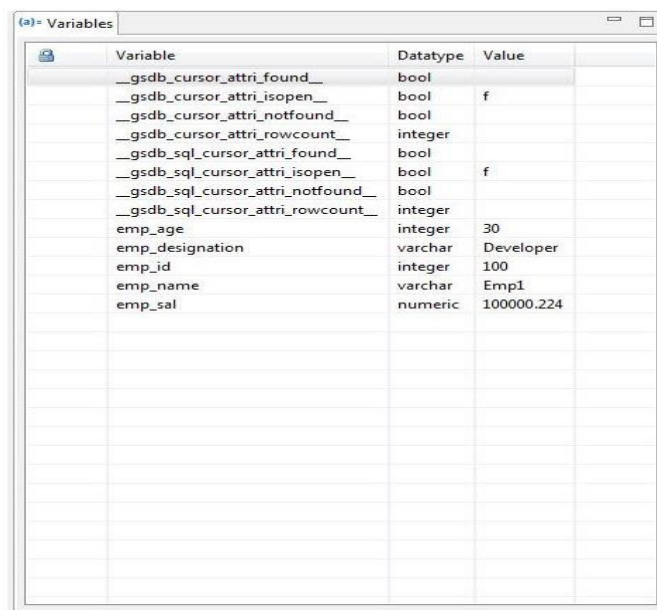
```
postgres@Host (1) func_long_src_code() - integer ⌵
1 CREATE OR REPLACE FUNCTION public.func_long_src_code()
2 RETURNS integer
3 LANGUAGE plpgsql
4 AS $$ DECLARE result INTEGER;
5 ab varchar(27);
6 bc varchar(27);
7     a INTEGER;
8
9 BEGIN
10     a := 10;
11 a := a+2;
12 a := a+2;
13 a := a+2;
14 a := a+2;
15 a := a+2;
16     a := a+2;
17 a := a+2;
18 a := a+2;
19 a := a+2;
20 ab:='abcdefghijklmnopqrstuvwxyz';
21 bc:=ab;
22 ab:='abcasddfsdfksdfksdklflkla';
23 a := a+2;
24 a := a+2;
25 a := a+2;
26 a := a+2;
```

You can terminate debugging by clicking  in the toolbar, or pressing **F10**, or select **Terminate Debugging** in the **Debug** menu. After the debugging is complete, the function execution proceeds and will not be stopped at any breakpoint.



Relevant information will be displayed in **Callstack** and **Variables** panes.




The **Variables** pane shows the current values of variables. If you hover over the variable of a function/procedure, the current value is also displayed.



You can step through the code using **Step Into**, **Step Out** or **Step Over**. For details, see [Controlling Execution](#).

- Step 4** Click  to continue the execution till the next breakpoint (if any). The result of the executed PL/SQL program is displayed in the **Result** tab and the **Callstack** and **Variables** panes are cleared. You can click  in the **Result** tab to copy the content of the tab.

Perform the following operations to remove a breakpoint:

- Double-click a breakpoint to remove it from **PL/SQL Viewer**.
- Select the breakpoint in the breakpoint check box and click  in the **Breakpoints** pane.

----End

Rearranging the Variables Pane

You can arrange the **Variables** pane and its columns to the following positions:

- Next to the **SQL Assistant** tab
- Next to the **SQL Terminal** tab
- Next to the **Object Browser** tab
- Next to the **Result** tab
- Next to the **Breakpoints** tab
- Next to the **Callstack** tab
- Next to the **Object Browser** tab

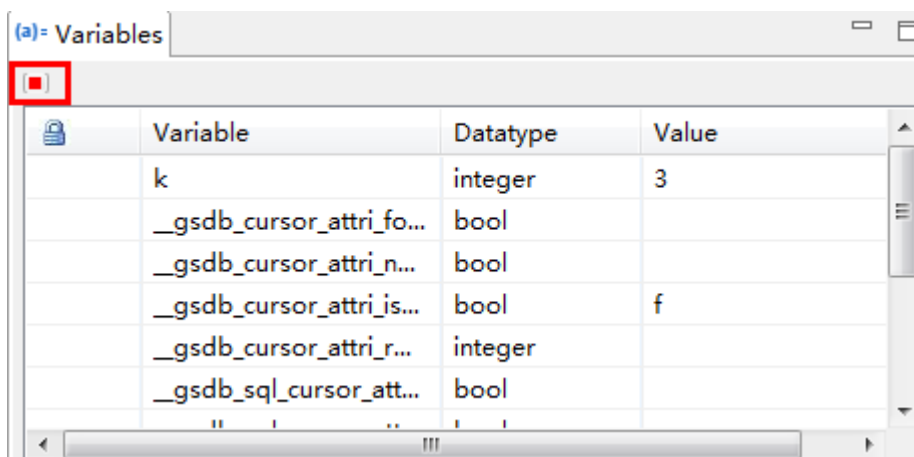
NOTE

When debugging is complete, the **Variables** pane will be minimized regardless of its position. If the **Variables** pane is moved next to the **SQL Terminal** or **Result** tab, you need to minimize the pane after debugging is complete. The position of the **Variables** pane remains unchanged after it is rearranged.

Enabling/Disabling System Variables

System variables are displayed by default in the **Variables** pane. You can disable the display of system variables if necessary.

Step 1 Click the button under **Variables** to disable the display of system variables.



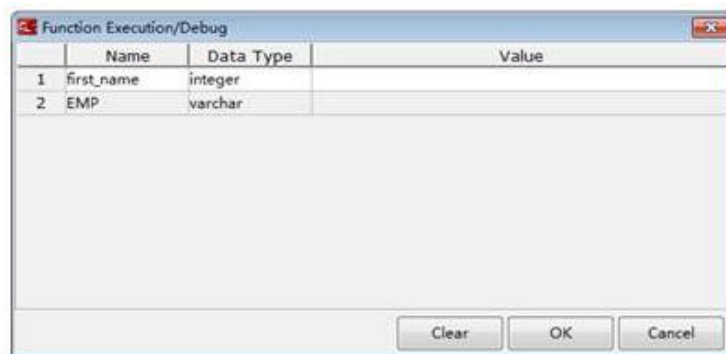
The button is toggled on by default.

----End

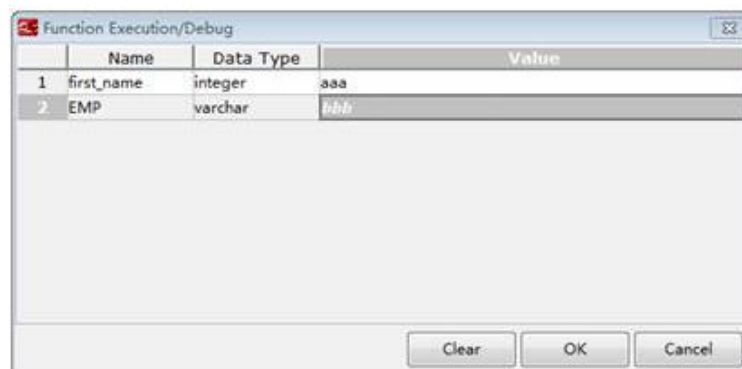
Displaying Cached Parameters

When a PL/SQL function or procedure is debugged or executed, the same parameter values are used for the next debugging or execution.

When a PL/SQL object is executed, the following window is displayed.



The **Value** column is empty upon the first execution. Enter the values as required.



Click **OK**. The parameter values will be cached. The cached parameter values will be displayed in the next execution or debugging.

NOTE

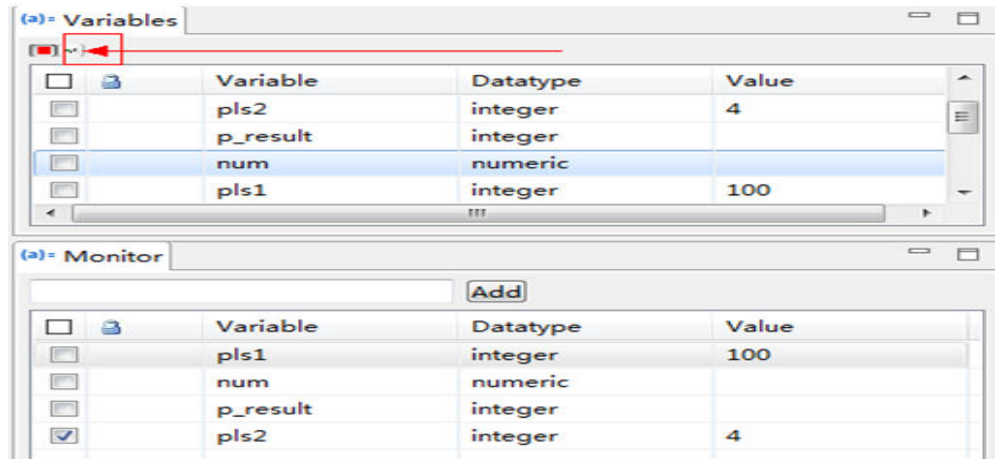
Once a specific connection is removed, all the cached parameter values are cleared.

Displaying Variable in the Monitor Pane

Data Studio displays the variables which are being monitored in the **Monitor** pane during debugging.

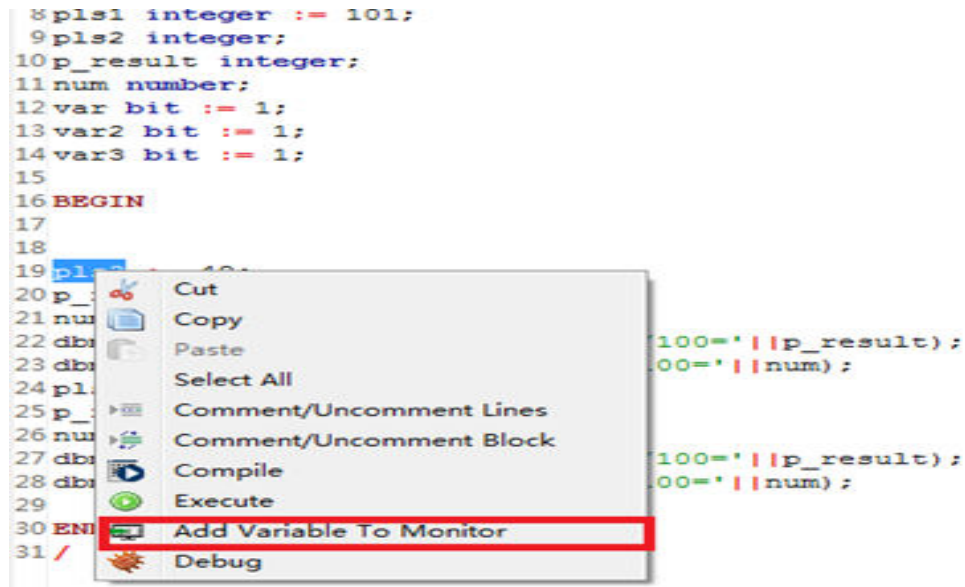
In the **Monitor** pane, add a variable in the following ways:

- Select a variable from the **Variables** pane and right-click the variable.
- Select a variable from the **Variable** column and add it by clicking the button in the **Variables** window toolbar.



If the variable is monitored, its value in the **Monitor** pane will always be the same as that in the **Variables** pane.

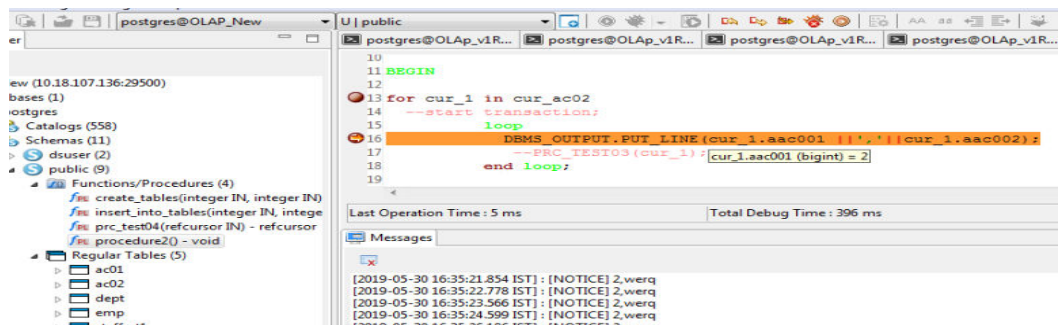
- During function/procedure debugging, right-click the variable to be added in the editor and choose **Add Variable To Monitor** in the menu displayed.



The **Monitor** pane can be dragged to anywhere in the **Data Studio** window.

Hovering Over a Variable to View Its Information During Debugging

When debugging a PL/SQL function in Data Studio, you can hover over a variable to view its information.



Supporting Rollback/Commit During Debugging

Data Studio allows committing or rolling back the PL/SQL query result after debugging is complete.

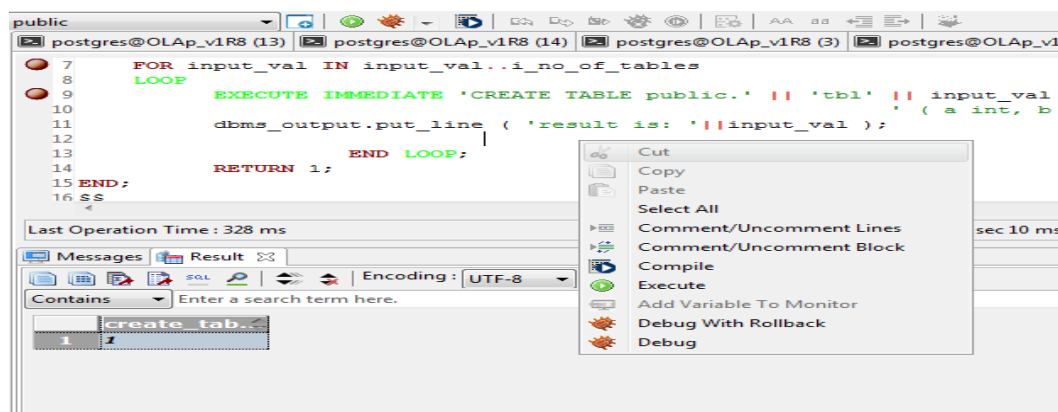
- If **Debug With Rollback** is enabled, the PL/SQL execution result after debugging is not saved to the database.
- If **Debug With Rollback** is disabled, the PL/SQL execution result after debugging is submitted to the database.

Perform the following steps to enable the rollback function:

Step 1 Check the **Debug With Rollback** box and enable the rollback function during PL/SQL debugging.

Or

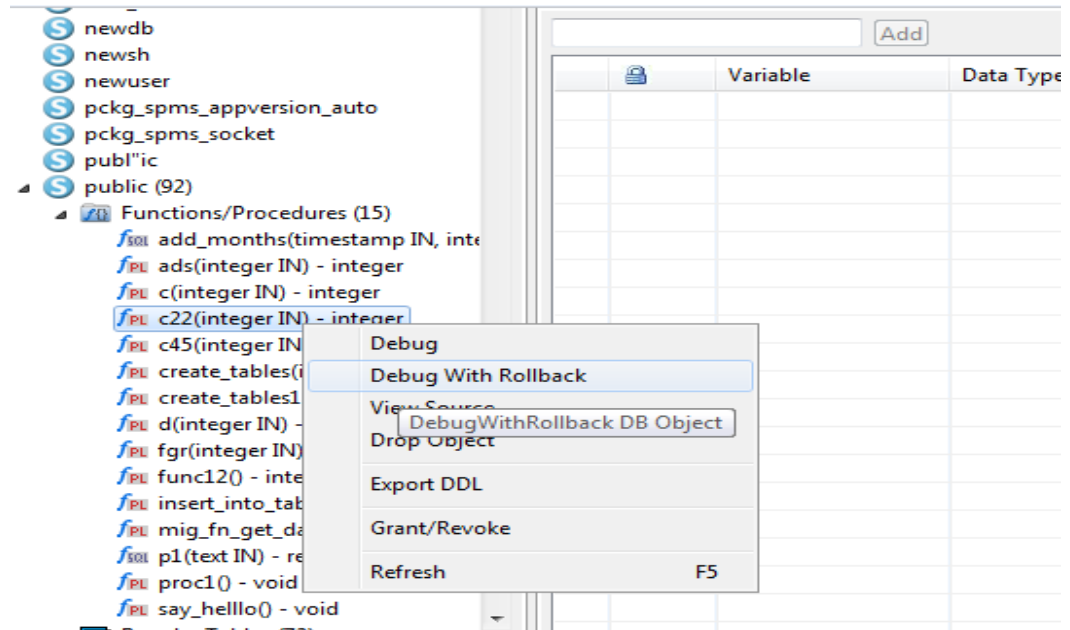
Right-click the **SQL Terminal** pane where the PL/SQL function is executed.



Select **Debug With Rollback** to enable the rollback function after the debugging is complete.

Or

Right-click any PL/SQL function under **Functions/Procedures** in **Object Browser**.




----End

4.14.3 Controlling Execution

Topics in this section include:

- [Starting Debugging](#)
- [Single Stepping a PL/SQL Function](#)
- [Continuing the Debugging](#)
- [Viewing Callstack](#)

Starting Debugging

Select the function that you want to debug in the **Object Browser** pane. Start debugging by clicking  on the toolbar or using any other method mentioned in previous sections. If no breakpoint is set or the breakpoint set is invalid, the debugging operation is performed without stopping any statement and Data Studio will simply execute the object and display the results (if any).

Single Stepping a PL/SQL Function

You can run the command for single stepping in the toolbar to debug a function. This allows you to debug the program line by line. When a breakpoint occurs during the operation of single stepping, the operation will be suspended and the program will be stopped.


Single stepping means executing one statement at a time. Once a statement is executed, you can see the execution result in other debugging tabs.

 NOTE

A maximum of 100 **PL/SQL Viewer** tabs can be displayed at a time. If more than 100 tabs are opened, the tabs of function calls will be closed. For example, if 100 tabs are opened and a new debugging object is called, Data Studio will close the tabs of function calls and open the tab of the new debugging object.

Step Into


To execute the code by statement, select **Step Into** from the **Debug** menu, or click , or press **F7**.

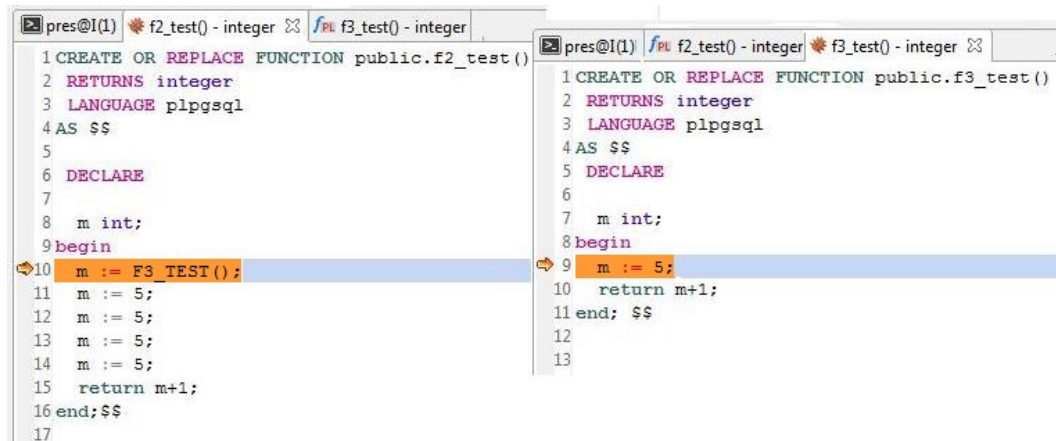
When stepping into a function, Data Studio executes the current statement and then enters the debugging mode. The debugged line will be indicated by an arrow  on the left. If the executed statement calls another function, Data Studio will step into that function. Once you have stepped through all the statements in that function, Data Studio jumps to the next statement of the function it was called from.

Press **F7** to go to the next statement. If you click **Continue**, PL/SQL code execution will continue.

An example is as follows:

When entering line 8, enter **m := F3_TEST();**. That is, go to line 9 in **f3_test()**. You can step through all the statements in **f3_test()** by pressing **F7** repeatedly to step into each line. Once you have stepped through all the statements in that function, Data Studio jumps to line 10 in **f2_test()**.

The currently debugged object is marked with the  symbol in the tab title, which indicates the function name.



```
pres@I(1) f2_test() - integer x f3_test() - integer x
1 CREATE OR REPLACE FUNCTION public.f2_test()
2 RETURNS integer
3 LANGUAGE plpgsql
4 AS $$
5
6 DECLARE
7
8 m int;
9 begin
10 m := F3_TEST();
11 m := 5;
12 m := 5;
13 m := 5;
14 m := 5;
15 return m+1;
16 end;$$
17

pres@I(1) f2_test() - integer x f3_test() - integer x
1 CREATE OR REPLACE FUNCTION public.f3_test()
2 RETURNS integer
3 LANGUAGE plpgsql
4 AS $$
5 DECLARE
6
7 m int;
8 begin
9 m := 5;
10 return m+1;
11 end; $$
12
13
```

Stepping Over

Stepping over is the same as Stepping into, except that when it reaches a call for another function, it will not step into the function. The function will run, and you will be brought to the next statement in the current function. **F8** is the shortcut key for **Step Over**. However, if there is a breakpoint set inside the called function, **Step Over** will enter the function, and hit the set breakpoint.

In the following example, when you click **Step Over** in line 10, Data Studio executes the **f3_test()** function.

```
9 begin
10 m := F3_TEST ();
11 m := 5;
12 m := 5;
13 m := 5;
14 m := 5;
15 return m+1;
16 end;$$
```

The cursor will be moved to the next statement in `f2_test()`, that is, line 11 in `f2_test()`.

```
9 begin
10 m := F3_TEST ();
11 m := 5;
12 m := 5;
13 m := 5;
14 m := 5;
15 return m+1;
16 end;$$
```

You can step over a function when you are familiar with the way the function works and ensure that its execution will not affect the debugging.

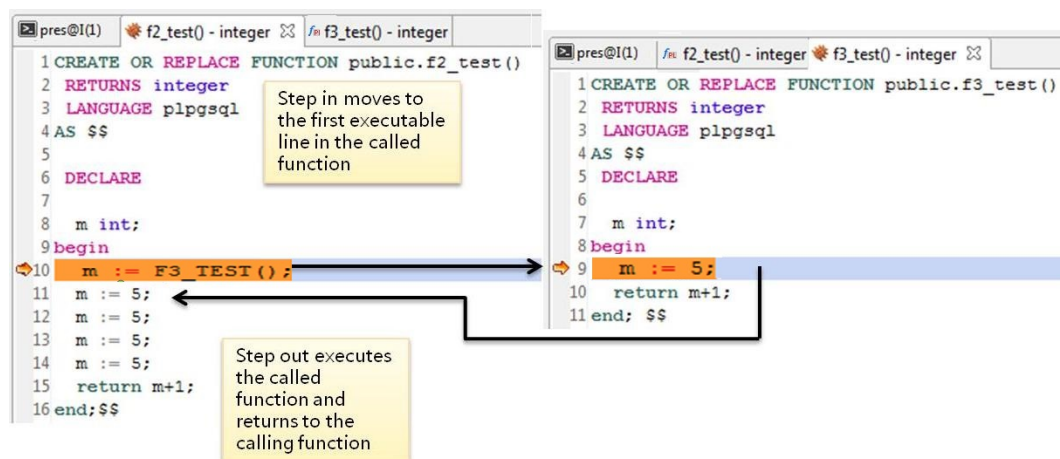
NOTE

Stepping over a line of code that does not contain a function call executes the line just like stepping into the line.

Stepping Out

Stepping out of a sub-program continues execution of the function and then suspends execution after the function returns to its calling function. You can step out of a long function when you have determined that the rest of the function is not significant to debug. However, if a breakpoint is set in the remaining part of the function, then that breakpoint will be hit before returning to the calling function.


A function will be executed when you step over or step out of it. **Shift+F7** is the shortcut key for **Step Out**.



In the preceding example:

- Choose **Debug > Step Into** to step into **f3_test()**.
- Choose **Debug > Step Out** to step out of **f3_test()**.

Continuing the Debugging

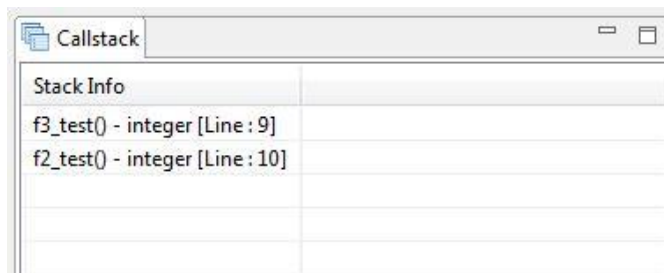
When the debugged process stops at a specific location, you can select **Continue (F9)** from the **Debug** menu, or click  in the toolbar to continue the PL/SQL function execution.

Viewing Callstack

The **Callstack** pane displays the chain of functions as they are called. The **Callstack** pane can be opened from the minimized window. The most recent functions are listed at the top, and the least recent at the bottom. At the end of each function name is the current line number in that function.

You can double-click the function names in the **Callstack** pane to open panes of different functions. For example, when **f2_test()** calls line 10 of **f3_test()**, the debugging pointer will point to the first executable line (that is, line 9 in the preceding example) in the function call.

In this case, the **Callstack** pane will be displayed as follows.



NOTE

Press **Alt+J** to copy the content in the **Callstack** pane.

4.14.4 Checking Debugging Information

When you use Data Studio, you can examine debugging information through several debugging panes. This section describes how to check the debugging information:

- [Operating on Variables](#)
- [Viewing Results](#)

Operating on Variables

The **Variables** pane is used to monitor information or evaluate values. The **Variables** pane can be opened from the minimized window to evaluate or modify variables or parameters in a PL/SQL procedure. As you step through the code, the values of some local variables may be changed.

Variable	Datatype	Value
__gsdb_cursor_attri_found__	bool	
__gsdb_cursor_attri_isopen__	bool	f
__gsdb_cursor_attri_notfound__	bool	
__gsdb_cursor_attri_rowcount__	integer	
__gsdb_sql_cursor_attri_found__	bool	
__gsdb_sql_cursor_attri_isopen__	bool	f
__gsdb_sql_cursor_attri_notfound__	bool	
__gsdb_sql_cursor_attri_rowcount__	integer	
emp_age	integer	30
emp_designation	varchar	Developer
emp_id	integer	100
emp_name	varchar	Emp1
emp_sal	numeric	100000.224

NOTE

Press **Alt+K** to copy the content of the **Variables** pane.

You can double-click the corresponding line of the variable and manually change its value during runtime.

Click the **Variable**, **Datatype**, or **Value** column in the **Variables** pane to sort the values. For example, to change the value of the percentage variable from 5 to 15, double-click the corresponding line in the **Variable** pane. The **Set Variable Value** dialog box will be displayed, which prompts you to enter the variable value. Input the variable value and click **OK**.

To set **NULL** as a variable value, enter **NULL** or **null** in the **Value** column.

If a variable is read-only, will be displayed next to it.

Read-only variables cannot be updated. A variable declared as a constant will not be shown as read-only in the **Variables** pane. However, an error will be reported when this variable is updated.

NOTE


- If **'NULL'** or **NULL** is entered in the **Variables** pane, the parameter value will be displayed as **NULL**. This rule also applies to character datatypes.
- If the value is set to a variable using Data Studio, the value of the variable is the same as the value returned by the statement **SELECT EXPRESSION** executed using **gsql**.

Setting/Displaying Variables	Description
Setting a variable to NULL	<ol style="list-style-type: none"> 1. Double-click a variable value in the Variables pane. A dialog box is displayed. 2. Left the parameter blank.

Setting/Displaying Variables	Description
Setting a string value	Some examples are as follows: <ul style="list-style-type: none">To set the value to abc, enter abc.To set the value to Master's Degree, enter Master's Degree.To set the value as text (NULL), set it to NULL in the Variables pane.
Setting a BOOLEAN value	Enclose the BOOLEAN value t or f within single quotation marks ('). For example, to set t to a BOOLEAN variable, enter ' t ' in the Value column.
Displaying a variable value	If the variable value is NULL , it will be displayed as NULL . If the variable value is NULL , it will be displayed as empty. If the variable value is a string, for example, <i>abc</i> , it will be displayed as <i>abc</i> .

Viewing Results

The **Result** tab displays the result of the PL/SQL debugging session, with the corresponding procedure name at the top of the tab. The **Result** tab is automatically displayed only when the result of executing a PL/SQL program exists.

You can click  in the **Result** tab to copy the content of the tab. For details, see [Using SQL Terminals](#).

NOTE

- The tool tip in the **Result** tab displays a maximum of 10 lines, each of which contains up to 80 characters.
- If the result of an executed query is **NULL**, it will be displayed as **<NULL>**.
- Tab characters (ASCII 009) in table data will not be displayed in the **Result**, **View Table Data**, or **Properties** pane. Tab characters will be included correctly in the copied or exported data, and displayed correctly in the tool tip.

4.15 Working with Functions/Procedures

4.15.1 Overview

This section provides you with details on working with functions/procedures and SQL functions in Data Studio.

NOTE

Data Studio supports PL/pgSQL and SQL languages for the operations are listed as follows:

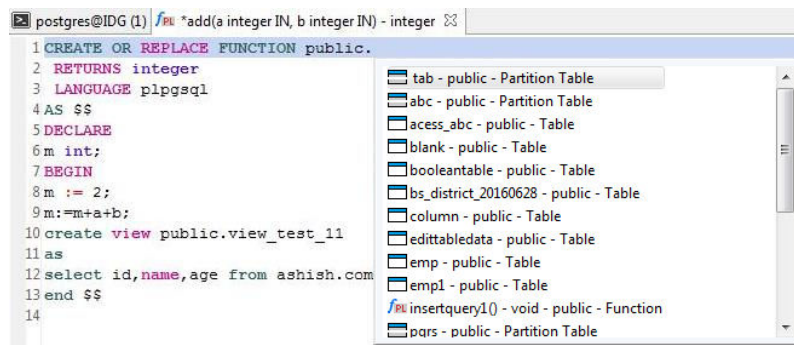
- [Creating a Function/Procedure](#)
- [Editing a Function/Procedure](#)
- [Exporting the DDL of a Function or Procedure](#)
- [Dropping a Function/Procedure](#)

4.15.2 Selecting a DB Object in the PL/SQL Viewer

Data Studio suggests a list of possible schema names, table names, column names, views, sequences, and functions in the **PL/SQL Viewer**.

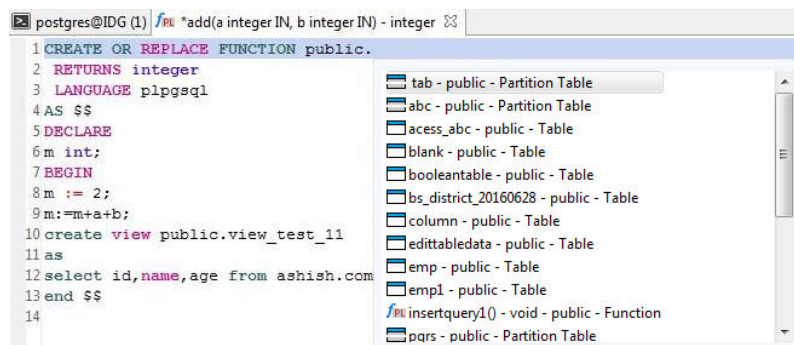
Follow the steps below to select a DB object:

Step 1 Press **Ctrl+Space** and enter the required parent DB object name. The DB objects list is refined as you continue typing the DB object name. The DB objects list displays all DB objects of the database connected to **SQL Terminal**.



Step 2 To select the parent DB object, use the **Up** or **Down** arrow keys and press **Enter** on the keyboard, or double-click the parent DB object.

Step 3 Enter **.** (period) to list all child DB objects.



Step 4 To select the child DB object, use the **Up** or **Down** arrow keys and press **Enter** on the keyboard, or double-click the child DB object.

On selection, the child DB object will be appended to the parent DB object (with a period(.)).

 NOTE

- Auto-suggest also works on keywords, data types, schema names, table names, views, and table name aliases in the same way as shown above for all schema objects that you have accessed.

Following is a sample query with alias objects:

```
SELECT
  table_alias.<auto-suggest>
FROM test.t1 AS table_alias
WHERE
  table_alias.<auto-suggest> = 5
GROUP BY table_alias.<auto-suggest>
HAVING table_alias.<auto-suggest> = 5
ORDER BY table alias.<auto-suggest>
```

- Auto-suggest may show "Loading" in Terminal for following scenarios:
 - The object is not loaded due to the value mentioned in the **Load Limit** field. Refer to [Adding a Connection](#) for more information.
 - The object is not loaded since it is added in the **Exclude** list option.
 - There is a delay in fetching the object from the server.
- If there are objects with the same name in different case, then auto-suggest will display child objects of both parent objects.

Example:

If there are two schemas that are named **public** and **PUBLIC**, then all child objects for both these schemas will be displayed.

----End

4.15.3 Exporting the DDL of a Function or Procedure

Perform the following steps to export the DDL of a function or procedure:

Step 1 In the **Object Browser** pane, right-click the selected function or procedure and select **Export DDL**.


The **Data Studio Security Disclaimer** dialog box is displayed.

Step 2 Click **OK**.

The **Save As** dialog box is displayed.

Step 3 In the **Save As** dialog box, select the location to save the DDL and click **Save**. The status bar displays the operation progress.

 NOTE

- To cancel the export operation, double-click the status bar to open the **Progress View** tab and click . For details, see [Canceling Table Data Export](#).
- If the file name contains characters that are not supported by Windows, the file name will be different from the schema name.
- The MS Visual C Runtime file (**msvcrt100.dll**) is required for this operation. For details, see [Troubleshooting](#).
- You can export the DDL of multiple objects. For details about the objects whose DDL cannot be exported, see [Batch Export](#).

The **Data Exported Successfully** dialog box and status bar display the status of the completed operation.

Database Encoding	File Encoding	Support for Exporting DDL
UTF-8	UTF-8	Yes
	GBK	Yes
	LATIN1	Yes
GBK	GBK	Yes
	UTF-8	Yes
	LATIN1	No
LATIN1	LATIN1	Yes
	GBK	No
	UTF-8	Yes

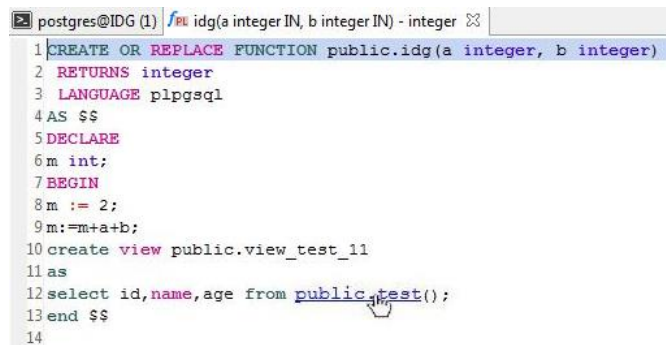
----End

4.15.4 Viewing Object Properties in the PL/SQL Viewer

Data Studio allows you to view table properties, procedures/functions and SQL functions.

Follow the steps below to view table properties:

Step 1 Press **Ctrl** and point to the table name.



```

postgres@IDG (1) / PL idg(a integer IN, b integer IN) - integer
1 CREATE OR REPLACE FUNCTION public.idg(a integer, b integer)
2 RETURNS integer
3 LANGUAGE plpgsql
4 AS $$
5 DECLARE
6 m int;
7 BEGIN
8 m := 2;
9 m:=m+a+b;
10 create view public.view_test_11
11 as
12 select id,name,age from public.test();
13 end $$
14

```

Step 2 Click the highlighted table name.

The properties of the selected table is displayed.

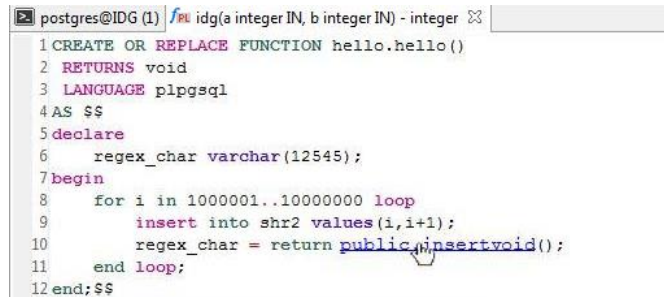
NOTE

The table properties are read-only.

----End

Follow the steps below to view functions/procedures or SQL functions:

Step 1 Press **Ctrl** and point to the procedure/function name or SQL function name.



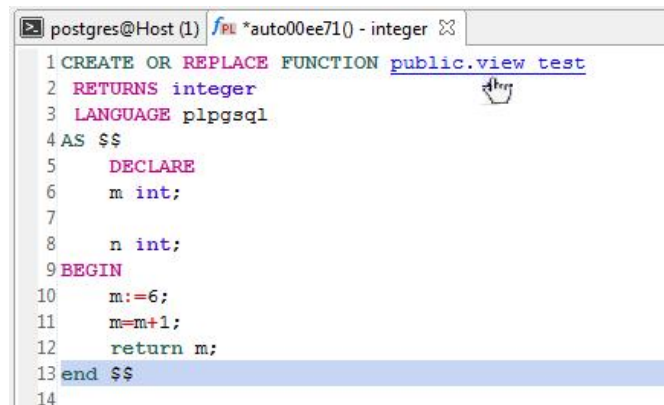
```
postgres@IDG (1) f idg(a integer IN, b integer IN) - integer
1 CREATE OR REPLACE FUNCTION hello.hello()
2 RETURNS void
3 LANGUAGE plpgsql
4 AS $$
5 declare
6     regex_char varchar(12545);
7 begin
8     for i in 1000001..10000000 loop
9         insert into shr2 values (i,i+1);
10        regex_char = return public.insertvoid();
11    end loop;
12 end;$$
```

Step 2 Click the highlighted function/procedure name or SQL function name. The function/procedure or SQL function is displayed in a new **PL/SQL Viewer** tab based on your selection.

----End

Follow the steps below to view object DDL:

Step 1 Press **Ctrl** and point to the name of an object DDL to be viewed.



```
postgres@Host (1) f *auto00ee710 - integer
1 CREATE OR REPLACE FUNCTION public.view test
2 RETURNS integer
3 LANGUAGE plpgsql
4 AS $$
5 DECLARE
6     m int;
7
8     n int;
9 BEGIN
10    m:=6;
11    m=m+1;
12    return m;
13 end $$
14
```

Step 2 Click the highlighted Object DDL name. A new tab page for viewing the object DDL is displayed based on your selection.

----End

4.15.5 Dropping a Function/Procedure

Individual or batch drop can be performed on functions/procedures. Refer to [Batch Dropping Objects](#) section for batch drop.

Follow the steps below to drop a function/procedure or SQL function object:

Step 1 In the **Object Browser** pane, right-click the selected function/procedure object and select **Drop Object**.

Step 2 To drop objects in batches, right-click two or more selected function/procedure objects and choose **Drop Objects**.

Step 3 In the confirmation dialog box, click **Yes** to complete the operation successfully.

The status bar displays the status of the completed operation.

----End

4.15.6 Executing a Function/Procedure

After you connect to the database, all the stored functions/procedures and tables will be automatically populated in the **Object Browser** pane. You can use Data Studio to execute PL/SQL programs or SQL functions.

NOTE

- Blank lines occurring above or below in a function/procedure will be trimmed by Data Studio before being sent to the server. Blank lines will also be trimmed when displaying the source received from the server.
- To execute a function/procedure, enter the same values in Data Studio and the gsq client. If you do not enter any value in Data Studio, then NULL is considered as the input.

For example:

- To execute the function/procedure with string, enter the value as data.
- To execute the function/procedure with date, enter the value as `to_date('2012-10-10', 'YYYY-MM-DD')`.
- A function/procedure with OUT and INOUT parameter types cannot be executed directly.
- Data Studio will not execute any function/procedure with unknown data type parameters.


You can right-click the function/procedure in the **Object Browser** to perform the following operations:

- Refresh the program to get the latest program from the server.
- Execute the function/procedure or SQL function.
- Debug a PL/SQL function.
- Drop the debug object.

Executing a PL/SQL Program or SQL Function

Follow the steps below to execute a PL/SQL program or SQL function:

Step 1 Double-click and open the PL/SQL program or SQL function. Each debug object will be opened in a new tab. You can open a maximum of 100 tabs in Data Studio.

Step 2 Click  on the toolbar or choose **Run > Execute** from the main menu, or right-click the program name in the **Object Browser** and select **Execute**.

Step 3 The **Execute Function/Procedure** dialog box is displayed prompting for your input.

NOTE

If there is no input parameter, then the **Execute Function/Procedure** dialog box will not appear. Instead, the PL/SQL program will be executed, and the result (if any) will be displayed in the **Result** tab.

Step 4 Provide your input for the function/procedure in the **Execute PL/pgSQL** dialog box and click **OK**.

To set NULL as the parameter value, enter **NULL** or **null**.


- If you do not provide a value that starts with a single quote, then a single quote (') will be added by Data Studio before and after the value and typecasting is done.
- If you provide a value that starts with a single quote, an additional single quote will not be added by Data Studio, but data type typecasting is done. For example:

For supported data types, the execution queries are as follows:

```
select func('1':INTEGER);
select func('1':FLOAT);
select func('xyz':VARCHAR);
```

- If quotes are already provided, you need to take care of escaping the quotes.

Example: If the input value is **ab'c**, then you need to enter **ab''c**.

The PL/SQL program is executed in the **SQL Terminal** tab and the result is displayed in the **Result** tab. You can copy the contents of the Result tab by clicking . Refer to [Using SQL Terminals](#) for more information on toolbar options..

Refer to [Executing SQL Queries](#) for information on reconnect option in case connection is lost during execution.

----End

4.15.7 Granting/Revoking a Privilege

Follow the steps below to grant/revoke a privilege:

Step 1 Right-click selected function/procedure and select the **Grant/Revoke**.

The **Grant/Revoke** dialog box is displayed.

Step 2 Refer to [Granting/Revoking a Permission \(Function/Procedure\)](#) section to grant/revoke a privilege.

----End

4.16 GaussDB(DWS) Tables

4.16.1 Table Management Overview

This section describes how to manage tables efficiently.

NOTE

- You need to configure all mandatory parameters to complete the operation. Mandatory parameters are marked with an asterisk (*).

4.16.2 Creating Regular Table

4.16.2.1 Overview

This section describes how to create a common table.

A table is a logical structure maintained by a database administrator and consists of rows and columns. You can define a table as a part of your data definitions from the data perspective. Before defining a table, you need to define a database and a schema. This section describes how to use Data Studio to create a table. To define a table in the database, perform the following steps:

- Step 1** In the **Object Browser** pane, right-click **Regular Tables**, and choose **Create Regular Table**.
- Step 2** Define basic table information, such as the table name and table type. For details, see [Providing Basic Information](#).
- Step 3** Define column information, such as the column name, data type schema, data type, and column constraint. For details, see [Defining a Column](#).
- Step 4** For details about how to determine table data distribution settings, see [Selecting Data Distribution](#).
- Step 5** Define column constraints for different constraint types. Constraint types include **PRIMARY KEY**, **UNIQUE**, and **CHECK**. For details, see [Defining Table Constraints](#).
- Step 6** Define table index information, such as the index name and access mode. For details, see [Defining an Index](#).

On the **SQL Preview** tab, you can check the automatically generated SQL query. For details, see [SQL Preview](#).

----End

Providing Basic Information

If you create a table in a schema, the current schema will be used as the schema of the table. Perform the following steps to create a common table:

- Step 1** Enter a table name. It specifies the name of the table to be created.

NOTE

Select the **Case** check box to retain the capitalization of the value of the **Table Name** parameter. For example, if you enter the table name **Employee**, the table name will be created as **Employee**.

The name of the table schema is displayed in **Schema**.

- Step 2** Select a table storage mode from the **Table Orientation** drop-down list.
- Step 3** Select a table type. Its value can be:
 - **Normal**: a normal table
 - **Unlogged**: An unlogged table. When data is written to an unlogged table, the data is not recorded in logs. The speed of writing data to an unlogged table is much higher than that of writing data to a common table. However, an unlogged table is insecure. In the case of a conflict or abnormal shutdown, an unlogged table is automatically truncated. The content of unlogged tables is not backed up to the standby node, and no log is automatically recorded when an index is created for unlogged tables.

- Step 4** Configure **Options**.

- **IF NOT EXISTS:** Create the table only if a table with same name does not exist.
- **WITH OIDS:** Create a table and assign OIDs.
- Configure **Filler Factor**. The value range is 10 to 100. The default value is 100 (filled to capacity).

If **Fill Factor** is set to a smaller value, the INSERT operation fills only the specified percentage of a table page. The free space of the page will be used to update rows on the page. In this way, the UPDATE operation can place the updated row content on the original page, which is more efficient than placing the update on a different page. Set it to 100 for a table that has never been updated. Set it to a smaller value for largely updated tables. TOAST tables do not support this parameter.

Step 5 Enter table description in the **Description of Table** text box.

Step 6 Click **Next** to define the column information of the table.

----End

You can configure the following parameters of a common table:

Table 4-7 Parameters

Parameter	Row-store Table	Column-store Table	ORC Table
Table Type	√	√	x
If Not Exists	√	√	√
With OIDS	√	x	x
Fill Factor	√	x	x

Defining a Column

A column defines a unit of information within a table's row. Each row is an entry in the table. Each column is a category of information that applies to all rows. When you add a table to a database, you can define the columns that compose it. Columns determine the type of data that the table can hold. After providing the general information about the table, click the **Columns** tab to define the list of table columns. Each column contains name, data type, and other optional properties.

You can perform the following operations only in a common table:

- [Deleting a Column](#)
- [Editing a Column](#)
- [Moving a Column](#)

To define a column, perform the following steps:

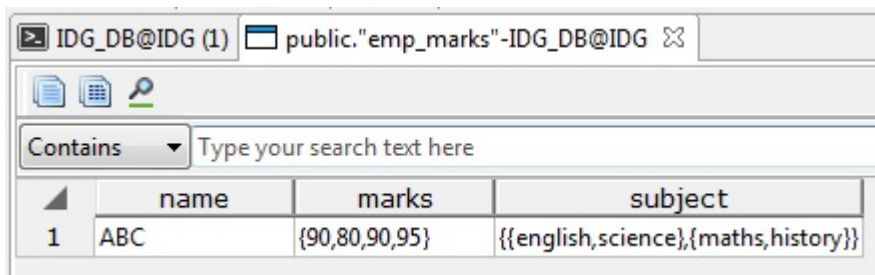
Step 1 Enter the column name in **Column Name** field. It specifies the name of a column to be created in the new table. This must be a unique name in the table.

NOTE

Select the **Case** check box to retain the capitalization of the value of the **Column Name** parameter. For example, if the column name entered is "Name", then the column name is created as "Name".

Step 2 Configure **Array Dimensions**. It specifies the array dimensions for the column.

Example: If array dimension for a column is defined as integer [], then it will add the column data as single dimension array.



	name	marks	subject
1	ABC	{90,80,90,95}	{{english,science},{maths,history}}

The marks column in the above table was created as single dimension and subject column as two dimensions.

Step 3 Select the data type of the column from the **Data Type** drop-down list. For example, **bigint** for integer values.

For complex data types,

- Select the required schema from the **Data type Schema** drop-down list.
- Select the corresponding data type from the **Data Type** drop-down list. This list displays the tables and views for the selected schema.

NOTE

User-defined data types are not available for selection.

Step 4 Enter the precision/size value of the data type entered in the **Precision/Size** field. This parameter is valid only when the data type can be defined by precision or size.

Step 5 Select the scale of the data type entered in the **Scale** field.

Step 6 Choose the following **Column Constraints** if required:

- **NOT NULL:** The column cannot contain null values.
- **UNIQUE:** The column may contain only unique values.
- **DEFAULT:** The default value used when no value is defined for the column.
- **Check:** An expression producing a Boolean result, which new or updated rows must satisfy for an INSERT or UPDATE operation to succeed.

Step 7 To add comments to **Column** in the **Create Regular Table** dialog box, add column information in **Description of Column (Max 5000 chars)** text box and click **Add**. You can also add comments in the column addition dialog box. You can check comments in general table properties.

Step 8 After you enter all information for new column, click **Add**. You can also delete a column from a list or change the order of columns. After defining all columns, click **Next**.

----End

You can configure the following parameters of a column in a common table:

Table 4-8 Parameters

Parameter	Row-store Table	Column-store Table	ORC Table
Array Dimensions	√	x	x
Data Type Schema	√	x	x
NOT NULL	√	√	√
Default	√	√	√
UNIQUE	√	x	x
CHECK	√	x	x

Deleting a Column

To delete a column, perform the following steps:

Step 1 Select a column.

Step 2 Click **Delete**.

----End

Editing a Column

Follow the steps to edit a column:

Step 1 Select a column.

Step 2 Click **Edit**.

Step 3 Edit the column details as required and click **Update** to save changes.

NOTE

You must complete the edit operation and save the changes to continue with other operations.

----End

Moving a Column

You can move a column in a table. To move a column, select the column and click **Up** or **Down**.

Selecting Data Distribution

Data distribution specifies how the table is distributed or replicated among data nodes.

Select one of the following options for the distribution type:

Distribution Type	Description
DEFAULT DISTRIBUTION	The default distribution type will be assigned for this table.
REPLICATION	Each row of the table will be replicated in all the data nodes of the database cluster.
HASH	Each row of the table will be placed based on the hash value of the specified column.
RANGE	Each row of the table will be placed based on the range value.
LIST	Each row of the table will be placed based on the list value.

After selecting data distribution, click **Next**.

The following table lists the data distribution parameters that can be configured for common tables.

Table 4-9 Distribution types

Distribution Type	Row-store Table	Column-store Table	ORC Table
DEFAULT DISTRIBUTION	√	√	x
HASH	√	√	√
REPLICATION	√	√	x

Defining Table Constraints

Creating constraints is optional. A table can have one (and only one) primary key. Creating the primary key is a good practice.

You can select the following types of constraints from the **Constraint Type** drop-down list:

- **Primary Key**

- **UNIQUE**
- **CHECK**

Primary Key

The primary key is the unique identity of a row and consists of one or more columns.

Only one primary key can be specified for a table, either as a column constraint or as a table constraint. The primary key constraint must name a set of columns that is different from other sets of columns named by any unique constraint defined for the same table.

Set the constraint type to **PRIMARY KEY** and enter the constraint name. Select a column from the **Available Columns** list and click **Add**. If you need a multi-column primary key, repeat this step for another column.

Fill Factor for a table is in the range 10 and 100 (unit: %). The default value is 100 (filled to capacity). If **Fill Factor** is set to a smaller value, the INSERT operation fills only the specified percentage of a table page. The free space of the page will be used to update rows on the page. In this way, the UPDATE operation can place the updated row content on the original page, which is more efficient than placing the update on a different page. Set it to 100 for a table that has never been updated. Set it to a smaller value for largely updated tables. TOAST tables do not support this parameter.

DEFERRABLE: Defer an option.

INITIALLY DEFERRED: Check the constraint at the specified time point.

In the **Constraints** area, click **Add**.

You can click **Delete** to delete a primary key from the list.

Mandatory parameters are marked with asterisks (*).

UNIQUE

Set the constraint type to **UNIQUE** and enter the constraint name.

Select a column from the **Available Columns** list and click **Add**. To configure unique for multiple columns, repeat this step for another column. After adding the first column, the UNIQUE constraint name will be automatically filled. The name can be modified.

Fill Factor: For details, see [Primary Key](#).

DEFERRABLE: For details, see [Primary Key](#).

INITIALLY DEFERRED: For details, see [Primary Key](#).

You can click **Delete** to delete UNIQUE from the list.

Mandatory parameters are marked with asterisks (*).

CHECK

Set the constraint type to **CHECK** and enter the constraint name.

When the INSERT or UPDATE operation is performed, and if the check expression fails, then table data is not altered.

If you double-click column in **Available Columns** list, it is inserted to **Check Expression** edit line to current cursor position.

In the **Constraints** area, click **Add**. You can click **Delete** to delete CHECK from the list. Mandatory parameters are marked with asterisks (*). After defining all constraints, click **Next**.

The following table lists the table constraint parameters that can be configured for common tables.

Table 4-10 Constraint types

Constraint Type	Row-store Table	Column-store Table	ORC Table
CHECK	√	x	x
UNIQUE	√	x	x
PRIMARY KEY	√	x	x

Defining an Index

Indexes are optional. They are used to enhance database performance. This operation constructs an index on the specified column(s) of the specified table. Select the **Unique Index** check box to enable this option.

Choose the name of the index method from the **Access Method** list. The default method is B-tree.

The **Fill factor** for an index is a percentage that determines how full the index method will try to pack index pages. For B-trees, leaf pages are filled to this percentage during initial index build, and also when extending the index at the right (adding new largest key values). If pages subsequently become completely full, they will be split, leading to gradual degradation in the index's efficiency. B-trees use a default fill factor of 90, but any integer value from 10 to 100 can be selected. If the table is static, then a fill factor of 100 can minimize the index's physical size. For heavily updated tables, an explain plan smaller fill factor is better to minimize the need for page splits. Other indexing methods use different fill factors but work in similar ways. The default fill factor varies between methods.

You can either enter a user-defined expression for the index or you can create the index using the **Available Columns** list. Select the column in the **Available Columns** list and click **Add**. If you need a multi-column index, repeat this step for other columns.

After entering the required information for the new index, click **Add**.

You can also delete an index from the list using the **Delete** button. After defining all indexes, click **Next**.

You can configure the following parameters of an index in a common table.

Table 4-11 Parameters

Parameter	Row-store Table	Column-store Table	ORC Table
Unique Indexes	√	x	x
btree	√	√	x
gin	√	√	x
gist	√	√	x
hash	√	√	x
psort	√	√	x
spgist	√	√	x
Fill Factor	√	x	x
User Defined Expression	√	x	x
Partial Index	√	x	x

SQL Preview

Data Studio generates a DDL statement based on the inputs provided in **Create New table** wizard.

You can only view, select, and copy the query. You cannot edit the query.

- To select all queries, press **Ctrl+A** or right-click and select **Select All**.
- To copy the selected query, press **Ctrl+C** or right-click and select **Copy**.

Click **Finish** to create the table. On clicking the **Finish** button, the generated query will be sent to the server. Any errors are displayed in the dialog box and status bar.

4.16.2.2 Working with Columns

After creating a table, you can add new columns in that table. You can also perform the following operations on the existing column only for a Regular table:

- [Creating a New Column](#)
- [Renaming a Column](#)
- [Toggle Not Null](#)
- [Dropping a Column](#)
- [Setting the Default Value of a Column](#)
- [Changing the Data Type](#)

Creating a New Column

Follow the steps below to add a new column to the existing table:

Step 1 Right-click **Columns** and select **Create column**.

The **Add New Column** dialog box is displayed prompting you to add information about the new column.

Step 2 Enter the details and click **Add**. You can view the added column in the corresponding table.

Data Studio displays the status of the operation in the status bar.

----End

Renaming a Column

Follow the steps below to rename a column:

Step 1 Right-click the selected column and select **Rename Column**.

A **Rename Column** dialog box is displayed prompting you to provide the new name.

Step 2 Enter the name and click **OK**. Data Studio displays the status of the operation in the status bar.

----End

Toggle Not Null

Follow the steps below to set or reset the Not Null option:

Step 1 Right-click the selected column and select **Toggle Not Null**.

A **Toggle Not Null Property** dialog box is displayed prompting you to set or reset the Not Null option.

Step 2 In the confirmation dialog box, click **OK** to complete the operation successfully. Data Studio displays the status of the operation in the status bar.

----End

Dropping a Column

Follow the steps below to drop a column:

Step 1 Right-click the selected column and select **Drop Column**. This operation deletes the column from the table.

A **Drop Column** dialog box is displayed.

Step 2 Click **OK** to complete the operation successfully. Data Studio displays the status of the operation in the status bar.

----End

Setting the Default Value of a Column

Follow the steps below to set the default value for a column:

Step 1 Right-click the selected column and select **Set Column Default Value**.

A dialog box with the current default value (if it is set) is displayed, prompting you to provide the default value.

Step 2 Enter the value and click **OK**. Data Studio displays the status of the operation in the status bar.

----End

Changing the Data Type

Follow the steps below to change the data type of a column:

Step 1 Right-click the selected column and select **Change Data Type**.

Change Data Type dialog box is displayed.

NOTE

The existing data type will show as Unknown while modifying complex data types.

Step 2 Select the **Data type Schema** and **Data Type**. If the **Precision/Size** spin box is enabled, enter the required details and click **OK**. Data Studio displays the status of the operation in the status bar.

----End

4.16.2.3 Working with Constraints

You can perform the following operations after a table is created only for a Regular table:

- [Creating a Constraint](#)
- [Renaming a Constraint](#)
- [Dropping a Constraint](#)

Creating a Constraint

Follow the steps below to add a new constraint to the existing table:

Step 1 Right-click the selected constraint of the table and select **Create constraint**.

The **Add New Constraint** dialog box is displayed prompting you to add information about the new constraint.

Step 2 Enter the **Constraint Name**, **Check Expression**, and click **Add**. You can view the added constraint in the corresponding table.

Data Studio displays the status of the operation in the status bar.

NOTE

The status bar will show the name of the constraint if it has been provided in the **Constraint Name** field, or else the constraint name will not be displayed as it is created by database server.

----End

Renaming a Constraint

Follow the steps below to rename a constraint:

Step 1 Right-click the selected constraint and select **Rename Constraint**.

The **Rename Constraint** dialog box is displayed prompting you to provide the new name.

Step 2 Enter the constraint name and click **OK**. Data Studio displays the status of the operation in the status bar.

----End

Dropping a Constraint

Follow the steps below to drop a constraint:

Step 1 Right-click the selected constraint and select **Drop Constraint**.

The **Drop Constraint** dialog box is displayed.

Step 2 Click **OK** to complete the operation successfully. Data Studio displays the status of the operation in the status bar.

----End

4.16.2.4 Managing Indexes

You can create indexes in a table to search for data efficiently.

After a table is created, you can add indexes to it. You can perform the following operations only in a common table:

- [Creating an Index](#)
- [Renaming an Index](#)
- [Changing a Fill Factor](#)
- [Deleting an Index](#)

Creating an Index

Perform the following steps to add an index to a table:

Step 1 Right-click **Indexes** and choose **Create Index** from the shortcut menu.

The **Create Index** dialog box is displayed.

Step 2 Enter the details and click **Create**. You can also view the SQL statement by clicking the **Preview Query** button. Items in **Available Columns** are not sorted. Items moved back from **Index Columns** to **Available Columns** are unsorted, and is not related to the column order in the table. You can set the order of the **Index Columns** using the arrow buttons. Data Studio displays the operation status in the status bar.

----End

Renaming an Index

Follow the steps below to rename an index:

Step 1 Right-click the selected index and select **Rename Index**.

The **Rename Index** dialog box is displayed.

Step 2 Enter a new name and click **OK**. Data Studio displays the operation status in the status bar.

----End

Changing a Fill Factor

To change a fill factor, perform the following steps:

Step 1 Right-click an index and choose **Change Fill Factor** from the shortcut menu.

The **Change Fill Factor** dialog box is displayed.

Step 2 Select a fill factor and click **OK**. Data Studio displays the operation status in the status bar.

----End

Deleting an Index

Perform the following steps to delete an index:

Step 1 Right-click an index and choose **Drop Index** from the shortcut menu.

The **Drop Index** dialog box is displayed.

Step 2 In the confirmation dialog box, click **OK**. Data Studio displays the operation status in the status bar. The index will be deleted from the table.

NOTE

When the last index of a table is deleted, the value of the **Has Index** parameter may still be **TRUE**. After a vacuum operation is performed on the table, this parameter will change to **FALSE**.

----End

4.16.3 Creating Foreign Table

Foreign tables created using query execution in SQL Terminal or any other tool can be viewed in the Object browser after refresh.

Step 1 To view the newly created foreign table, right-click and select **Refresh** either at database, schema and foreign table group level.

 NOTE

- GDS Foreign table is denoted with  icon before the table name.
- HDFS Foreign table is denoted with  icon before the table name.
- HDFS Foreign table with partition is denoted with  icon before the table name.

----End

4.16.4 Creating Partition Table

4.16.4.1 Overview

Partitioning refers to splitting what is logically one large table into smaller physical pieces based on specific schemes. The table based on the logic is called a partitioned table, and a physical piece is called a partition. Data is stored on these smaller physical pieces, namely, partitions, instead of the larger logical partitioned table.

Follow the steps below to define a table in your database:

- Step 1** In the **Object Browser** pane, right-click **Regular Tables**, and choose **Create Partition Table**.
- Step 2** Define basic table information, such as the table name and table type. For details, see [Providing Basic Information](#).
- Step 3** Define column information, such as the column name, data type schema, data type, and column constraint. For details, see [Defining a Column](#).
- Step 4** Select the data distribution information for the table. For details, see [Change Order of Partition](#).
- Step 5** Define column constraints for different constraint types. Constraint types include **PRIMARY KEY**, **UNIQUE**, and **CHECK**. For details, see [Defining Table Constraints](#).
- Step 6** Define table index information, such as the index name and access mode. For details, see [Defining an Index](#).
- Step 7** Define the partition information for the table such as partition name, partition column, partition value and so on. For details, see [Defining a Partition](#).
On the **SQL Preview** tab, you can check the automatically generated SQL query. For details, see [Checking the SQL Preview](#).
- Step 8** To add comments to **Column** in the **Create Partition Table** dialog box, add column information in **Description of Column (Max 5000 chars)** text box and click **Add**.

----End

Providing Basic Information

Provide the following information to create a table:

For details, see [Providing Basic Information](#).

- Table Name
- Schema
- Options
- Description of Table

Perform the following steps to configure other parameters:

Step 1 Select a table storage mode from the **Table Orientation** drop-down list.

 **NOTE**

If table orientation is selected as ORC, then an HDFS Partitioned table is created.

Step 2 Enter the ORC version number in the **ORC Version** field. This is applicable only for HDFS Partitioned table.

Step 3 After providing the general information about the table, click **Next** to define the columns information for the table.

The following table describes the parameters of partitioned tables.

Table 4-12 Parameters

Parameter	Row Partition	Column Partition	ORC Partition
Table Type	x	x	x
If Not Exists	√	√	√
With OIDS	x	x	x
Fill Factor	√	x	x

----End

Defining a Column

For details, see [Defining a Column](#).

The following table describes the parameters of partitioned tables.

Table 4-13 Parameters

Parameter	Row Partition	Column Partition	ORC Partition
Array Dimensions	√	x	x
Data Type	√	x	x
NOT NULL	√	√	√
Default	√	√	√
UNIQUE	√	x	x
CHECK	√	x	x

Change Order of Partition

You can change the order of partition as required in the table. To change the order, select the required partition and click **Up** or **Down**.

Checking the SQL Preview

For details, see [SQL Preview](#).

Editing a Partition

Perform the following steps to edit a partition:

- Step 1** Select a partition.
- Step 2** Click **Edit**.
- Step 3** Edit partition configurations as needed and click **Update** to save the changes.

NOTE

You must complete the edit operation and save the changes to continue with other operations.

----End

Deleting a Partition

Perform the following steps to delete a partition:

- Step 1** Select a partition.
- Step 2** Click **Delete**.

----End

Defining a Partition

The following table describes the parameters of partitioned tables.


Table 4-14 Parameters

Parameter	Row Partition	Column Partition	ORC Partition
Partition Type	By Range	By Range	By Value
Partition Name	√	√	x
Partition Value	√	√	x

Perform the following steps to define a table partition:

- Step 1** If **Row** or **Column** is selected for **Table Orientation** on the **General** tab, **By Range** will be displayed in the **Partition Type** area. If **ORC** is selected for **Table**

Orientation on the **General** tab, **By Value** will be displayed in the **Partition Type** area.

Step 2 In the **Available Column** area, select a column and click  .

The column will be moved to the **Partition Column** area.

 **NOTE**

- If **Table Orientation** is set to **Row** or **Column**, only one column can be selected for partitioning.
- If **Table Orientation** is set to **ORC**, up to four columns can be selected for partitioning.
- A maximum of four columns can be selected to define partitions.

Step 3 Enter a partition name.

Step 4 Click  next to **Partition Value**.

1. Enter the value by which you want to partition the table in **Value** column.
2. Click **OK**.

Step 5 After you enter all information for partition, click **Add**.

Step 6 After defining all partitions, click **Next**.

----End

You can perform the following operations on the partitions of a row-or column-partitioned table, but not on ORC partitioned tables:

[Deleting a Partition](#)

[Editing a Partition](#)

Defining an Index

For details about index definitions, see [Defining an Index](#).

Table 4-15 Parameters

Parameter	Row Partition	Column Partition	ORC Partition
Unique Indexes	√	x	x
btree	√	√	x
gin	√	√	x
gist	√	√	x
hash	√	√	x
psort	√	√	x
spgist	√	√	x
Fill Factor	√	x	x

Parameter	Row Partition	Column Partition	ORC Partition
User Defined Expression	√	x	x
Partial Index	√	x	x

Defining Table Constraints

For details about how to define table constraints, see [Defining Table Constraints](#).

Table 4-16 Parameters

Parameter	Partition	Column Partition	ORC Partition
Check	√	x	x
Unique	√	x	x
Primary Key	√	x	x

Configuring Data Distribution

For details about how to select a distribution type, see [Selecting Data Distribution](#).

Table 4-17 Parameters

Parameter	Row Partition	Column Partition	ORC Partition
DEFAULT DISTRIBUTION	√	√	x
Hash	√	√	√
Replication	√	√	x

4.16.4.2 Working with Partitions

After creating a table, you can add/modify partitions. You can also perform the following operations on an existing partition:

[Renaming a Partition](#)

[Dropping a Partition](#)

Renaming a Partition

Follow the steps below to rename a partition:

Step 1 Right-click the selected partition and select **Rename Partition**.

Rename Partition Table dialog box is displayed prompting you to provide the new name for the partition.

Step 2 Enter new name and click **OK**.

Data Studio displays the status of the operation in the status bar.

----End

Dropping a Partition

Follow the steps below to drop a partition:

Step 1 Right-click the selected index and select **Drop Partition**.

Drop Partition Table dialog box is displayed.

Step 2 Click **OK**.

The partition is dropped from the table. Data Studio displays the status of the operation in the status bar.

----End

4.16.5 Grant/Revoke Privilege - Regular/Partition Table

Follow the steps below to grant/revoke a privilege:

Step 1 Right-click regular tables group and select the **Grant/Revoke**.

The **Grant/Revoke** dialog box is displayed.

Step 2 Select the objects to grant/revoke privilege from the **Object Selection** tab and click **Next**.

Step 3 Select the role from the **Role** drop-down list in the **Privilege Selection** tab.

Step 4 Select **Grant/Revoke** in the **Privilege Selection** tab.

Step 5 Select/unselect the required privileges in the **Privilege Selection** tab.

In the **SQL Preview** tab, you can view the SQL query automatically generated for the inputs provided.

Step 6 Click **Finish**.

----End

4.16.6 Managing Table

4.16.6.1 Overview

This section describes how to manage tables efficiently.

 NOTE

- You need to configure all mandatory parameters to complete the operation. Mandatory parameters are marked with asterisks (*).
- Refreshing is the only operation supported for foreign table.

After creating the table, you can perform operations on the existing table. Right-click the selected table and select the required operation.

Context Menu

Additional options for table operations are available in the table context menu. The context menu options available for table operations are:

Table 4-18 Table context menu options

Menu Item	Description
View Table Data	Opens the table data information. For details, see Viewing Table Data .
Edit Table Data	Opens the window for editing table data. For details, see Editing Table Data .
Reindex Table	Re-creates the table index. For details, see Reindexing a Table .
Analyze Table	Analyzes a table. For details, see Analyzing a Table .
Truncate Table	Truncates table data. For details, see Truncating a Table .
Vacuum Table	Vacuums table data. For details, see Vacuuming a Table .
Set Table Description	Sets table description. For details, see Setting the Table Description .
Set Schema	Sets the schema of a table. For details, see Setting the Schema .
Export Table Data	Exports table data. For details, see Exporting Table Data .
Import Table Data	Imports table data. For details, see Importing Table Data .
Show DDL	Shows the DDL of a table. For details, see Show DDL .
Export DDL	Exports Table DDL. For details, see Exporting Table DDL .
Export DDL and Data	Exports DDL and table data. For details, see Exporting Table DDL and Data .
Rename Database	Renames a table. For details, see Renaming a Table .

Menu Item	Description
Drop Table	Drops (deletes) a table. For details, see Dropping a Table .
Properties	Shows table properties. For details, see Viewing Table Properties .
Grant/Revoke	Grants or revokes permissions. For details, see Grant/Revoke Privilege .
Refresh	Refreshes a table.

4.16.6.2 Renaming a Table

Follow the steps below to rename a table:

Step 1 Right-click the selected table and select **Rename Table**.

The **Rename Table** dialog box is displayed prompting you to provide the new name.

Step 2 Enter the table name and click **OK**. You can view the updated table name in **Object Browser**.

Data Studio displays the status of the operation in the status bar.

 **NOTE**

This operation is not supported for Partition ORC tables.

----End

4.16.6.3 Truncating a Table

Follow the steps below to truncate a table:

Step 1 Right-click the selected table and select **Truncate Table**. This operation deletes the data from an existing table.

Data Studio prompts you to confirm this operation.

Step 2 In the confirmation dialog box, click **OK** to complete the operation successfully.

A popup message and status bar display the status of the completed operation.

----End

4.16.6.4 Reindexing a Table

Index facilitate lookup of records. You need to reindex tables in the following scenarios:

- The index is corrupted and no longer contains valid data. Although in theory this must never happen, in practice, indexes can become corrupted due to software bugs or hardware failures. Reindexing provides a recovery method.

- The index has become "bloated". That is, it contains many empty or nearly-empty pages. This can occur with B-tree indexes in PostgreSQL under certain uncommon access patterns. Reindexing provides a way to reduce the space consumption of the index by writing a new version of the index without the dead pages.
- You have altered a storage parameter (such as the fill factor) for an index, and wish to ensure that the change has taken full effect.

Follow the steps below to reindex a table:

Step 1 Right-click the selected table and select **Reindex Table**.

A pop-up message and status bar display the status of the completed operation.

 **NOTE**

This operation is not supported for Partition ORC tables.

----End

4.16.6.5 Analyzing a Table

The analyzing table operation collects statistics about tables and table indices and stores the collected information in internal tables of the database where the query optimizer can access the information and use it to help make better query planning choices.

Follow the steps below to analyze a table:

Step 1 Right-click the selected table and select **Analyze Table**.

The **Analyze Table** message and status bar displays the status of the completed operation.

----End

4.16.6.6 Vacuuming a Table

Vacuuming table operation reclaims space and makes it available for re-use.

Follow the steps below to vacuum the table:

Step 1 Right-click the selected table and select **Vacuum Table**.

The **Vacuum Table** message and status bar display the status of the completed operation.

----End

4.16.6.7 Setting the Table Description

Follow the steps below to set the description of a table:

Step 1 Right-click the selected table and select **Set Table Description**.

The **Update Table Description** dialog box is displayed. It prompts you to set the table description.

Step 2 Enter the description and click **OK**.

The status bar displays the status of the completed operation.

Step 3 To view the table description, right-click the selected table and select **Properties**.

----End

4.16.6.8 Setting the Schema

Follow the steps below to set a schema:

Step 1 Right-click the selected table and select **Set Schema**.

The **Set Schema** dialog box is displayed that prompts you to select the new schema for the selected table.

Step 2 Select the schema name from the drop-down list and click **OK**. The selected table will be moved to the new schema.

The status bar displays the status of the completed operation.

NOTE

- This operation is not supported for Partition ORC tables.
- If the required schema contains a table with the same name as the current table, then Data Studio does not allow setting the schema for the table.

----End

4.16.6.9 Dropping a Table

Individual or batch dropping can be performed on tables. Refer to [Batch Dropping Objects](#) section for batch dropping.

This operation removes the complete table structure (including the table definition and index information) from the database and you have to re-create this table once again to store data.

Follow the steps below to drop the table:

Step 1 Right-click the selected table and select **Drop Table**.

Data Studio prompts you to confirm this operation.

Step 2 In the confirmation dialog box, click **OK** to complete the operation successfully.

The status bar displays the status of the completed operation.

----End

4.16.6.10 Viewing Table Properties

Follow the steps below to view the properties of a table:

Step 1 Right-click the selected table and select **Properties**.

Data Studio displays the properties (**General, Columns, Constraints, and Index**) of the selected table in different tabs.

The following table lists the operations that can be performed on each tab along with data editing and refreshing operation. Edit operation is performed by double-clicking the cell.


Tab Name	Operations Allowed
General	Save, Cancel, and Copy NOTE Only Table Description field can be modified.
Columns	Add, Delete, Save, Cancel, and Copy
Constraints	Add, Delete, Save, Cancel, and Copy
Index	Add, Delete, Save, Cancel, and Copy

Refer to [Editing Table Data](#) section for more information on edit, save, cancel, copy, paste, refresh operations.

NOTICE

When viewing table data, Data Studio automatically adjusts the column widths for table view. Users can resize the columns as needed. If the text content of a cell exceeds the total available display area, then resizing the cell column may cause DS to become unresponsive.

 **NOTE**

- Individual property window is displayed for each table.
- If the property of a table is modified for the table that is already opened, then refresh and open the properties of the table again to view the updated information on the same opened window.
- If the content of the column has spaces between the words, then word wrapping is applied to fit the column within the display area. Word wrapping is not applied if the content does not have any spaces between the words.
- The size of a column is determined by the column with the maximum content length.
- Any change made to the table properties from Object Browser will be reflected after refreshing () the **Properties** tab.
- Pasting operation is not allowed in **Data Type** column.

----End

4.16.6.11 Grant/Revoke Privilege

Follow the steps below to grant/revoke a privilege:

Step 1 Right-click the selected regular/partitioned table and select **Grant/Revoke**.

The **Grant/Revoke** dialog is displayed.

Step 2 Refer to [Grant/Revoke Privilege - Regular/Partition Table](#) to grant/revoke privilege.

----End

4.16.7 Managing Table Data

4.16.7.1 Exporting Table DDL

Perform the following steps to export the table DDL:

Step 1 In the **Object Browser** pane, right-click the selected table and select **Export DDL**.


The **Data Studio Security Disclaimer** dialog box is displayed.

Step 2 Click **OK**.

The **Save As** dialog box is displayed.

Step 3 In the **Save As** dialog box, select the location to save the DDL and click **Save**. The status bar displays the operation progress.

NOTE

- To cancel the export operation, double-click the status bar to open the **Progress View** tab and click . For details, see [Canceling Table Data Export](#).
- If the file name contains characters that are not supported by Windows, the file name will be different from the schema name.
- The MS Visual C Runtime file (**msvcrt100.dll**) is required for this operation. For details, see [Troubleshooting](#).

The **Data Exported Successfully** dialog box and status bar display the status of the completed operation.

Database Encoding	File Encoding	Support for Exporting DDL
UTF-8	UTF-8	Yes
	GBK	Yes
	LATIN1	Yes
GBK	GBK	Yes
	UTF-8	Yes
	LATIN1	No
LATIN1	LATIN1	Yes
	GBK	No
	UTF-8	Yes

 NOTE

You can select multiple objects and export their DDL. [Batch Export](#) lists the objects whose DDL cannot be exported.

----End

4.16.7.2 Exporting Table DDL and Data

The exported table DDL and data include the following:

- DDL of the table
- Columns and rows of the table

Perform the following steps to export the table DDL and data:

Step 1 In the **Object Browser** pane, right-click the selected table and select **Export DDL and Data**.


The **Data Studio Security Disclaimer** dialog box is displayed.

Step 2 Click **OK**.

The **Save As** dialog box is displayed.

Step 3 In the **Save As** dialog box, select the location to save the DDL and click **Save**. The status bar displays the operation progress.

 NOTE

- To cancel the export operation, double-click the status bar to open the **Progress View** tab and click . For details, see [Canceling Table Data Export](#).
- If the file name contains characters that are not supported by Windows, the file name will be different from the schema name.
- The MS Visual C Runtime file (**msvcrt100.dll**) is required for this operation. For details, see [Troubleshooting](#).

The **Data Exported Successfully** dialog box and status bar display the status of the completed operation.

Database Encoding	File Encoding	Support for Exporting DDL
UTF-8	UTF-8	Yes
	GBK	Yes
	LATIN1	Yes
GBK	GBK	Yes
	UTF-8	Yes
	LATIN1	No
LATIN1	LATIN1	Yes
	GBK	No

Database Encoding	File Encoding	Support for Exporting DDL
	UTF-8	Yes

 **NOTE**

You can select multiple objects from ordinary and partitioned tables to export DDL and data, including columns, rows, indexes, constraints, and partitions. **Batch Export** lists the objects whose DDL and data cannot be exported.

----End

4.16.7.3 Exporting Table Data

Perform the following steps to export table data:

Step 1 Right-click the selected table and select **Export Table Data**.

The **Export Table Data** dialog box is displayed with the following options:

- **Format:** Table data can be exported in Excel (xlsx/xls), CSV, TXT, or binary format. The default format is Excel (xlsx/xls).
- **Include Header:** This option is available for CSV and TXT files. If this option is selected, the exported data will include the column headers. By default, this option is selected when a CSV or TXT file is exported, but it is not mandatory. This option will be disabled for Excel (xlsx/xls) and binary formats.
- **Quotes:** Use this option to define quotes. You can enter only a single-byte character for this option, and the value of **Quotes** should be different from that of **Delimiter**. By default, this option is selected when a CSV or TXT file is exported, but it is not mandatory. This option will be disabled for Excel (xlsx/xls) and binary formats.
 - If table data includes delimiters, the character specified in this option will be used.
 - If the value includes a quote, it will not be escaped by the same quote.
 - If the result contains the values of multiple rows, it will be quoted by quotes.
- **Escape:** Use this option to define escape values. You can enter only a single-byte character for this option, and the value of **Escape** must be different from that of **Quotes**. By default, this option is selected when a CSV or TXT file is exported, but it is not mandatory. This option will be disabled for Excel (xlsx/xls) and binary formats.
- **Replace NULL with:** Use this option to replace the null value in the table with a specified string. This option contains a maximum of 100 characters, and cannot contain newline characters or carriage return characters. The value of this option must be different from the values of **Delimiter** and **Quotes**. By default, this option is selected when a CSV or TXT file is exported, but it is not mandatory. This option will be disabled for Excel (xlsx/xls) and binary formats.
- **Encoding** (optional): This option will be pre-populated with the encoding options made in **Preferences > Session Setting**.

- **Delimiter:** Use this option to define delimiters. You can select the provided delimiters or customize delimiters in **Delimiter > Other**. The default delimiter for CSV and TXT formats is commas (,). The **Other** field can contain a maximum of 10 bytes. By default, this option is selected when a CSV or TXT file is exported, but it is not mandatory. This option will be disabled for Excel (xlsx/xls) and binary formats. It is mandatory when the **Other** field is selected.
- **All Columns:** Use this option to quickly select all columns. This option is selected by default. To manually select columns, deselect this option and select the columns to export from the **Available Columns** list.
 - **Available Columns:** Use this option to select the columns to export.
 - **Selected Columns:** This option displays the selected columns to export. The column sequence can be adjusted. By default, all columns are displayed.

 **NOTE**

[Column/Row Size](#) in [FAQ](#) describes the row and column size supported by xlsx and xls.

- **File Name:** Use this option to specify the name of the exported file. By default, the table name is displayed in this option.

 **NOTE**

The file name follows the Windows file naming convention.

- **Output Path:** Use this option to select the location where the exported file is saved. The **Output Path** field is auto-populated with the selected path.
- **Security Disclaimer:** This option displays the security disclaimer. To continue the export operation, you need to read and agree to the disclaimer.
 - **I Agree:** By default this option is selected. You cannot proceed if this option is deselected.
 - **Do not show again:** You can select this option to hide the **Security Disclaimer** for the subsequent table data export from the current Data Studio instance.

 **NOTE**

- Character, double, date, calendar, and Boolean data types will be stored in the Excel format. All other data types will be converted into strings and stored in the Excel format.
- To export an Excel file, if a cell contains more than 32,767 characters, the data exported to the cell will be truncated.

Step 2 Complete the required fields and click **OK**.

The **Save As** dialog box is displayed.

Step 3 Click **Save** to save the exported data in the selected format. The status bar displays the operation progress.

The **Data Exported Successfully** dialog box and status bar displays the status of the completed operation.

 NOTE

- If the disk is full during table export, Data Studio displays an I/O error. Perform the following operations to rectify this error:
 1. Click **OK** to disable the database connection.
 2. Clean up disk space.
 3. Create the connection again and export the table data.
- If the file name contains characters that are not supported by Windows, the file name will be different from the table name.

----End

Canceling Table Data Export

Perform the following steps to cancel table data export:

Step 1 Double-click the status bar to open the **Progress View** tab.

Step 2 In the **Progress View** tab, click .

Step 3 In the **Cancel Operation** dialog box, click **Yes**.

The **Messages** tab and status bar display the status of the canceled operation.

----End

4.16.7.4 Show DDL

To display a DDL query for a table, perform the following steps:

Step 1 Right-click the table, and then select **Show DDL**.

Data Studio displays the DDL of the selected table.

 NOTE

- A new terminal window is opened each time you select to show DDL.
- The MS Visual C Runtime file (**msvcrt100.dll**) is required for this operation. For details, see [Troubleshooting](#).

Database Encoding	File Encoding	Show DDL
UTF-8	UTF-8	Yes
	GBK	Yes
	LATIN1	Yes
GBK	GBK	Yes
	UTF-8	Yes
	LATIN1	No
LATIN1	LATIN1	Yes
	GBK	No

Database Encoding	File Encoding	Show DDL
	UTF-8	Yes

----End

4.16.7.5 Importing Table Data

Prerequisites:

- If the definition of the source file does not match that of the target table, modify the properties of the target table in the **Import Table Data** dialog box. Additional columns of the target table will be inserted with default values.
- You should know the export properties of the file to import, such as **Delimiter**, **Quotes**, and **Escape**. Export properties saved during data export cannot be changed when a file is being imported.

Perform the following steps to import table data:

Step 1 Right-click the selected table and select **Import Table Data**.

The **Import Table Data** dialog box is displayed with the following options:

- **Import Data File:** This option displays the path of the imported file. Click **Browse** to select other files.
- **Format:** Table data can be imported in CSV, TXT, or binary format. CSV is the default format.
- **Include Header:** Select this option if the imported file contains a column header. By default, this option is selected when a CSV or TXT file is exported, but it is not mandatory. This option will be disabled for the binary format.
- **Quotes:** You can enter only a single-byte character for this option, and the value of **Quotes** should be different from the null value of **Delimiter**. By default, this option is selected when a CSV or TXT file is exported, but it is not mandatory. This option will be disabled for the binary format.
- **Escape:** You can enter only a single-byte character for this option. If the value of **Escape** is the same as that of **Quotes**, the value of **Escape** will be replaced with \0. This option defaults to double quotation marks (") when a CSV or TXT file is exported, but it is not mandatory. This option will be disabled for the binary format.
- **Replace with Null:** You can configure this option to replace the null value in the table with a string. The null string used for exporting data should be used for importing data, and the null string needs to be specified. By default, this option is selected when a CSV or TXT file is exported, but it is not mandatory. This option will be disabled for the binary format.
- **Encoding** (optional): This option will be pre-populated with the encoding options made in **Preferences > Session Setting**.
- **Delimiter:** You can select the provided delimiters or customize delimiters in **Delimiter > Other**. The default delimiter for CSV and TXT formats is commas (.). The value of this option should be different from those of **Quotes** and **Replace with Null**. By default, this option is selected when a CSV or TXT file

is imported, but it is not mandatory. This option will be disabled for the binary format. It is mandatory when the **Other** field is selected.

- **All Columns:** Use this option to quickly select all columns. This option is selected by default. To manually select columns, deselect this option and select the columns to export from the **Available Columns** list.
 - **Available Columns:** Use this option to select the columns to export.
 - **Selected Columns:** This option displays the selected columns to export. The column sequence can be adjusted. By default, all columns are displayed.

Step 2 Click **Browse** next to the **Import Data File** field.

The **Open** dialog box is displayed.

Step 3 In the **Open** dialog box, select the file to import and click **Open**.

Step 4 Complete the required fields and click **OK**.

The status bar displays the operation progress. The imported data will be added to the existing table data.

The **Data Imported Successfully** dialog box and status bar display the status of the completed operation.

----End

Canceling Table Data Import

Perform the following steps to cancel table data import:

Step 1 Double-click the status bar to open the **Progress View** tab.

Step 2 In the **Progress View** tab, click .

Step 3 In the **Cancel Operation** dialog box, click **Yes**.

The **Messages** tab and status bar display the status of the canceled operation.

----End


4.16.7.6 Viewing Table Data



Follow the steps to view table data:

Step 1 Right-click the selected table and select **View Table Data**.



The **View Table Data** tab is displayed where you can view the table data information.

Toolbar menu in the **View Table Data** window:

Toolbar Name	Toolbar Icon	Description
Copy		Click the icon to copy selected content from View Table Data window to clipboard. The shortcut key is Ctrl+C .

Toolbar Name	Toolbar Icon	Description
Advanced Copy		Click the icon to copy content from result window to the clipboard. Results can be copied to include the row number and/or column header. Refer to Query Results to set this preference. The shortcut key is Ctrl+Shift+C .
Show/Hide Search Bar		Click the icon to display/hide the search text field. This is a toggle button.
Encoding	-	Refer to Executing SQL Queries for information on encoding selection.

Icons in Search field:

Icon Name	Toolbar Icon	Description
Search		Click the icon to search the table data displayed based on the criteria defined. The text is case-insensitive.
Clear Search Text		Click the icon to clear the search texts entered in the search field.


Refer to [Executing SQL Queries](#) for column reordering and sorting options.

- **Query Submit Time:** Provides the query submitted time.
- The number of rows obtained and the execution time are displayed, as well as the default number of rows. If there are additional rows to be fetched, then it will be denoted with the word "more". You can scroll to the bottom of the table to obtain and display all rows.

NOTICE

- When you view table data, Data Studio automatically adjusts the column widths for an optimal table view. Users can resize the columns as needed. If the text content of a cell exceeds the total available display area, then resizing the cell column may cause DS to become unresponsive.
- A maximum of 1000 characters can be displayed in a cell of the table. The excess characters are displayed as ellipsis (...).
 - If the user copies the data from a cell in a table or the **Result** tab and pastes it on any editor (such as SQL terminal/PLSQL source editor, notepad or any other external editor application), the entire data is pasted.
 - If the user copies the data from a cell in a table or the **Result** tab and pastes it on an editable cell (same or different), the cell shows only the first 1000 characters with "..." in the end.
 - When the table/**Result** tab data is exported, the exported file contains the whole data.

 **NOTE**

- Individual table data window is displayed for each table.
- If the data of the table that is already opened is modified, then refresh and open the table data again to view the updated information on the same opened window.
- While the data is loading a message displays at the bottom stating "fetching".
- If the text of a column contains spaces, word wrapping is applied to fit the column width. Word wrapping is not applied to columns without space.
- To copy part of a cell, select the desired part and press **Ctrl+C** or click .
- The column size depends on the column with the longest text.
- You can save preference to define:
 - Number of records to be obtained
 - Column width
 - Copy option from result setFor details, see [Query Results](#).

----End

4.16.7.7 Editing Table Data

Follow the steps below to edit table data:

Step 1 Right-click the selected table and select **Edit Table Data**.

The **Edit Table** data tab is displayed.

Refer to [Viewing Table Data](#) for description on copy and search toolbar options.

----End

Data Studio validates only the following data types entered into cells:

Bigint, bit, boolean, char, date, decimal, double, float, integer, numeric, real, smallint, time, time with time zone, time stamp, time stamp with time zone, tinyint, and varchar. Editing of array type data type is not supported.



Any related errors during this operation reported by database will be displayed in Data Studio. Time with time zone and timestamp with time zone columns are non-editable columns.

You can perform the following operations in the **Edit Table Data** tab:

- [Insert](#)
- [Delete](#)
- [Update](#)
- [Copy](#)
- [Pastes content](#)

Insert

Follow the steps to insert a row:

- Step 1** Click  to insert a row.
- Step 2** Double-click the cell to modify and enter the required details in the row.
- Step 3** Click  to save changes.


The **Edit Table Data** tab status bar shows the **Query Submit Time**, **Number of Rows Fetched**, **Execution Time** and **Status** of the operation.

NOTICE

Data Studio updates rows identified by the unique key. If a unique key is not identified for a table and there are identical rows, then an update operation made on one of the rows will affect all identical rows. Refresh the **Edit Table Data** tab to view the updated rows.

NOTE

- Changes to cells in a row that are not saved are highlighted in green. Once saved the color resets to default color.
- Unsaved records are highlighted in red. The number of successful and failed records are displayed in the status bar of the **Edit Table Data** tab.
- Clicking **Save** either saves all the valid changes or does not save anything if there are invalid changes. Refer to [Editing Table Data](#) to set the behavior of save operation.

- Step 4** Click  to roll back the changes that are not saved.
- Step 5** Set the preference to define:
- Number of records to be obtained
 - Column width
 - Copy option from result set

For details, see [Query Results](#).

----End

Data Studio allows you to edit the distribution key column only for a new row.

Delete

Follow the steps to delete a row:

Step 1 Click the row header of the row to be deleted.

Step 2 Click  to delete a row.

Step 3 Click  to save changes. The **Define Unique Key** dialog box is displayed.


Step 4 Click the required option:

- **Use All Columns**
Click **Use All Columns** to define all columns as unique key.
- **Custom Unique Key**
 - a. Click **Custom Unique Key** to define selected columns as unique key.
 - b. The **Define Unique Key** dialog box is displayed.
 - c. Select the required columns and click **OK**.
- **Cancel**

Click **Cancel** to modify the information in **Edit Table Data** tab.


The **Edit Table Data** tab status bar shows the **Query Submit Time**, **Number of Rows Fetched**, **Execution Time** and **Status** of the operation.

Select **Remember the selection for this window** option to hide the unique definition window from displaying while continuing with the edit table data

operation. Click  from Edit Table Data toolbar to clear previously selected unique key definition and display unique definition wind

NOTE

- Changes to cells in a row that are not saved are highlighted in green. Once saved the color resets to default color.
- Unsaved records are highlighted in red. The number of successful and failed records are displayed in the status bar of the [Edit Table Data](#) tab.
- Clicking **Save** either saves all the valid changes or does not save anything if there are invalid changes. For details, see [Editing Table Data](#).

Step 5 Click  to roll back the changes that are not saved.


Step 6 Refresh the table data to view deleted duplicate rows.

----End

Update

Follow the steps to update cell data:

Step 1 Double-click the cell to update the contents of the cell.

Step 2 Click  to save changes.

The **Define Unique Key** dialog box is displayed.

Step 3 Click the required option:

- **Use All Columns**

Click **Use All Columns** to define all columns as unique key.

- **Custom Unique Key**

a. Click **Custom Unique Key** to define selected columns as unique key.

b. The **Define Unique Key** dialog box is displayed.


c. Select the required columns and click **OK**.

- **Cancel**

Click **Cancel** to modify the information in **Edit Table Data** tab.


The status bar shows the **Execution Time** and **Status** of the operation.

Select **Remember the selection for this window** option to hide the unique definition window from displaying while continuing with the edit table data

operation. Click  from Edit Table Data toolbar to clear previously selected unique key definition and display unique definition wind

NOTE

- Changes to cells in a row that are not saved are highlighted in green. Once saved the color resets to default color.
- Unsaved records are highlighted in red. The number of successful and failed records are displayed in the status bar of the **Edit Table Data** tab.
- Clicking **Save** either saves all the valid changes or does not save anything if there are invalid changes. For details, see [Editing Table Data](#).

Step 4 Click  to roll back the changes that are not saved.

Step 5 Refresh the table data to view deleted duplicate rows.



----End

During the edit operation, Data Studio does not allow you to edit the distribution key column as it is used by the DB to locate data in the database cluster.

Copy


You can copy data from the **Edit Table Data** tab.

Follow the steps to copy data:

Step 1 Select the cell(s) and click  (Copy) or  (Advanced Copy).

For more information about the differences between **Copy** and **Advanced Copy**, see [Executing SQL Queries](#).

 NOTE


- Data can be copied to include the row number and/or column header. Refer to [Query Results](#) to set this preference.
- To copy part of a cell, select the desired part and press **Ctrl+C** or click .

----End

Pastes content

You can copy data from a CSV file and paste it into cells in the **Edit Table Data** tab to insert and update records. If you paste onto existing cell data, the data is overwritten with the new data from the CSV file. Follow the steps to paste data into a cell:

Step 1 Copy data from the CSV file.

Step 2 Select the cell(s) and click .

Step 3 Click  to save changes. The **Define Unique Key** dialog box is displayed.


Step 4 Click the required option:

- **Use All Columns**
Click **Use All Columns** to define all columns as unique key.
- **Custom Unique Key**
 - a. Click **Custom Unique Key** to define selected columns as unique key.
 - b. The **Define Unique Key** dialog box is displayed.
 - c. Select the required columns and click **OK**.
- **Cancel**


Click **Cancel** to modify the information in **Edit Table Data** tab.

The status bar shows the **Execution Time** and **Status** of the operation.

Select **Remember the selection for this window** option to hide the unique definition window from displaying while continuing with the edit table data

operation. Click  from Edit Table Data toolbar to clear previously selected unique key definition and display unique definition wind

 NOTE

- The number of copied cells from CSV must match the number of cells selected in the **Edit Table Data** tab to paste the data.
- Click  to roll back the changes that are not saved.
- Changes to cells in a row that are not saved are highlighted in green. Once saved the color resets to default color.
- Unsaved records are highlighted in red. The number of successful and failed records are displayed in the status bar of the **Edit Table Data** tab.
- Clicking **Save** either saves all the valid changes or does not save anything if there are invalid changes. For details, see [Editing Table Data](#).

----End

During the pasting operation, Data Studio does not allow you to edit the distribution key column as it is used by the DB to locate data in the database cluster.

NOTE

Empty cells are shown as [NULL]. Empty cell in **Edit Table Data** tab can be searched using the **Null Values** search drop-down.

Refer to [Executing SQL Queries](#) for information on show/hide search bar, sort, column reorder, and encoding options..

4.16.8 Editing Temporary Tables

Data Studio allows you to edit temporary tables. Temporary tables are deleted automatically when you close the connection that was used to create the table.

NOTICE

Ensure that connection reuse is enabled when you use the SQL Terminal to edit temporary tables. Refer to [Managing SQL Terminal Connections](#) for information about enabling SQL Terminal Connection reuse.

Follow the steps to edit a temporary table:

Step 1 Execute a query on the temporary table.

The **Result** tab displays the results of the SQL query along with the query statement executed.

Step 2 Edit the temporary table from the **Result** tab. Refer to the [Executing SQL Queries](#) for information on editing the resultset.

----End

4.17 Sequences

4.17.1 Creating Sequence

Follow the steps below to create a sequence:

Step 1 In the **Object Browser** pane, right-click **Sequences** under the particular schema where you want to create the sequence and select **Create Sequence**.

The **Create New Sequence** dialog box is displayed.

Step 2 Provide information to create a sequence:

1. Enter a name in the **Sequence Name** field.

NOTE

Select the **Case** check box to retain the capitalization of the text entered in **Sequence Name** field. For example, if the sequence name entered is "Employee", then the sequence name is created as "Employee".

2. Enter the minimum value in the **Minimum Value** field.
3. Enter the increase step value in the **Increment By** field.
4. Enter maximum value in the **Maximum Value** field.

 **NOTE**

The minimum and maximum value should be between -9223372036854775808 and 9223372036854775807.

5. Enter the start value of the sequence in **Start Value** field.
6. Enter the cache information in **Cache** field. The cache value denotes the number of sequences stored in the memory for quick access.
7. Select the **Cycle** field to recycle sequences after the number of sequences reaches either the maximum or minimum value.

 **NOTE**

The schema name auto-populates in the **Schema** field.

8. Select the table from the **Table** drop-down list.
9. Select the column from the **Column** drop-down list.

Step 3 Click **Finish**.

The status bar displays the status of the completed operation.

 **NOTE**

In the **SQL Preview** tab, you can view the SQL query automatically generated for the inputs provided.

----End

4.17.2 Grant/Revoke Privilege

Follow the steps below to grant/revoke a privilege:

Step 1 Right-click the sequences group and select **Grant/Revoke**.

The **Grant/Revoke** dialog is displayed.

Step 2 Select the objects to grant/revoke privilege from the **Object Selection** tab and click **Next**.

Step 3 Select the role from **Role** drop-down list in the **Privilege Selection** tab.

Step 4 Select **Grant/Revoke** in the **Privilege Selection** tab.

Step 5 Select/unselect the required privileges in the **Privilege Selection** tab.

In the **SQL Preview** tab, you can view the SQL query automatically generated for the inputs provided.

Step 6 Click **Finish**.

----End

4.17.3 Working with Sequences

You can perform the following operations on an existing sequence:

- [Granting/Revoking a Privilege](#)
- [Dropping a Sequence](#)
- [Dropping a Sequence Cascade](#)

Dropping a Sequence

Individual or batch dropping can be performed on sequences. Refer to [Batch Dropping Objects](#) section for batch drop.

Follow the steps to dropping a sequence:

Step 1 Right-click the selected sequence and select **Drop Sequence**.

The **Drop Sequence** dialog box is displayed.

Step 2 Click **Yes** to drop the sequence.

The status bar displays the status of the completed operation.

----End

Dropping a Sequence Cascade

Follow the steps to drop a sequence cascade:

Step 1 Right-click the selected sequence and select **Drop Sequence Cascade**.

The **Drop Sequence Cascade** dialog box is displayed.

Step 2 Click **Yes** to drop the sequence cascade.

The status bar displays the status of the completed operation.

----End

NOTE

This is only available for OLAP, not for OLTP.

Granting/Revoking a Privilege

Follow the steps to grant/revoke a privilege:

Step 1 Right-click selected sequence and select **Grant/Revoke**.

The **Grant/Revoke** dialog is displayed.

Step 2 Refer to [Grant/Revoke Privilege](#) to grant/revoke a privilege.

----End

4.18 Views


4.18.1 Creating a View

Follow the steps below to create a new view:

Step 1 Right-click the **Views** and select **Create View**.

The DDL template for the view is displayed in the SQL Terminal tab.

Step 2 Edit the DDL as required.

Step 3 Click  to execute the DDL.

Step 4 Press **F5** to refresh the **Object Browser**.

You can view the new view in the **Object Browser**.

 **NOTE**

The status bar will not display message on completion of this operation.

----End

4.18.2 Granting/Revoking a Privilege

Follow the steps below to grant/revoke a privilege:

Step 1 Right-click the views group and select **Grant/Revoke**.

The **Grant/Revoke** dialog box is displayed.

Step 2 Select the objects to grant/revoke a privilege from the **Object Selection** tab and click **Next**.

Step 3 Select the role from the **Role** drop-down list in the **Privilege Selection** tab.

Step 4 Select **Grant/Revoke** in the **Privilege Selection** tab.

Step 5 Select/unselect the required privileges in the **Privilege Selection** tab.

In the **SQL Preview** tab, you can view the SQL query automatically generated for the inputs provided.

Step 6 Click **Finish**.

----End

4.18.3 Working with Views

Views can be created to restrict access to specific rows or columns of a table. A view can be created from one or more tables and is determined by the query used to create the view.

You can perform the following operations on an existing view:

- [Exporting the View DDL](#)
- [Dropping a View](#)
- [Dropping a View Cascade](#)
- [Renaming a View](#)
- [Setting the Schema for a View](#)
- [Viewing the Show DDL](#)
- [Setting the Default Value for the View Column](#)

- [Viewing the Properties of a View](#)
- [Granting/Revoking a Privilege](#)

Exporting the View DDL

Follow the steps below to export view the DDL:

Step 1 Right-click the selected view and select **Export DDL**.


The **Data Studio Security Disclaimer** dialog box is displayed.

Step 2 Click **OK**.

The **Save As** dialog box is displayed.

Step 3 In the **Save As** dialog box, select the location to save the DDL and click **Save**. The status bar displays the progress of the operation.

NOTE

- To cancel the export operation, double-click the status to open the **Progress View** tab and click .
- The exported file name will not be the same as the view name, if the view name contains characters which are not supported by Windows.
- Multiple objects can be selected to export the view DDL. Refer to [Batch Export](#) for the list of the objects that are not supported for exporting view DDL.

The **Export** message and status bar display the status of the completed operation.

Database Encoding	File Encoding	Supports Exporting DDL
UTF-8	UTF-8	Yes
	GBK	Yes
	LATIN1	Yes
GBK	GBK	Yes
	UTF-8	Yes
	LATIN1	No
LATIN1	LATIN1	Yes
	GBK	No
	UTF-8	Yes

----End

Dropping a View

Individual or batch dropping can be performed on views. Refer to [Batch Dropping Objects](#) for batch dropping.

Follow the steps below to drop the view:

Step 1 Right-click the selected view and select **Drop View**.

The **Drop View** dialog box is displayed.

Step 2 Click **Yes** to drop the view.

The status bar displays the status of the completed operation.

----End

Dropping a View Cascade

Follow the steps below to drop a view and its dependent database objects:

Step 1 Right-click the selected view and select **Drop View Cascade**.

The **Drop View** dialog box is displayed.

Step 2 Click **Yes** to drop the view and its dependent database objects.

The status bar displays the status of the completed operation.

----End

Renaming a View

Follow the steps below to rename a view:

Step 1 Right-click the selected view and select **Rename View**.

The **Rename View** dialog box is displayed.

Step 2 Enter the required name for the view and click **OK**. You can view the renamed view in the **Object Browser**.

The status bar displays the status of the completed operation.

----End

Setting the Schema for a View

Follow the steps below to set the schema for a view:

Step 1 Right-click the selected view and select **Set Schema**.

The **Set Schema** dialog box is displayed.

Step 2 Select the required schema from the drop-down list and click **OK**.

The status bar displays the status of the completed operation.

If the required schema contains a view with the same name as the current view, then Data Studio does not allow setting the schema for the view.

----End

Viewing the DDL

Follow the steps below to view the DDL of the view:

Step 1 Right-click the selected view and select **Show DDL**.

The DDL is displayed in a new **SQL Terminal** tab. You must refresh the **Object Browser** to view the latest DDL.

----End

Setting the Default Value for the View Column

Follow the steps below to set the default value for a column in the view:

Step 1 Right-click the selected column name under the view and select **Set View Column Default Value**.

A dialog box with the current default value (if it is set) is displayed which prompts you to provide the default value.

Step 2 Enter the value and click **OK**.

Data Studio displays the status of the operation in the status bar.

----End

Viewing the Properties of a View

Follow the steps below to view the properties of the View:

Step 1 Right-click the selected View and select **Properties**.

The properties (General and Columns) of the selected View is displayed in different tabs.

NOTE

If the property of a View is modified that is already opened, then refresh and open the properties of the View again to view the updated information on the same opened window.

----End

Granting/Revoking a Privilege

Follow the steps below to grant/revoke a privilege:

Step 1 Right-click the selected view and select **Grant/Revoke**.

The **Grant/Revoke** dialog box is displayed.

Step 2 Refer to [Granting/Revoking a Privilege](#) to grant/revoke privilege.


----End

4.19 SQL Terminal

4.19.1 Opening Multiple SQL Terminal Tabs

You can open multiple **SQL Terminal** tabs in Data Studio to execute multiple SQL statements for query in the current **SQL Terminal** tab. Perform the following steps to open a new **SQL Terminal** tab:

You can also open multiple **SQL Terminal** tabs on different connection templates.

Step 1 In the **Object Browser** pane, right-click the desired database and choose **Open Terminal** from the shortcut menu. Alternatively, click  in the toolbar or press **Ctrl+T** to open a new SQL terminal.

The **SQL Terminal** tab is displayed.

----End


NOTE

- In Data Studio, a maximum of 100 **SQL Terminal** tabs can be opened for each connected database. Based on the number of query times, each **SQL Terminal** tab contains multiple **Result** tabs and one **Message** tab. If the database connection is lost, the corresponding **SQL Terminal** tab is still available.
- The restoration operation applies to all minimized **SQL Terminal** tabs. You cannot restore a single tab.
- After all terminals are shut down, Data Studio resets the counter of the SQL terminal.
- After all **Result Set** tabs are closed, Data Studio resets the counter of the result set.
- Data Studio allows you to reset counters in the following pages: **Display DDL User/Role**, **Batch Delete**, **Result Set**, and **Execution Plan**.

Data Studio displays an error message indicating that no result is found in the status bar. The **Result** tab displays the successful execution results.

Perform the following steps to open a new **SQL Terminal** tab in another connection:

Step 1 Select the required connection from the connection list in the toolbar.

Step 2 In the **Object Browser** pane, right-click the desired connected database and choose **Open Terminal**, or click  in the toolbar. The **SQL Terminal** tab is displayed.

The name format of the new **SQL Terminal** tab is as follows:

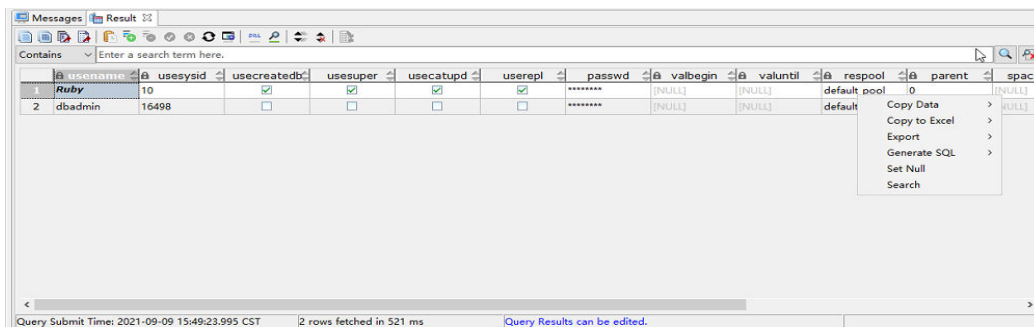
Database name@Connection information(Tab number), for example, *postgres@IDG_1(2)*. The number of each **SQL Terminal** tab in the same connection information is unique.

----End

Right-Click Menus in the Result Tab

You can copy or export cell data to an Excel file and generate a SQL query file.

After the SQL query result is displayed in the **Result** tab, right-click the result. The following menu is displayed:



Perform the following steps to add a row number and column header to the result set:

- Step 1** On the menu bar of Data Studio, click **Settings**.
- Step 2** Choose **Preferences**.
- Step 3** Expand the **Result Management** tab and choose **Query Results**.
- Step 4** In the **Result Advanced Copy** area, select **Include column header** and **Include row number**.

----End

The following table describes the right-click options.

Table 4-19 Right-click options

Option	Sub-Item	Description
Copy Data	Copy	Copies data in the selected cell.
	Advanced Copy	Copies data in the selected cell, row number, and column header based on the preference settings.
Copy to Excel	Copy as xls	Exports data of selected cells to an xls file, which contains a maximum of 64,000 rows and 256 columns.
	Copy asxlsx	Exports data of selected cells to an xlsx file, which contains a maximum of 1 million rows.
Export	Current Page	Exports the table data on the current page.
	All Pages	Exports all tables.

Option	Sub-Item	Description
Generate SQL	Selected Line	Selects data from the target table of the statement for inserting data to generate a SQL file.
	Current Page	Selects data of the current page from the target table of the statement for inserting data to generate a SQL file.
	All Pages	Selects all table data from the target table of the statement for inserting data to generate a SQL file.
Set Null	-	Sets the cell data to null .
Search	-	Searches for data in the selected cell and displays all data that meets the search criteria.

 **NOTE**

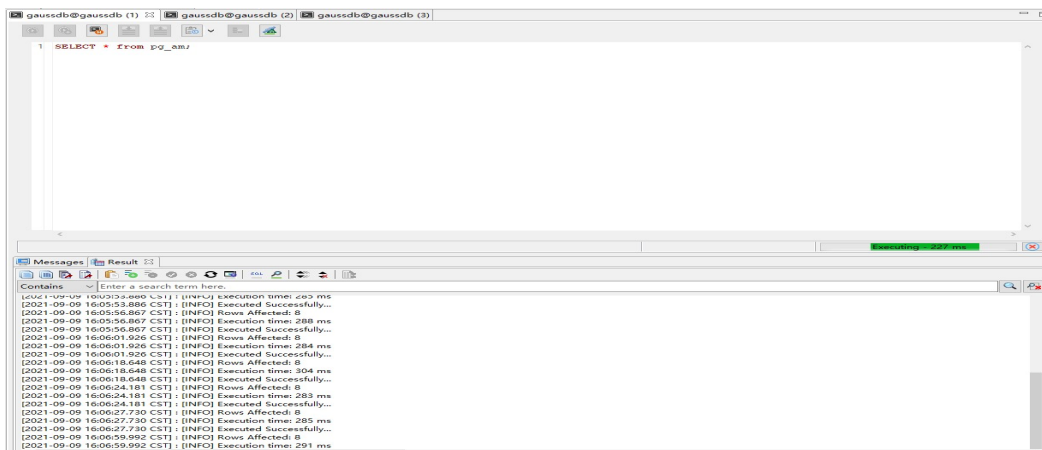
The preceding SQL files do not take effect for the result sets generated by queries that use **JOIN**, expressions, views, **SET** operators, aggregate functions, **GROUP BY** clauses, or column aliases.

Displaying Execution Progress Bar

When a query is executed in the **SQL Terminal** pane, a progress bar is displayed to dynamically display the execution duration. After the query is complete, the time bar disappears. The total execution duration is displayed next to the time bar.

If you want to cancel the query, click **Cancel** next to the time bar.

The procedure is shown in the following figure.



NOTE

- The **Cancel** button is deleted from the toolbar.
- The progress bar is also displayed when you compile or debug an object in the PL/SQL editor.
- The time format displayed in the progress bar is *w* hour *x* minute *y* second *z* millisecond.
- When queries are performed in batches in **SQL Terminal**, the progress bar displays the total time consumed by the queries.

4.19.2 Managing the History of Executed SQL Queries

Data Studio allows viewing and managing frequently executed SQL queries. The history of executed SQL queries is saved only in **SQL Terminal**.

Perform the following steps to view the history of executed SQL queries:

Step 1 Click  in **SQL Terminal**.

The **SQL History** dialog box is displayed.

----End

NOTE

The scripts of historical SQL queries are not encrypted.

The number of queries displayed in the **SQL History** dialog box depends on the value set in **Preferences > Editor > SQL History**. For details about setting the value, see [SQL History](#). Data Studio overwrites the older queries into the SQL history after the list is full. The executed queries are automatically stored in the list.

The **SQL History** dialog box contains the following columns:

- **Pin Status**: displays whether a query remains on the top. Pinned queries remain on the top and will not be deleted from the history even when the list is full.
- **SQL Statement**: displays the SQL query. The maximum number of characters for a SQL query displayed in the **SQL Statement** column depends on the

value set in **Preferences > Editor > SQL History**. For details about modifying the value, see [SQL History](#).

- **Number of Records:** displays the number of records obtained by the SQL query
- **Start Time:** displays the time when the query was executed
- **Execution Time:** displays the duration of the query execution
- **Database Name:** displays the name of the database
- **Execution Status:** displays the status of the executed query, which can be **Success** or **Failure**

The connection information is deleted together with the query history. If the **SQL History** dialog box is closed, the query is not removed from the list.

You can perform the following operations in the **SQL History** dialog box:

- [Loading a SQL Query into the SQL Terminal Pane](#)
- [Loading Multiple SQL Queries into the SQL Terminal Pane](#)
- [Deleting a SQL Query](#)
- [Deleting All SQL Queries](#)
- [Pinning a SQL Query](#)
- [Unpinning a SQL Query](#)

Loading a SQL Query into the SQL Terminal Pane

Perform the following steps to load a SQL query into the **SQL Terminal** pane:

Step 1 Select the required query and click .

The query is added to the cursor position in **SQL Terminal**.

----End

Loading Multiple SQL Queries into the SQL Terminal Pane

You can click the **Load in SQL Terminal and close History** button to load selected queries into **SQL Terminal** and close the **SQL History** dialog box.

Perform the following steps to load multiple selected SQL queries into the **SQL Terminal** pane:

Step 1 Select the required queries.

Step 2 Click .

The queries are added to the cursor position in **SQL Terminal**.

----End


 **NOTE**

If you continue the execution upon an error, each statement in **SQL Terminal** will be executed in sequence as a scheduled job. The execution status is updated in the console and each job is listed in the progress bar. When the time difference between **Job Execution**, **Progress Bar Update** and **Console Update** is small, you will not be able to stop the execution by opening the progress bar. In this case, you need to close **SQL Terminal** to stop the execution.

Loading More Records

To load more data in the **Result** tab, you need to scroll down to bottom, which is inconvenient in some scenarios. Data Studio provides a button that simplifies the loading operation.

Perform the following steps to load more records:

Step 1 Select the required queries and click .

All the required records are listed.

----End

Deleting a SQL Query

Perform the following steps to delete a SQL query from the **SQL History** list:

Step 1 Select the required query and click .

A confirmation dialog box is displayed.

Step 2 Click **OK**.

----End

Deleting All SQL Queries

Perform the following steps to delete all SQL queries from the **SQL History** list:

Step 1 Click .

A confirmation dialog box is displayed.

Step 2 Click **OK**.

----End

Pinning a SQL Query

You can pin queries that you do not want Data Studio to delete automatically from **SQL History**. You can pin a maximum of 50 queries. Pinned queries are displayed at the top of the list. The value set in **SQL History** does not affect the pinned queries. For details, see [SQL History](#).

 **NOTE**

The pinned queries are displayed at the top of the list once the **SQL History** pane is closed and opened again.

Perform the following steps to pin a SQL query:

Step 1 Select the required SQL query and click .

The **Pin Status** column displays the pinned status of the query.

----End

Unpinning a SQL Query

Perform the following steps to unpin a SQL query:

Step 1 Select the required SQL query and click .

The **Pin Status** column displays the unpinned status of the query.

----End

4.19.3 Opening and Saving SQL Scripts

Opening an SQL Script

Follow the steps to open an SQL script:

Step 1 Choose **File > Open** from the main menu. Alternatively, click **Open** on the toolbar or right-click the **SQL Terminal** and select **Open**.

If the SQL Terminal has existing content, then there will be an option to overwrite the existing content or append content to it.

Step 2 The **Open** dialog box is displayed.

Step 3 In **Open** dialog box, select the SQL file to import and click **Open**.

The selected SQL script is opened as a **File Terminal**.

The icons on the file terminal tab is different from those in the SQL terminal. When you move the mouse cursor over the source file, corresponding database connection will be displayed on File Terminal.

----End

 **NOTE**

- The encoding type of the SQL file must match the encoding type specified in [preferences](#).
- Label of the file terminal will start with asterisk(*) if any of its content is edited. Dirty flag is removed once the file terminal is saved.
- File Terminals cannot be renamed. One terminal is always mapped to one Source Script File, but one script can be opened in multiple terminals.
- You can open SQL scripts only on SQL Terminals.

Data Studio allows you to save and open SQL scripts in the **SQL Terminal**. After saving the changes, SQL Terminal will be changed to a File Terminal.

Saving an SQL Script

The **Save** option saves the File Terminal content to the associated file. ,

Follow the steps to save an SQL script:

Step 1 Perform any of the following operations:

- Choose **File > Save** from the main menu.
- Press "Ctrl + S" to save the SQL terminal content.
- Click **Save** on the toolbar or right-click the **SQL Terminal** and select **Save**.

The **Data Studio Security Disclaimer** dialog box is displayed.

Step 2 Click **OK**.

Data Studio displays the status of the operation in the status bar.

NOTE

- The script is saved as an SQL file. Data Studio sets the read/write permission for the saved SQL file. To ensure security, you must set the read/write permissions for folders.
- When a change is made in a file and if that associated file is unavailable, it will trigger the **Save As** option.
 - In any case, if saving of the source file is failed due to some reasons, then user is prompted with the **Save As** option to save the content as a new source file. If you choose not to save (that is cancelling **Save As**), then File Terminal gets converted into an SQL Terminal.
 - The changes made to File Terminals are not Auto Saved.

----End

Saving an SQL Script in New File

The **Save As** option saves the terminal content to a new file.

Follow the steps to save an SQL script:

Step 1 Perform any of the following operations:

- Choose **File > Save As** from the main menu.
- Alternatively click "Ctrl + Alt + S" key to save SQL terminal or File terminal content in new file.

The **Data Studio Security Disclaimer** dialog box is displayed.

Step 2 Click **OK**.

The **Save As** dialog box is displayed.

Step 3 Select the location to save the script and click **Save**.

----End

NOTE

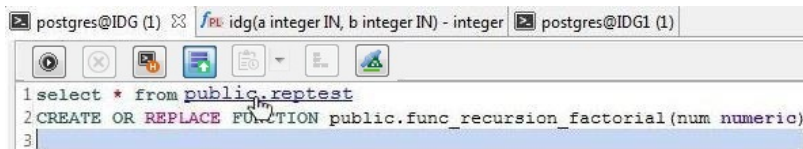
When there are unsaved changes in File Terminals, user will be given an option to save or cancel on graceful exit of data studio.

4.19.4 Viewing Object Properties in the SQL Terminal

Data Studio allows you to view table properties and functions/procedures.

Follow the steps to view table properties:

Step 1 Press **Ctrl** and point to the table name.



```
postgres@IDG (1) x f PL idg(a integer IN, b integer IN) - integer postgres@IDG1 (1)
1 select * from public.reptest
2 CREATE OR REPLACE FUNCTION public.func_recursion_factorial(num numeric)
3
```

Step 2 Click the highlighted table name. The properties of the selected table are displayed.

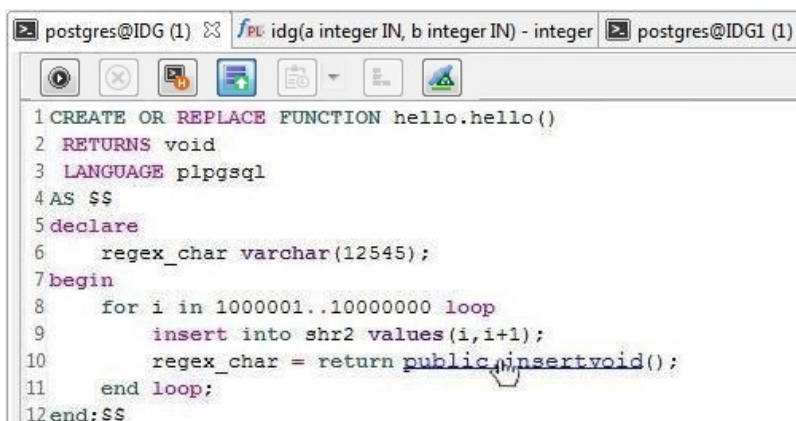
NOTE

The table properties are read-only.

----End

Follow the steps to view functions/procedures:

Step 1 Press **Ctrl** and point to the function/procedure name.



```
postgres@IDG (1) x f PL idg(a integer IN, b integer IN) - integer postgres@IDG1 (1)
1 CREATE OR REPLACE FUNCTION hello.hello()
2 RETURNS void
3 LANGUAGE plpgsql
4 AS $$
5 declare
6     regex_char varchar(12545);
7 begin
8     for i in 1000001..10000000 loop
9         insert into shr2 values (i,i+1);
10        regex_char = return public.insertvoid();
11    end loop;
12end;$$
```

Step 2 Click the highlighted function/procedure name. The function/procedure is displayed in a new **PL/SQL Viewer** tab.

----End

Follow the steps to view the properties of a view:

Step 1 Press **Ctrl** and point to the view name.

Step 2 Click the highlighted view name. The properties of the selected view are displayed.

----End

Saving a Terminal Content Before Exiting Data Studio

Data Studio allows you to save the unsaved content of the terminal before exiting the application.

Follow the steps to save the content of the terminal:

Step 1 Click on the close button of the application. **Exit Application** dialog box will appear.

Step 2 Click **Graceful Exit**.

1. The **Saving File Terminal** dialog box appears. Unsaved dirty file terminal is displayed.

Step 3 Select the terminal to save.

Step 4 Click **OK**.

----End

 **NOTE**

The **Saving File Terminal** dialog box will not appear in case of force exit.

4.19.5 Canceling the Execution of SQL Queries

Data Studio allows you to cancel the execution of an SQL query being executed in the **SQL Terminal**.

Follow the steps to cancel execution of an SQL query:

Step 1 Execute the SQL query in the **SQL Terminal**.

Step 2 Click  in the **SQL Terminal** or press **Shift+Esc**.

Alternatively, you can choose **Run > Cancel** from the main menu or right-click **SQL Terminal** and select **Cancel**, or select **Cancel** from **Progress View** tab.

----End

When you cancel the query, the execution stops at the currently executing SQL statement.

Database changes made by the canceled query are rolled back and the queries following the canceled query are not executed.

A query cannot be canceled and the **Result** tab shows the result when:

1. The server has finished execution of the query and is preparing the result.
2. The result of the executed query is being transferred from the server to the Data Studio client.

A query cannot be canceled while viewing the query **Execution Plan**. For more details, refer to [Viewing the Execution Plan and Costs](#).

The **Messages** tab shows the query cancelation message.

 **NOTE**

The **Cancel** button is enabled only during query execution.


4.19.6 Formatting of SQL Queries

Data Studio supports formatting and highlighting of SQL queries and PL/SQL statements.

PL/SQL Formatting

Follow the steps to format PL/SQL statements:

Step 1 Select the PL/SQL statements to be formatted.

Step 2 Click  on the toolbar to format the query.

Alternatively, use the key combination **Ctrl+Shift+F** or choose **Edit > Format** from the main menu.

The PL/SQL statements are formatted.

----End

SQL Formatting

Data Studio supports formatting of simple SQL SELECT, INSERT, UPDATE, DELETE statements which are syntactically correct. The following are some of the statements for which formatting is supported:

1. The SELECT statement must be made of the following clauses:

- Target list
- FROM clause (including JOIN)
- Where
- Group by
- Having
- Order by
- Common table expression

SELECT statement without SET operations like UNION, UNION ALL, MINUS, INTERSECT and so on

SELECT statements without sub-queries

2. The INSERT statement is made of the following clauses only:

- Insert Into Table name
- Values
- Values Column List
- RETURNING

3. The UPDATE statement is made of the following clauses only:

- Update Table name
- SET
- FROM clause (including JOIN)
- Where
- RETURNING


4. The DELETE statement is made of the following clauses only:

- Delete From Table name
- USING clause (including JOIN)
- Where

- RETURNING

Follow the steps below to format SQL queries:

Step 1 Select the SQL query statements to be formatted.

Step 2 Click  on the toolbar to format the query.

Alternatively, use the key combination **Ctrl+Shift+F** or choose **Edit > Format** from the main menu.

The query is formatted.

The following table describes the query formatting rules.

Table 4-20 Query formatting rules

State ment	Clause	Formatting Rule
SELEC T	SELECT list	Line break before first column
		Indent column list
	FROM	Line break before FROM
		Line break after FROM
		Indent FROM list
		Stack FROM list
	Line break before JOIN	Line break after JOIN
		Line break after JOIN
		Line break before ON
		Line break after ON
		Indent table after JOIN
		Indent ON condition
	WHERE	Line break before WHERE
		Line break after WHERE
		Place WHERE condition on single line
		Place WHERE condition on single line
	GROUP BY	Line break before GROUP
		Line break before GROUP BY expression
		Indent column list
		Stack column list
	HAVING	Line break before HAVING

State ment	Clause	Formatting Rule	
		Line break after HAVING	
		Indent HAVING condition	
	ORDER BY	Line break before ORDER	
		Line break after BY	
		Indent column list	
		Stack column list	
	CTE	Indent subquery braces	
		Each CTE in a new line	
	INSER T	INSERT INFO	Line break before opening brace
			Line break after opening brace
Line break before closing brace			
Indent column list brace			
Indent column list			
Line break before VALUES			
Stack column list			
Line break before VALUES			
Line break before opening brace			
Line break after opening brace			
Line break before closing brace			
Indent VALUES expressions list braces			
Indent VALUES expressions list			
Stack VALUES expressions list			
DEFAULT		Line break before DEFAULT	
		Indent DEFAULT keyword	
CTE		Each CTE in a new line	
RETURNING		Line break before RETURNING	
		Line break after RETURNING	
		Indent RETURNING column list	
	Place RETURNING column List on single line		

State ment	Clause	Formatting Rule
UPDA TE	UPDATE Table	Line break before table
		Indent table
	SET Clause	Line break before SET
		Indent column assignments list
		Indent column assignments list
	FROM CLAUSE	Line break before FROM
		Line break after FROM
		Indent FROM list
		Stack FROM list
	JOIN CLAUSE(FROM CLAUSE)	Line break before JOIN
		Line break after JOIN
		Line break before ON
		Line break after ON
		Indent table after JOIN
		Indent ON condition
	WHERE CLAUSE	Line break before WHERE
		Line break after WHERE
		Place WHERE condition on single line
		Place WHERE condition on single line
	CTE	Each CTE in a new line
RETURNING	Line break before RETURNING	
	Line break after RETURNING	
DELET E	USING CLAUSE	Indent RETURNING column list
		Line break before FROM
		Line break after FROM
		Indent USING list
		Stack FROM list
	JOIN CLAUSE	Line break before JOIN
		Line break after JOIN

State ment	Clause	Formatting Rule
		Line break before ON
		Line break after ON
		Indent table after JOIN
		Indent ON condition List
	WHERE CLAUSE	Line break before WHERE
		Line break after WHERE
		Place WHERE condition on single line
		Stack WHERE condition list
	CTE	Each CTE in a new line
	RETURNING	Line break before RETURNING
		Line break after RETURNING
		Indent RETURNING column list

----End

Data Studio supports automatic highlighting of the following punctuation mark's pair when cursor is placed before or after the punctuation mark or the punctuation mark is selected.

- Brackets - ()
- Square brackets - []
- Braces - { }
- Single-quoted string literals - ' '
- Double-quoted string literals - " "

Follow the steps below to change case for SQL queries and PL/SQL statements:

Method 1

Step 1 Select the text, and choose **Edit > Upper Case/Lower Case**.

The text changes to the case selected.

----End

Method 2:

Step 1 Select the text, and choose **AA** or **aa** from the toolbar.

The text changes to the case selected.

----End

Method 3:

Step 1 Select the text, and press Ctrl+Shift+U to change to the upper case or Ctrl+Shift+L to change to the lower case.

The text changes to the case selected.

----End

SQL Highlighting

Keywords are highlighted automatically when you enter them (according to the default color scheme) as shown below:

```

1 CREATE OR REPLACE FUNCTION pg_catalog.login_audit_messages(flag boolean)
2 RETURNS TABLE(username text, database text, logintime timestamp with time zone, type text, result text, client_conninfo text)
3 LANGUAGE plpgsql
4 SECURITY DEFINER
5 AS $$
6 DECLARE
7 user_name text;
8 db_name text;
9 success_time1 timestamp with time zone;
10 success_time2 timestamp with time zone;
11 success_count integer;
12 SQL_STMT VARCHAR2(400);
13 BEGIN
14 SELECT SESSION_USER INTO user_name;
15 SELECT CURRENT_DATABASE() INTO db_name;
16 IF flag = true THEN
17 --get the last login success info.
18 SQL_STMT := 'SELECT username,database,time,type,result,client_conninfo FROM pg_query_audit(''1970-1-1'', ''9999-12-31'')
19 ELSE
20 --get the count of success login before.
21 EXECUTE 'SELECT count(*) FROM pg_query_audit(''1970-1-1'', ''9999-12-31'') WHERE type = ''login_success'' AND client_cor
22
23 --if success count is more than 1, calculate the failed login record between success_time1 and success_time2.
24 IF success_count > 1 THEN
25 --get the last 1 login success info.
26 EXECUTE 'SELECT time FROM pg_query_audit(''1970-1-1'', ''9999-12-31'') WHERE type = ''login_success'' AND client_cor

```

The following figure shows the default color scheme for the specified type of syntax:

Syntax Category	Color Value	HEX Value	Shade
DEFAULT	RGB(0,0,0)	000000	
UNRESERVED_KEYWORD	RGB(198,0,134)	C60086	
TYPE	RGB(64,0,200)	4000C8	
PREDICATES	RGB(224,5,11)	E0050B	
RESERVED	RGB(35,90,80)	235A50	
CONSTANTS	RGB(35,90,80)	235A50	
SINGLE_LINE_COMMENT	RGB(64,128,128)	408080	
STRING	RGB(0,0,255)	0000FF	

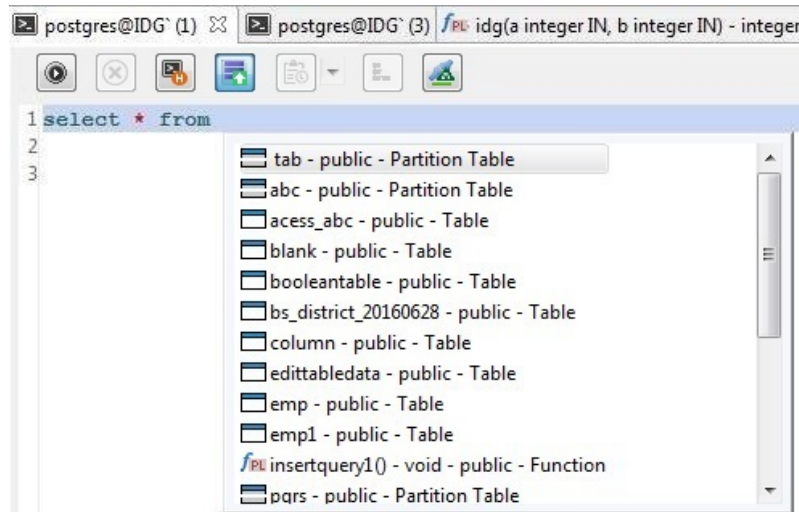
You can also customize SQL highlighting schemes for specific types of syntax. For details, see [Syntax Highlighting](#).

4.19.7 Selecting a DB Object in the SQL Terminal

Data Studio suggests a list of possible schema names, table names and column names, and views in the **SQL Terminal**.

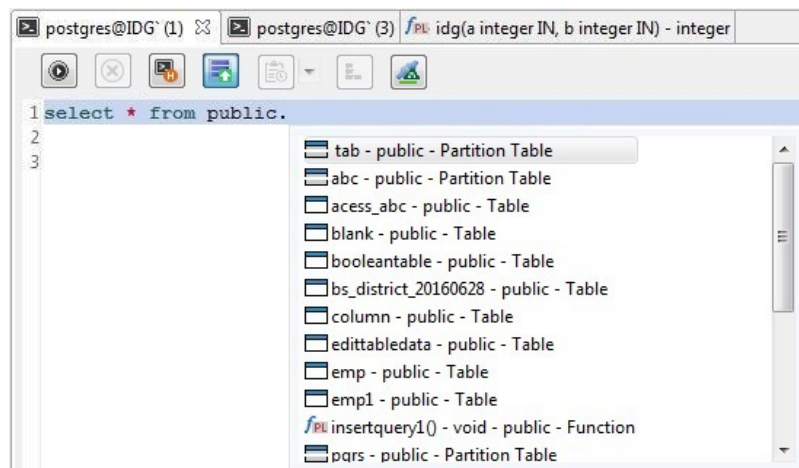
Follow the steps below to select a DB object:

Step 1 Press **Ctrl+Space** and enter the required parent DB object name. The DB objects list is refined as you continue typing the DB object name. The DB objects list displays all DB objects of the database connected to the **SQL Terminal**.



Step 2 To select the parent DB object, use the **Up** or **Down** arrow keys and press **Enter** on the keyboard, or double-click the parent DB object.

Step 3 Enter . (period) to list all child DB objects.



Step 4 To select the child DB object, use the **Up** or **Down** arrow keys and press **Enter** on the keyboard, or double-click the child DB object.

On selection, the child DB object will be appended to the parent DB object (with a period '.').

 **NOTE**

- Auto-suggest also works on keywords, data types, schema names, table names, views, and table name aliases in the same way as shown above for all schema objects that you have access.

Following is a sample query with alias objects:

```
SELECT
  table_alias.<auto-suggest>
FROM test.t1 AS table_alias
WHERE
  table_alias.<auto-suggest> = 5
GROUP BY table_alias.<auto-suggest>
HAVING table_alias.<auto-suggest> = 5
ORDER BY table alias.<auto-suggest>
```

- Auto-suggest may show "Loading" in Terminal for following scenarios:
 - The object is not loaded due to the value mentioned in the **Load Limit** field. Refer to [Adding a Connection](#) for more information.
 - The object is not loaded since it is added in the **Exclude** list option. Refer to [Adding a Connection](#) for more information.
 - There is a delay in fetching the object from the server.
- If there are objects with the same name in different case, then auto-suggest will display child objects of both parent objects.

Example:

If there are two schemas with the name public and PUBLIC, then all child objects for both these schemas will be displayed.


----End



4.19.8 Viewing the Execution Plan and Costs

The execution plan shows how the table(s) referenced by the SQL statement will be scanned (plain sequential scan and index scan).

The SQL statement execution cost is the estimation at how long it will take to run the statement (measured in cost units that are arbitrary, but conventionally mean disk page fetches).

Follow the steps below to view the plan and cost for a required SQL query:

- Step 1** Enter the query or use an existing query in the **SQL Terminal** and click  on the SQL Terminal toolbar to view explain plan.

To view explain plan with analyze, click the drop-down from , select **Include Analyze**, and click .

The **Execution Plan** opens in tree view format as a new tab at the bottom by default. The display mode has a tree shape and text style.

 **NOTE**

The data shown in tree explain plan and visual explain may vary, since the execution parameters considered by both are not the same.

Following are the parameters selected for explain plan with/without analyze and the columns displayed:











Table 4-21 Explain plan options







Explain Plan Type	Parameter Selected	Columns
Include Analyze unchecked (default setting)	Verbose, Costs	Node type, startup cost, total cost, rows, width, additional Info
Include Analyze checked	Analyze, Verbose, Costs, Buffers, Timing	Node type, startup cost, total cost, rows, width, Actual startup time, Actual total time, Actual Rows, Actual loops, Additional Info

Additional Info column includes, predicate information (filter predicate, hash condition), distribution key and output information along with the node type information.

The tree view of plan categorizes nodes into 16 types. In the tree view, each node will be preceded with corresponding type of icon. Following is the list of node categories with icons: Following is the list of node categories with icons:

Table 4-22 Node categories with Icon

Node Category	Icon
Aggregate	
Group Aggregate	
Function	
Hash	
Hash Join	
Nested Loop	
Nested Loop Join	
Modify Table	
Partition Iterator	
Row Adapter	

Node Category	Icon
Seq Scan on	
Set Operator	
Sort	
Stream	
Union	
Unknown	

Hover over the highlighted cells to identify the heaviest, costliest, and slowest node. Cells will be highlighted only for tree view.





If multiple queries are selected, the explanation plan with/without Analyze is displayed only for the last query.

Each time execution plan is executed, the plan opens in a new tab.

If the connection is lost and the database is still connected in Object Browser, then **Connection Error** dialog box is displayed:

- **Yes** - The connection is reestablished and retrieves explain plan and cost.
- **No**: Disconnects database from **Object Browser**

Toolbar menu in the **Execution Plan** window:

Toolbar Name	Toolbar Icon	Description
Tree Format		This icon is used view explain plan in tree format.
Text Format		This icon is used view explain plan in text format.
Copy		This icon is used to copy selected content from result window to clipboard. Shortcut key - Ctrl+C .
Save		This icon is used to save the explain plan in text format.

For more information about refresh, SQL preview, and search bar, see [Executing SQL Queries](#).

Refresh operation re-executes the explain/analyze query and refreshes the plan in the existing tab.

The result is displayed in the **Messages** tab.

----End

4.19.9 Viewing the Query Execution Plan and Cost Graphically

Visual Explain plan displays a graphical representation of the SQL query using information from the extended JSON format. This helps to refine query to enhance query and server performance. It helps to analyze the query path taken by the database and identifies heaviest, costliest and slowest node.

The graphical execution plan shows how the table(s) referenced by the SQL statement will be scanned (plain sequential scan and index scan).


The SQL statement execution cost is the estimate at how long it will take to run the statement (measured in cost units that are arbitrary, but conventionally mean disk page fetches).

Costliest: Highest **Self Cost** plan node.

Heaviest: Maximum number of rows output by a plan node is considered heaviest node.

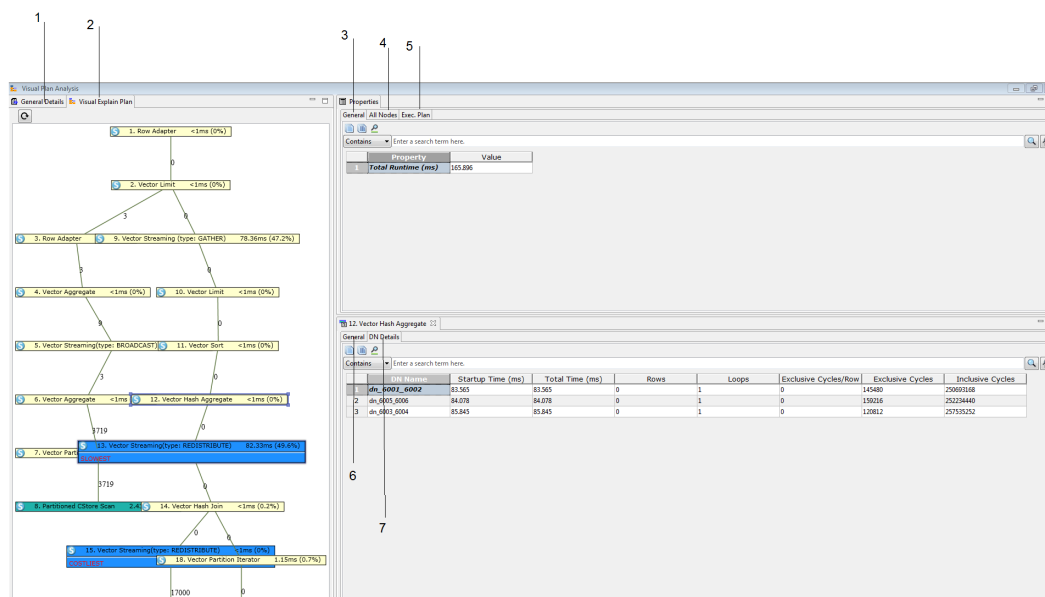
Slowest: Highest execution time by a plan node.

Follow the steps to view the graphical representation of plan and cost for a required SQL query:

Step 1 Enter the query or use an existing query in the **SQL Terminal** and click  on the SQL Terminal toolbar. Alternatively, press **ALT+CTRL+X** together.

Visual Plan Analysis window is displayed.

Refer to [Viewing the Execution Plan and Costs](#) for information on reconnect option in case connection is lost while retrieving the execution plan and cost.



- 1 - **General Detail** tab: This tab displays the query.
- 2 - **Visual Explain Plan** tab: This tab displays a graphical representation of all nodes like execution time, costliest, heaviest, and slowest node. Click each node to view the node details.
- 3 - **Properties - General** tab: Provides the execution time of the query in ms.
- 4 - **Properties - All Nodes** tab: Provides all node information.

Column Name	Description
Node Name	Name of the node
Analysis	Node analysis information
RowsOutput	Number of rows output by the plan node
RowsOutput Deviation (%)	Deviation % between estimated rows output and actual rows output by the plan node
Execution Time (ms)	Execution time taken by the plan node
Contribution (%)	Percentage of the execution time taken by plan node against the overall query execution time.
Self Cost	Total Cost of the plan node - Total Cost of all child nodes
Total Cost	Total cost of the plan node

- 5 - **Properties - Exec. Plan** tab - Provides the execution information of all nodes.

Column Name	Description
Node Name	Name of the node
Entity Name	Name of the object
Cost	Execution time taken by the plan node
Rows	Number of rows output by the plan node
Loops	Number of loops of execution performed by each node.
Width	The estimated average width of rows output by the plan node in bytes
Actual Rows	Number of estimated rows output by the plan node

Column Name	Description
Actual Time	Actual execution time taken by the plan node

- 6 - **Plan Node - General** tab - Provides the node information for each node.

Row Name	Description
Output	Provides the column information returned by the plan node
Analysis	Provides analysis of the plan node like costliest, slowest, and heaviest.
RowsOutput Deviation (%)	Deviation % between estimated rows output and actual rows output by the plan node
Row Width (bytes)	The estimated average width of rows output by the plan node in bytes
Plan Output Rows	Number of rows output by the plan node
Actual Output Rows	Number of estimated rows output by the plan node
Actual Startup Time	The actual execution time taken by the plan node to output the first record
Actual Total Time	Actual execution time taken by the plan node
Actual Loops	Number of iterations performed for the node
Startup Cost	The execution time taken by the plan node to output the first record
Total Cost	Execution time taken by the plan node
Is Column Store	This field represents the orientation of the table (column or row store)
Shared Hit Blocks	Number of shared blocks hit in buffer
Shared Read Blocks	Number of shared blocks read from buffer
Shared Dirtied Blocks	Number of shared blocks dirtied in buffer

Row Name	Description
Shared Written Blocks	Number of shared blocks written in buffer
Local Hit Blocks	Number of local blocks hit in buffer
Local Read Blocks	Number of local blocks read from buffer
Local Dirtied Blocks	Number of local blocks dirtied in buffer
Local Written Blocks	Number of local blocks written in buffer
Temp Read Blocks	Number of temporary blocks read in buffer
Temp Written Blocks	Number of temporary blocks written in buffer
I/O Read Time (ms)	Time taken for making any I/O read operation for the node
I/O Write Time (ms)	Time taken for making any I/O write operation for the node
Node Type	Represents the type of node
Parent Relationship	Represents the relationship with the parent node
Inner Node Name	Child node name
Node/s	No description needed for this field, this will be removed from properties

Based on the plan node type additional information may display. Few examples:

Plan Node	Additional Information
Partitioned CStore Scan	Table Name, Table Alias, Schema Name
Vector Sort	Sort keys
Vector Hash Aggregate	Group By Key
Vector Has Join	Join Type, Hash Condition
Vector Streaming	Distribution key, Spawn On

- **7 - Plan Node - DN Details** tab - Provides detailed data node information for each node. DN Details are available only if data is being collected from data node.

Refer to [Viewing Table Data](#) section for description on copy and search toolbar options.

----End

4.19.10 Using SQL Terminals

Auto Commit

The **Auto Commit** option is available in the **Preferences** pane. For details, see [Transaction](#).

- If **Auto Commit** is enabled, the **Commit** and **Rollback** functions are disabled. Transactions are committed automatically.
- If **Auto Commit** is disabled, **Commit** and **Rollback** functions are enabled. Transactions are committed or rolled back manually.

NOTE

- For OLAP, the server will open a transaction for all SQL statements, such as **SELECT**, **EXPLAIN SELECT**, and **SET PARAMETER**.
- For OLTP, the server will open a transaction for only DML statements, such as **INSERT**, **UPDATE**, and **DELETE**.

Reuse Connection

The **Reuse Connection** option allows you to select the same SQL terminal connection or new connection for the result set. The selection affects the record visibility due to the isolation levels defined in the database server.

- When **Reuse Connection** is set to **ON**, terminal connection will be used to perform operations on data and refresh the **Result** tab.

For some databases, the temporary tables created or used by the terminal can be edited in the **Result** tab.

- When **Reuse Connection** is set to **OFF**, new connection will be used to perform operations on data and refresh the **Result** tab.

For some databases, the temporary tables can be edited in the **Result** tab.



: displayed when **Reuse Connection** is set to **ON**



: displayed when **Reuse Connection** is set to **OFF**



: displayed when **Reuse Connection** is disabled

Perform the following steps to set **Reuse Connection** to **OFF**:

Step 1 Click  in the **SQL Terminal** toolbar.

Reuse Connection is set to **OFF** for the terminal.  is displayed.

 NOTE


- The **Reuse Connection** function is set to **ON** by default. You can set it to **OFF** as required. If you enable **Auto Commit**, **Reuse Connection** is set to **ON** automatically.
- If you disable **Auto Commit**, **Reuse Connection** is set to **OFF** automatically. However, this function is still displayed as **ON** on the GUI, and the status cannot be modified.

----End

For details about **Auto Commit** and **Reuse Connection**, see [Table 4-27](#).

Executing SQL Queries

Perform the following steps to execute a function/procedure or SQL query:

Enter a function/procedure or SQL statement in the **SQL Terminal** tab and click , or press **Ctrl+Enter**, or choose **Run > Compile/Execute Statement** in the main menu.

Alternatively, you can right-click in the **SQL Terminal** tab and select **Execute Statement**.

 NOTE

You can check the status bar to view the status of a query being executed.

After the function/procedure or SQL query is executed, the result is generated and displayed in the **Result** tab.

If the connection is lost during execution but the database remains connected in **Object Browser**, the **Connection Error** dialog box is displayed with the following options:

- **Reconnect**: The database is reconnected.
- **Reconnect and Execute**: With **Auto Commit** set to **ON**, execution will continue from the failed statement. With **Auto Commit** set to **OFF**, execution will continue from the position of the cursor.
- **Cancel**: The database is disconnected in **Object Browser**.

If the reconnection fails after three attempts, the database will be disconnected in **Object Browser**. Connect to the database in **Object Browser** and try the execution again.

 **NOTE**

- For time-consuming queries, the result set can be edited only after the complete results are obtained.
- Query results can be edited in the following scenarios:
 - The selected objects are in the same table.
 - All or some columns are selected without aliases, aggregate functions, or column expressions.
 - The query contains the **WHERE** clause.
 - The query contains the **ORDER BY** clause.
 - The table is an ordinary, partitioned, or temporary table.
- If an empty row is committed, **Null** is assigned to all columns.
- Result sets of queries executed on tables available in **Object Browser** are editable.
- Results of queries executed in **SQL Terminal** can be edited.

You can choose **Settings > Preferences** to set the column width. For details, see [Query Results](#).

Column Reorder

You can click a column header and drag the column to the desired position.

Multi-Column Sort

This feature allows you to sort table data of some pages by multiple columns, as well as to set the priority of columns to be sorted.

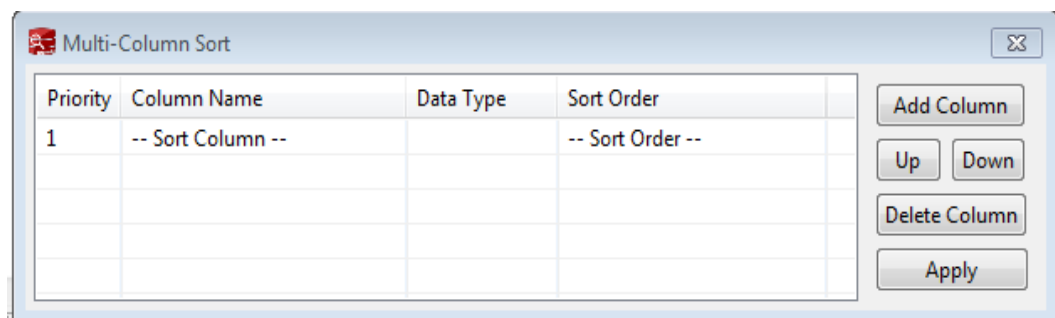
This feature is available for the following tabs:

- **Result Set**
- **Edit Table Data**
- **View Table Data**
- **Batch Drop Result**

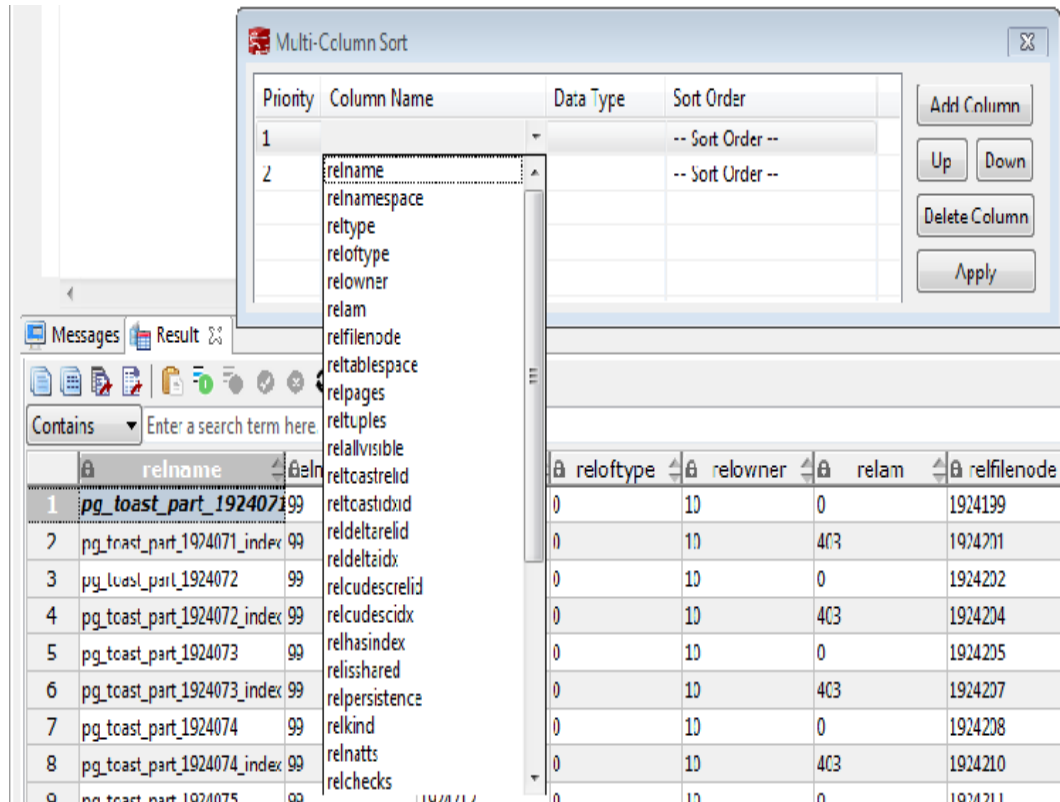
Perform the following steps to enable **Multi-Column Sort**:

Step 1 Click  in the toolbar.

The **Multi-Column Sort** dialog box is displayed.



Step 2 Click **Add Column**. Choose the column to be sorted from the drop-down list.



Step 3 Set the sort order.

Step 4 Click **Apply**.

----End

The **Multi-Column Sort** dialog box contains the following elements.

Table 4-23 Elements of the Multi-Column Sort dialog box

Name	UI Element Type	Description/Operation
Priority	Read-only text field	Shows the column priority in Multi-Column Sort
Column Name	Concatenated field, which can be all column names of the table	Shows the name of the column added for sorting
Data Type	Read-only text field	Shows data type of the selected column
Sort Order	Concatenated field, which can be in either ascending or descending order	Shows the sort order of the selected column

Name	UI Element Type	Description/Operation
Add Column	Button	Adds new columns to a table for multi-column sort
Delete Column	Button	Deletes selected columns from a table for multi-column sort
Up	Button	Moves the selected column up by one step to change the sort priority
Down	Button	Moves the selected column down by one step to change the sort priority
Apply	Button	Applies the sort priority


 **NOTE**



Data types will be sorted in an alphabetical order, except the following ones:

TINYINT, SMALLINT, INTEGER, BIGINT, FLOAT, REAL, DOUBLE, NUMERIC, BIT, BOOLEAN, DATE, TIME, TIME_WITH_TIMEZONE, TIMESTAMP, and TIMESTAMP_WITH_TIMEZONE

The **Multi-Column Sort** dialog box contains the following icons.

Table 4-24 Icons of the Multi-Column Sort dialog box

Icon	Description	Operation
	Not Sorted	If this icon is displayed in a column header, the column is not sorted. You can click this icon to sort the column in ascending order. Alternatively, use Alt +Click to select the column header.

Icon	Description	Operation
	Ascending Sort	If this icon is displayed in a column header, the column is sorted in ascending order. You can click this icon to sort the column in descending order. Alternatively, use Alt +Click to select the column header.
	Descending Sort	If this icon is displayed in a column header, the column is sorted in descending order. If you click on this icon the column will be in no sort order. Alternatively, use Alt +Click to select the column header.

Icons for the sort priority are as follows:



: Icon with three dots indicates the highest priority.





: Icon with two dots indicates the second highest priority.







: Icon with one dot indicates the lowest priority.



Table 4-25 Toolbar icons

Toolbar Name	Toolbar Icon	Description
Copy		This icon is used to copy selected data from the Result pane to clipboard. The shortcut key is Ctrl+C .
Advanced Copy		This icon is used to copy selected data from the Result pane to clipboard. The copied data includes column headers. See Query Results to set this preference. The shortcut key is Ctrl +Shift+C .

Toolbar Name	Toolbar Icon	Description
Export all data		This icon is used to export all data to files in Excel (xlsx/xls), CSV, text, or binary format. For details, see Exporting Table Data . NOTE <ul style="list-style-type: none">The columns involved in the query are automatically populated in the Selected Columns area. The Available Columns area is empty.To export the query results, execute the query again using a new connection. The exported results may be different from the data in the Result pane.This function is not available for queries using the EXPLAIN or ANALYZE statement. To export such queries, select Export current page data.
Export current page data		This icon is used to export current page data to files in Excel (xlsx/xls) or CSV format.
Paste		This icon is used to paste copied information. For details, see Pastes content .
Add		This icon is used to add a row to the result set. For details, see Insert .
Delete		This icon is used to delete a row from the result set. For details, see Delete .
Save		This icon is used to save the changes made in the result set. For details, see Editing Table Data .
Rollback		This icon is used to roll back the changes made in the result set. For details, see Editing Table Data .
Refresh		This icon is used to refresh information in the result set. If multiple result sets are open for the same table, changes made in one result set will take effect in other result sets after refresh. If the table is edited, the result sets will be updated after refresh.
Clear Unique Key selection		This icon is used to clear the previously selected unique key. For details, see Editing Table Data .

Toolbar Name	Toolbar Icon	Description
Show/Hide Query bar		This icon is used to display or hide the query executed for a specified result set. This is a toggle button.
Show/Hide Search bar		This icon is used to display or hide the Search field. This is a toggle button.
Encoding	Encoding : UTF-8 ▾	Whether you can configure this field depends on the settings in Preferences > Result Management > Query Results > Result Data Encoding . In this drop-down list, you can select the appropriate encoding to view the data accurately. The value defaults to UTF-8. For details about the encoding preference, see Result Data Encoding . NOTE Data editing operations, except data insertion, are restricted after the default encoding is modified.
Multi Sort		This icon is used to display the Multi Sort dialog box.
Clear Sort		This icon is used to reset all sorted columns.

Icons in the **Search** field are as follows:

Icon Name	Icon	Description
Search		This icon is used to search for result sets according to the criteria defined. The text is case-insensitive.
Clear Search Text		This icon is used to clear the text entered in the Search field.

Right-click options in the **Result** pane are as follows:

Option	Description
Close	Closes only the active Result pane
Close Others	Closes all other Result panes except the active one
Close Tabs to the Right	Closes all Result panes to the right of the active one

Option	Description
Close All	Closes all Result panes including the active one
Detach	Opens only the active Result pane


Status information displayed in the **Result** pane is as follows:

- **Query Submit Time:** indicates time when a query is submitted
- The number of rows obtained and the execution time are displayed, as well as the default number of rows. If there are additional rows to be obtained, the icon is displayed with the word **more**. You can scroll to the bottom of the table to obtain and display all rows.

NOTICE

When you are viewing table data, Data Studio automatically adjusts the column width for better display. You can adjust the column width as required. If the text length exceeds the column width and you adjust the column width, Data Studio may fail to respond.

NOTE

- A new **Result** pane is opened each time a query is executed. To view the results in the new pane, select the pane.
- Set the **focusOnFirstResult** parameter to **false** to automatically locate the newly opened **Result** pane. For details, see [Installing and Configuring Data Studio](#).
- Selected rows, columns, and cells can be copied from the result set.
- All data can be exported even after the connection is removed.
- If the text of a column contains spaces, word wrapping is applied to fit the column width. Word wrapping is not applied to columns without space.
- To copy part of a cell, select the desired part and press **Ctrl+C** or click .
- The column size depends on the column with the longest text.
- You can save preferences to define:
 - Number of records to be obtained
 - Column width
 - Copying options from a result setFor details, see [Query Results](#).
- If the lock icon is displayed in any column of the **Result Set** tab, parameters cannot be edited.

Backing up Unsaved Queries/Functions/Procedures

Data Studio backs up unsaved data in **SQL Terminal** and **PL/SQL Viewer** periodically based on the time interval defined in the **Preferences** pane. Data is encrypted and saved based on the **Preference** settings. See [Query/Function/Procedure Backup](#) to enable or disable the backup function, set time interval of data saving, and encrypt the saved data.

Unsaved changes in **SQL Terminal** and **PL/SQL Viewer** are backed up and saved in the **DataStudio\UserData\Username\Autosave** folder. If these backup files have been saved before Data Studio is shut down unexpectedly, these files will be available upon the next login.

If unsaved data exists in **SQL Terminal** and **PL/SQL Viewer** during graceful exit, Data Studio will not be closed until the backup is complete.



Locating Errors

When an error occurs during the execution of queries/functions/procedures, an error locating message will be displayed.

Yes: Click **Yes** to proceed with the execution.

No: Click **No** to stop the execution.

You can select **Do not display other errors that occur during the execution** to hide the error messages and proceed with the current SQL query.

The line number and position of an error message is displayed in the **Messages** pane. In **SQL Terminal** or **PL/SQL Viewer**, the corresponding line is marked with  and a red underline at the position of the error. You can hover over  to display the error message. For details about why the line number does not match with the error detail, see [FAQs](#).

NOTE

If a query/function/procedure is modified during execution, the error locator may not display the correct line number and the position of the error.

Searching in the PL/SQL Viewer or SQL Terminal Pane

Perform the following steps to search in the **PL/SQL Viewer** or **SQL Terminal** pane:

Press **F3** to search for the next line or **Shift+F3** to search for the previous line. You can use these shortcut keys after pressing **Ctrl+F** to search for text and key words. **Ctrl+F**, **F3**, and **Shift+F3** will be available only when you search for keywords in the current instance.

Step 1 Choose **Edit > Find and Replace** from the main menu.

Alternatively press **Ctrl+F**.

The **Find and Replace** dialog box is displayed.

Step 2 Enter the text to be searched for in the **Find what** field, and click the **Find Next** button.

The desired text is highlighted.

You can press **F3** for forward search or **Shift+F3** for backward search.

 **NOTE**

When reaching the last line in a SQL query or PL/SQL statement, select **Wrap around** to proceed with the search.

----End

Locating a Specific Line in the PL/SQL Viewer or SQL Terminal Pane

Perform the following steps to locate a specific line in the **PL/SQL Viewer** or **SQL Terminal** pane:

Perform the following steps to go to a line in **PL/SQL Viewer** or **SQL Terminal**:

Step 1 Choose **Edit > Go To Line** from the main menu or press **Ctrl+G**.

The **Go To Line** dialog box is displayed, allowing you to skip to a specific line in **SQL Terminal**.

Step 2 Enter the desired line number in the **Enter the line number** field, and click **OK**.

The cursor moves to the beginning of the line entered in the **Go to Line** dialog box.

 **NOTE**

You cannot enter the following characters in this field:

- Non-numeric character
- Special characters
- Line numbers that do not exist in the editor
- Number with more than 10 digits

----End

Commenting or Uncommenting

Data Studio allows you to comment or uncomment lines or blocks.

Perform the following steps to comment or uncomment lines in **PL/SQL Viewer** or **SQL Terminal**:

Step 1 Select the lines to comment or uncomment.

Step 2 Choose **Edit > Comment/Uncomment Lines** from the main menu to comment or uncomment each selected line.

Alternatively, press **Ctrl+/**** or right-click a line and select **Comment/Uncomment Lines**.

----End

Perform the following steps to comment or uncomment blocks in **PL/SQL Viewer** or **SQL Terminal**:

Step 1 Select the lines or a block to comment or uncomment.

Step 2 Choose **Edit > Comment/Uncomment Block** from the main menu to comment or uncomment each selected line or the entire block.

Alternatively, press **Ctrl+Shift+/'** or right-click a line or the entire block and select **Comment/Uncomment Block**.

----End

Indenting or Un-indenting Lines

You can indent or un-indent lines according to the indent size defined in **Preferences**.

Perform the following steps to indent lines in **PL/SQL Viewer** or **SQL Terminal**:

Step 1 Select the desired lines.

Step 2 Press **Tab** or click .

Move the selected lines according to the indent size defined in **Preferences**. For details about modifying the indent size, see [Formatter](#).

----End

Perform the following steps to un-indent lines in **PL/SQL Viewer** or **SQL Terminal**:

Step 1 Select the desired lines.

Step 2 Press **Shift+Tab** or click .

Move the selected lines according to the indent size defined in **Preferences**. For details about modifying the indent size, see [Formatter](#).

NOTE

Only selected lines that have available tab space will be un-indented. For example, if multiple lines are selected and one of the selected lines starts at position 1, pressing **Shift+Tab** will un-indent all lines except the one starting at position 1.

----End

Inserting Spaces

The **Insert Space** option is used to replace a tab with spaces according to the indent size defined in **Preferences**.

Perform the following steps to replace a tab with spaces in **PL/SQL Viewer** or **SQL Terminal**:

Step 1 Select the desired lines.

Step 2 Press **Tab** or **Shift+Tab**.

A tab is replaced with spaces according to the indent size defined in **Preferences**. For details about modifying the indent size, see [Formatter](#).

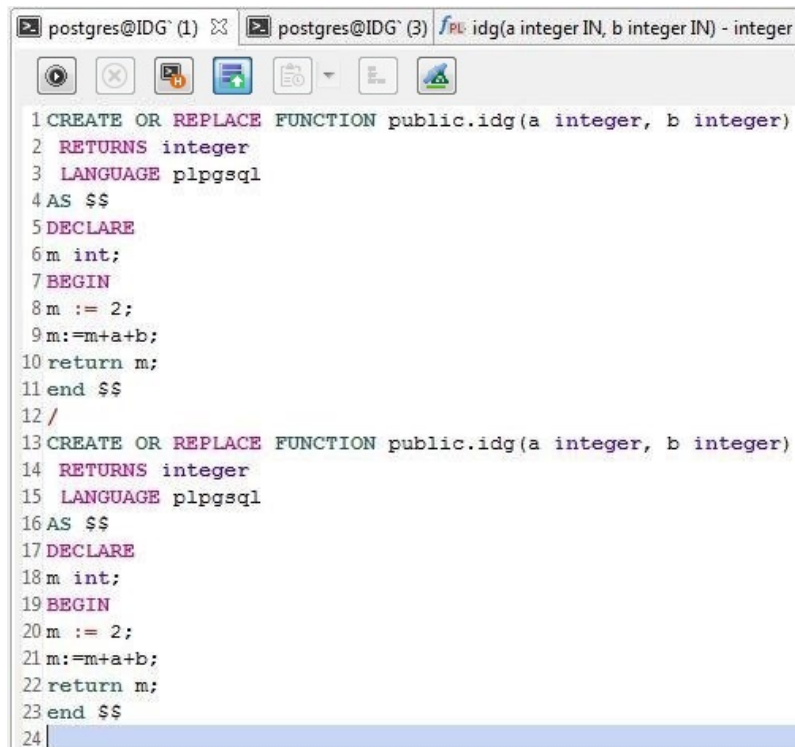
----End

Executing Multiple Functions/Procedures or Queries

Perform the following steps to execute multiple functions/procedures:

Insert a forward slash (/) in a new line under the function/procedure in **SQL Terminal**.

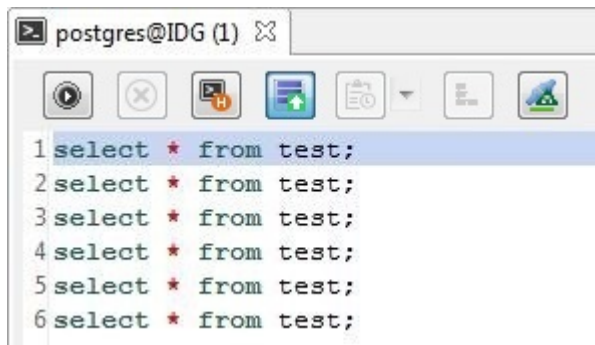
Add the new function/procedure in the next line.




```
postgres@IDG` (1) postgres@IDG` (3) public.idg(a integer IN, b integer IN) - integer
1 CREATE OR REPLACE FUNCTION public.idg(a integer, b integer)
2 RETURNS integer
3 LANGUAGE plpgsql
4 AS $$
5 DECLARE
6 m int;
7 BEGIN
8 m := 2;
9 m:=m+a+b;
10 return m;
11 end $$
12 /
13 CREATE OR REPLACE FUNCTION public.idg(a integer, b integer)
14 RETURNS integer
15 LANGUAGE plpgsql
16 AS $$
17 DECLARE
18 m int;
19 BEGIN
20 m := 2;
21 m:=m+a+b;
22 return m;
23 end $$
24
```

Perform the following steps to execute multiple SQL queries:

Step 1 Enter multiple SQL queries in **SQL Terminal** as follows:



```
postgres@IDG (1)
1 select * from test;
2 select * from test;
3 select * from test;
4 select * from test;
5 select * from test;
6 select * from test;
```

Step 2 Click  in **SQL Terminal**, or press **Ctrl+Enter**, or choose **Run > Compile/Execute Statement** from the main menu.

 **NOTE**

- If no query is selected, only the query in the line where the cursor is placed will be executed.
- If the cursor is placed in an empty line, the next available query statement will be executed.
- If the cursor is placed in the last empty line, no query will be executed.
- If a single query is written in multiples lines and the cursor is placed in any line of the query, the query will be executed. Queries are separated using a semicolon (;).

----End

Perform the following steps to execute a SQL query after executing a function/procedure:

Insert a forward slash (/) in a new line under the function/procedure in **SQL Terminal**. Then add new query or function/procedure statements.

Perform the following steps to execute PL/SQL statements and SQL queries on different connections:

Select the required connection from the **Connection** drop-down list and click  in **SQL Terminal**.

Renaming a SQL Terminal

Perform the following steps to rename a SQL Terminal:

Step 1 Right-click in **SQL Terminal** and select **Rename Terminal**.

The **Rename Terminal** dialog box is displayed prompting you to enter the new terminal name.

Step 2 Enter the new name and click **OK**.

 **NOTE**

- The terminal name must follow the Windows file naming convention.
- The **Rename Terminal** dialog box allows a maximum of 150 characters.
- The **Restore** option cannot be used to restore to the default name. You must manually rename a terminal with its default name.
- Tool tip of the renamed terminal will display the previous terminal name.


----End

SQL Assistant

The SQL Assistant tool provides suggestion or reference for the information entered in **SQL Terminal** and **PL/SQL Viewer**. Perform the following steps to open SQL Assistant:

When Data Studio is started, related syntax is displayed in the **SQL Assistant** panel. After you enter a query in **SQL Terminal**, related syntax details are displayed, including precautions, examples, and description of syntax, functions, and parameters. Select the text and right-click to copy the selected text or copy and paste it to **SQL Terminal**.

 NOTE

- Choose **Settings > Preferences > Environment > Session Setting**. In the **SQL Assistant** area displayed on the right, enable or disable the **SQL Assistant** function permanently. By default, the **SQL Assistant** function is enabled permanently.
- After the **SQL Assistant** function is enabled, you can click the **SQL Assistant** icon () on the toolbar to open the **SQL Assistant** window. If the **SQL Assistant** icon is gray after the **SQL Assistant** function is enabled, the operation is invalid.

Using Templates

The **Templates** option of Data Studio allows you to insert frequently used SQL statements in **SQL Terminal** or **PL/SQL Viewer**. Some frequently used SQL statements have been saved in Data Studio. You can create, edit, or remove a template. For details, see [Adding/Editing/Removing a Template](#).

The following table lists the default templates.

Name	Description
df	delete from
is	insert into
o	order by
s*	select from
sc	select row count
sf	select from
sl	select

Perform the following steps to use the **Templates** option:

Step 1 Enter a template name in **SQL Terminal** or **PL/SQL Viewer**.

Step 2 Press **Ctrl+Alt+Space**.

A list of existing template information is displayed. For details, see the following tables.

Exact Match	Display
On	Displays all entries that start with the input text (case-sensitive). For example, if SF is entered in SQL Terminal or PL/SQL Viewer , all entries that start with SF are displayed.

Exact Match	Display
Off	Displays all entries that start with the input text (case-insensitive). For example, if SF is entered in SQL Terminal or PL/SQL Viewer , all entries that start with SF , Sf , sF , or sf are displayed.

Text Selection/Cursor Location	Display
Text is selected and the shortcut key is used.	Displays entries that match the text between the leftmost character of the selected text and the space or newline character nearest to the character.
No text is selected and the shortcut key is used.	Displays entries that match the text between the cursor position and the space or newline character nearest to that position.

 **NOTE**

- If you press **Ctrl+Alt+Space** without entering text in **SQL Terminal** or **PL/SQL Viewer**, all entries in **Templates** will be displayed.
- If the text entered in **SQL Terminal** or **PL/SQL Viewer** matches with only one entry, this entry will replace the text entered and the template list will not be displayed.

----End

4.19.11 Exporting Query Results

You can export the results of an SQL query into a CSV, Text or Binary file.

Topics in this section include:

- [Exporting all data](#)
- [Exporting Data On the Current Page](#)

Exporting all data

The following functions are disabled while the export operation is in progress:

- Executing SQL queries in the **SQL Terminal**
- Executing PL/SQL statements
- Debugging PL/SQL statements

Follow the steps below to export all results:

Step 1 Select the **Result** tab.

Step 2 Click .

The **Export ResultSet Data** window is displayed.

Refer to [Exporting Table Data](#) to complete the export operation.

 **NOTE**

You can check the status bar to view the status of the result being exported.

The **Data Exported Successfully** dialog box is displayed.

Step 3 Click **OK**. Data Studio displays the status of the operation in the **Messages** tab.

 **NOTE**

If the disk is full while exporting the results, then Data Studio displays an error in the Messages tab. In this case, clear the disk, re-establish the connection and export the result data.

----End


The Messages tab shows the **Execution Time**, **Total Result Records Fetched**, and the path where the file is saved.

Exporting Data On the Current Page

It is advised to export all results instead of exporting the current page. The **Export Current Page to CSV** function has been deleted.

Follow the steps below to export the current page:

Step 1 Select the **Result** tab.

Step 2 Click the  icon to export the current page.

The **Data Studio Security Disclaimer** dialog box is displayed.

Step 3 Click **OK**.

Step 4 Select the location to save the current page.

 **NOTE**

You can check the status bar to view the status of the page being exported.

Step 5 Click **Save**. The **Data Exported Successfully** dialog box is displayed.

Step 6 Click **OK**. Data Studio displays the status of the operation in the **Messages** tab.

 **NOTE**

If the disk is full while exporting the results, then Data Studio displays an error in the Messages tab. In this case, clear the disk, re-establish the connection and export the result data.

----End

4.19.12 Managing SQL Terminal Connections

Data Studio allows you to reuse an existing SQL Terminal connection or create a new SQL Terminal connection for execution plan and cost, visual explain plan, and

operations in the resultset. By default, the SQL Terminal reuses the existing connection to perform these operations.

Use new connection when there are multiple queries queued for execution in existing connection as the queries are executed sequentially and there may be a delay. Always reuse existing connection while working on temp tables. Refer to the [Editing Temporary Tables](#) section to edit temp tables.

Complete the steps to enable or disable SQL Terminal connection reuse:

Step 1 Click  to enable or disable SQL Terminal connection reuse.

Refer to the [FAQs](#) section for the behavior of query execution with reuse and new connection.

 **NOTE**

Use the existing SQL Terminal connection to edit temporary tables.

----End

4.20 Batch Operation

4.20.1 Overview

You can view accessible database objects in the navigation tree in **Object Browser**. Schema are displayed under databases, and tables are displayed under schemas.

Object Browser displays only the objects that meet the following minimum permission requirements of the current user.

Object Type	Permissions displayed in Object Browser
Database	Connect
Schema	Use
Table	Select
Column	Select
Sequence	Use
Function/Procedure	Execute

The child objects of the objects accessible to you do not need to be displayed in **Object Browser**. For example, if you have the permission to access a table but does not have the permission to access a column in the table, **Object Browser** only displays the columns you can access. If access to an object is revoked during an operation on the object, an error message will be displayed, indicating that you

do not have permissions to perform the operation. After you refresh **Object Browser**, the object will not be displayed.

The following objects can be displayed in the navigation tree:

- Schemas
- Functions/Procedures
- Tables
- Sequences
- Views
- Columns, constraints, and indexes

All default created schemas, except for the **public** schema, are grouped under **Catalogs**. User schemas are displayed under their databases in **Schemas**.

NOTE

The filter option in **Object Browser** opens a new tab, where you can specify the search scope. Press **Enter** to start the search. **Object Browser** also provides a search bar. You can search for an object by name. In an expanded navigation tree, only the objects that match the filter criteria are displayed.

In a collapsed navigation tree, the filtering rule takes effect when a node is expanded.

4.20.2 Batch Dropping Objects

The batch drop operation allows you to drop multiple objects. This operation also applies to searched objects.

NOTE

- Batch drop is allowed only within a database.
- An error is reported on batch dropping system objects, which cannot be dropped.





Perform the following steps to batch drop objects:

Step 1 Press **Ctrl+left-click** (select objects one by one) or **Shift+left-click** (select objects in a bunch) to select the objects to be dropped.

Step 2 Right-click and select **Drop Objects**.

The **Drop Objects** tab displays the list of objects to be dropped.

Column Name	Description	Example
Type	Displays information about the object type.	Table, view
Name	Displays the object name.	public.bs_operation_201804
Query	Displays the query that will be executed to drop objects.	DROP TABLE IF EXISTS public.a123

Column Name	Description	Example
Status	Displays the status of the drop operation. <ul style="list-style-type: none">•  To start: The drop operation has not been started.•  In progress: The object is being dropped.•  Completed: The drop operation has been completed.•  Error: The object has not been dropped due to an error.	<ul style="list-style-type: none">• To start• In progress• Completed• Error
Error Message	Displays the failure cause of a drop operation.	The table abc does not exist. Skip it.

Step 3 Select the required parameters.

Option	Description
Cascade	The cascade drop operation is performed to drop dependent objects and attributes. The dropped dependent objects will be removed from Object Browser only after the refresh operation is performed.
Atomic	The atomic drop operation is performed to drop all objects. If the operation fails, no objects will be dropped.
No selection	If neither Cascade nor Atomic is selected, no dependent objects are dropped.

Step 4 Click **Start**.

Runs: displays the number of objects that are dropped from the object list

Errors: displays the number of objects that are not dropped due to errors

Step 5 Click **Stop** or close the **Drop Objects** dialog box to stop the drop operation.

For details about copy, advanced copy, show/hide search bar, sort, and column reorder options, see [Executing SQL Queries](#).

 NOTE

- Select part of a cell and press **Ctrl+C** or click  to copy selected text in the cell.
- When you select multiple objects in **Object Browser** to drop, a batch drop window is displayed and the object icons are enabled in the menu bar. If you disconnect the database, the icons will remain disabled even after reconnection. In this case, you need to reselect the objects to drop and the selected objects will be displayed in the new batch drop window.

----End

4.20.3 Granting/Revoking Privileges

The batch grant/revoke operation allows you select multiple objects to grant/revoke privileges. You can also perform batch grant/revoke operation on searched objects.

This feature is only available for OLAP, not for OLTP.

 NOTE

Batch grant/revoke is allowed only with the same object type within that schema.

Follow the steps to grant/revoke privileges in a batch:

- Step 1** Press **Ctrl+left-click** (select objects one by one) or **Shift+left-click** (select objects in a bunch) to select the objects to grant/revoke privileges.
- Step 2** Right-click and select **Grant/Revoke**.
Grant/Revoke dialog box is displayed.
- Step 3** Refer to [Granting/Revoking a Privilege](#) section to grant/revoke privilege.

----End

4.21 Personalizing Data Studio

4.21.1 Overview

This section provides details on how to personalize Data Studio using preferences settings.

4.21.2 General

This section describes how to customize shortcut keys.

Setting Shortcut Keys

You can customize Data Studio shortcut keys.

Perform the following steps to set or modify shortcut keys:

- Step 1** Choose **Settings > Preferences** from the main menu.
The **Preferences** dialog box is displayed.

Step 2 Choose **General > Shortcut Mapper**.

The **Shortcut Mapper** pane is displayed.

Step 3 Select the desired shortcut key and click **Modify**.**Step 4** Enter the new shortcut key in the **Binding** text box.

For example, to change the shortcut key for **Step Into** from **F7** to **F6**, move the cursor to the **Binding** text box and enter **F6**.

Step 5 Click **OK**. The **Restart Data Studio** dialog box is displayed. **NOTE**

You can modify multiple shortcut keys before restarting Data Studio.

Step 6 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, the **Restart Confirmation** dialog box is displayed.**Step 7** Click **OK** to close running jobs and restart, or click **Cancel** to cancel the restart operation.**----End**

Perform the following steps to remove shortcut keys:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **General > Shortcut Mapper**.

The **Shortcut Mapper** pane is displayed.

Step 3 Select the desired shortcut key and click **Unbind Key**.**Step 4** Click **OK**. The **Restart Data Studio** dialog box is displayed. **NOTE**

You can remove multiple shortcut keys before restarting Data Studio.

Step 5 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, the **Process is running** dialog box is displayed.**Step 6** Click **OK** to wait till the operations are complete or click **Force Restart** to cancel the operations.**----End**

Perform the following steps to restore the default shortcut keys:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **General > Shortcut Mapper**.

The **Shortcut Mapper** pane is displayed.

Step 3 Click **Restore Defaults**. For details about default shortcut keys, see [Data Studio Right-Click Menus](#).

Step 4 Click **OK**.

The **Restart Data Studio** dialog box is displayed.

Step 5 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, the **Process is running** dialog box is displayed.**Step 6** Click **OK** to wait till the operations are complete or click **Force Restart** to cancel the operations.

----End

Shortcut Keys

Data Studio supports keyboard short cut keys similar to other windows based application. The following table lists some shortcut keys of Data Studio and their functions. For details about how to customize shortcut keys, see [Setting Shortcut Keys](#).

Table 4-26 Default shortcut keys of Data Studio

Function	Shortcut Key
Sorts the result sets of views and tables, editing tables, and queries in ascending or descending order, or in the order of results received by the server	Alt+Click
Opens the Help menu	Alt+H
Saves the SQL script	Ctrl+S
Opens the Edit menu	Alt+E
Compiles or executes statements in SQL Terminal	Ctrl+Enter
Searches and replaces	Ctrl+F
Searches for the previous one	Shift+F3
Searches for the next one	F3
Redoes an operation	Ctrl+Y
Copies information of Execution Time and Status in the Edit Table Data tab	Ctrl+Shift+K
Copies database objects from the automatic recommendation list	Alt+U
Opens the Callstack , Breakpoints , or Variables pane	Alt+V
Opens a SQL script	Ctrl+O
Steps over	F8

Function	Shortcut Key
Steps into	F7
Steps out	Shift+F7
Comments out or uncomments a row	Ctrl+/
Locates the first element in Object Browser	Alt+Page Up or Alt+Home
Locates the last element in Object Browser	Alt+Page Down or Alt+End
Locates a specific row	Ctrl+G
Disconnects from the database	Ctrl+Shift+D
Formats SQL or PL/SQL	Ctrl+Shift+F
Changes to uppercase	Ctrl+Shift+U
Changes to lowercase	Ctrl+Shift+L
Updates the cells or columns in the Edit Table Data, Properties, or Results pane. Click the cell or column header to enable this option.	F2
Closes the PL/SQL Viewer, View Table Data, Execute Query, or Properties tab	Shift+F4
Continues the PL/SQL debugging	F9
Cuts content	Ctrl+X
Copies the name of the object modified in Object Browser or in the terminal. You can copy the selected data from the Terminal, Result, View Table Data, or Edit Table Data tab.	Ctrl+C
Copies the data in the Result, View Table Data, or Edit Table Data tab. The data contains/does not contain the column title and row number	Ctrl+Shift+C
Copies queries in the Edit Table Data tab	Ctrl+Alt+C
Copies content of the Variables tab	Alt+K
Copies content of the Callstack tab	Alt+J
Copies content of the Breakpoints tab	Alt+Y
Visualizes the interpretation plan	Alt+Ctrl+X

Function	Shortcut Key
Displays online help (user manual)	F1
Template	Alt+Ctrl+Space
Switches to the first SQL Terminal tab	Alt+S
Selects all	Ctrl+A
Opens the Setting menu	Alt+G
Refreshes the Object Browser pane	F5
Searches for an object	Ctrl+Shift+S
Opens the Debugging menu	Alt+D
Debugs a template	F10
Debugs a database object	Ctrl+D
Highlights Object Browser	Alt+X
Opens the File menu	Alt+F
Creates a connection	Ctrl+N
Opens the Running menu	Alt+R
Switches between the SQL Terminal tabs	Ctrl+Page Up or Ctrl+Page Down
Expands or collapses all objects	Ctrl+M
Pastes content	Ctrl+V
Collapses objects to browse the navigation tree	Alt+Q
Performs execution	Ctrl+E
Displays the execution plan and expense	Ctrl+Shift+X
Stops a running query	Shift+Esc
Comments out or uncomments a row or the entire block	Ctrl+Shift+/
Enables Auto Suggest of the database object list	Ctrl+Space

4.21.3 Editor

This section describes how to customize syntax highlighting, SQL history information, templates, and formatters.

Syntax Highlighting

Perform the following steps to customize SQL highlighting:


Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Editor > Syntax Coloring**.

The **Syntax Coloring** pane is displayed.

Step 3 Click the color button to customize the color for a syntax type.

For example, click  to customize the color for **Strings**. A dialog box is displayed prompting you to select a color.

Select a color for a specific syntax type. You can select one of the basic colors or customize a color.

NOTE

Click **Restore Defaults** in the **Syntax Coloring** pane to restore the default color.

Step 4 Click **OK**. The **Restart Data Studio** dialog box is displayed.

Step 5 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, the **Process is running** dialog box is displayed.

Step 6 Click **OK** to wait till the operations are complete or click **Force Restart** to cancel the operations.

NOTE

The **Preferences.prefs** file contains the custom color settings. If the file is damaged, Data Studio will display the default settings.

The customized color will be used after you restart Data Studio.

----End

SQL History

You can set the value of **SQL History Count** and also the number of characters saved for each query in **SQL History**.

Perform the following steps to set the value of **SQL History Count** and also the number of characters saved for each query in **SQL History**:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Editor > SQL History**.

The **SQL History** pane is displayed.

Step 3 Set the number of queries to be saved in the **SQL History Count** field.

NOTE

The value ranges from 1 to 1000. The current value of this field will be displayed.

Step 4 Set the value of **SQL Query Characters** to the maximum number of characters allowed in each query that is saved in **SQL History**.

 **NOTE**

The value ranges from 1 to 1000. You can enter **0** to remove the character limit. The current value of this field will be displayed.

Step 5 Click **Apply**.

Step 6 Click **OK**.

 **NOTE**

- Click **Restore Defaults** in the **Syntax Coloring** pane to restore the default value.
- **SQL History Count** defaults to 50 and **SQL Query Characters** defaults to 1000.
- If the input value is less than the original one, data may be lost. In this case, a message is displayed to notify you of the data loss risk and ask you whether to proceed.
- If you move away from this pane without saving the changes, a message is displayed to notify you of the unsaved changes.
- The number of pinned queries is not affected by the changed value of the **SQL History Count** field. For example, if the number of pinned queries is 50 and **SQL History Count** is set to 25, 50 pinned queries will be displayed in **SQL History**.
- If the value of **SQL Query Characters** is changed, the new value applies only to queries added after the change.

----End

Adding a Template

Data Studio allows you to create, edit, and remove a template. For details about templates, see [Using Templates](#).

 **NOTE**

If the default settings are restored, all user-defined templates will be removed from the list.

Perform the following steps to create a template:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Editor > Templates**.

The **Templates** pane is displayed.

Step 3 Click **New**.

Step 4 Enter a template name in the **Name** field.

Step 5 Enter description in the **Description** field.

Step 6 Enter a SQL statement pattern in the **Pattern** field.

 **NOTE**

The syntax of the text entered in **Pattern** will be highlighted.

Step 7 Click **OK**.

----End

Editing a Template

Perform the following steps to edit a template:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Editor > Templates**.

The **Templates** pane is displayed.

Step 3 Click **Edit**.

Step 4 Edit the name in the **Name** field as required.

Step 5 Edit the description in the **Description** field as required.

Step 6 Edit the SQL statement pattern in the **Pattern** field as required.

NOTE

The syntax of the text entered in **Pattern** will be highlighted.

Step 7 Click **OK**.

----End

Removing a Template

Perform the following steps to remove a template:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Editor > Templates**.

The **Templates** pane is displayed.

Step 3 Select the template to be removed, and click **Remove**.

The template is removed from the **Templates** pane.

NOTE

Default templates that are removed can be added back using the **Restore Removed** option. It will restore the template to the last updated version. However, the **Restore Removed** option is not applicable to user-defined templates.

----End

Restoring the Default Template Settings

Perform the following steps to restore the default template settings:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Editor > Templates**.

The **Templates** pane is displayed.

Step 3 Select at least one default template that has been modified and restore the default template settings.

Step 4 Click **Revert to Default**.

----End

Formatter

Data Studio allows you to set the tab width and convert tabs to spaces during indent and unindent operations. For details, see [Indenting or Un-indenting Lines](#).

Perform the following steps to customize the indent size and convert tabs to spaces:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Editor > Formatter**.

The **Formatter** pane is displayed.

Step 3 Select **Insert Space** to convert tabs to spaces, or **Insert Tab** to add or remove tabs when indenting or unindenting lines.

Step 4 Enter the indent size in **Indent Size** to define the indent/unindent/space length.

----End

Transaction

Perform the following steps to edit settings in **Transaction**:

Step 1 Choose **Settings > Preferences** from the main menu.

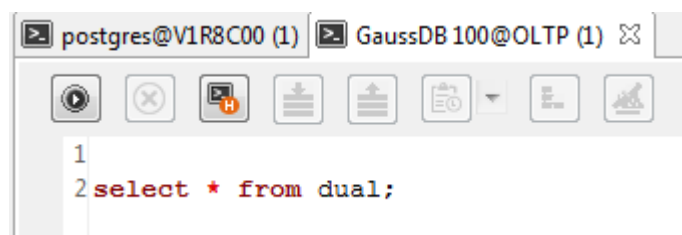
The **Preferences** dialog box is displayed.

Step 2 Choose **Editor > Transaction**.

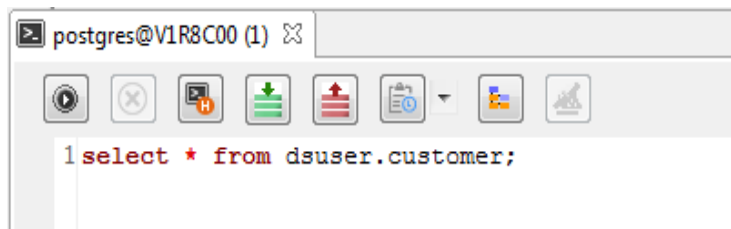
The **Transaction** pane is displayed.

Step 3 In the **Auto Commit** window, you can perform the following operations:

- Select **Enable** to enable the Auto Commit feature. In this case, transactions are automatically committed and cannot be manually committed or rolled back.



- Select **Disable** to disable the Auto Commit feature. In this case, transactions can be manually committed or rolled back.



NOTE

Auto Commit defaults to **Enable**.

----End

Folding a SQL Statement

Perform the following steps to fold a SQL statement:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Editor > Folding**.

The **Folding** pane is displayed.

Step 3 Select **Enable** or **Disable**. By default, **Enable** is selected.

- **Enable**: indicates that the SQL folding feature is enabled. Supported SQL statements can be folded or unfolded.
- **Disable**: indicates that the SQL folding feature is disabled.

NOTE

Any change in the **Folding** parameter takes effect only in new editors, and will not take effect in opened editors until they are restarted.

----End

Font

Perform the following steps to configure **Font**:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Editor > Font**.

The **Font** pane is displayed.

Step 3 Configure the font size, which ranges from 1 to 50 and defaults to 10.

----End

Auto Suggest

Perform the following steps to configure **Auto Suggest**:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Editor > Auto Suggest**.

The **Auto Suggest** pane is displayed.

Step 3 In the **Auto Suggest** pane, configure **Auto Suggest Min Character**. The value ranges from 2 to 10 and defaults to 2.

To enable the Auto Suggest feature, sort the following groups:

1. Keywords
2. Data types
3. Loaded database objects

NOTE

- Each group must be sorted.
- Databases are classified by keyword and data type.
- If database is not connected, default keywords, that is, database type, must be displayed.
- When you enter a period (.), only related database objects are displayed. Keywords and data types are not displayed.
- The Auto Suggest feature can be enabled using shortcut keys.

----End

4.21.4 Environment

Session Setting

Perform the following steps to configure Data Studio encoding and file encoding:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Environment > Session Setting**.

The **Session Setting** pane is displayed.

Step 3 Select the Data Studio encoding from the **Data Studio Encoding** drop-down list.

Step 4 Select the file encoding from the **File Encoding** drop-down list.

NOTE

Data Studio supports only UTF-8 and GBK file encoding types.

Step 5 Click **OK**. The **Restart Data Studio** dialog box is displayed.

Step 6 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, the **Process is running** dialog box is displayed.

Step 7 Click **OK** to proceed or click **Force Restart** to cancel the operations and restart Data Studio.

 **NOTE**

Click **Restore Defaults** in **Session Setting** to restore the default value. The default value for **Data Studio Encoding** and **File Encoding** is **UTF-8**.

----End

SQL Assistant

Perform the following steps to enable or disable **SQL Assistant**:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Environment > Session Setting**.

The **Session Setting** pane is displayed.

Step 3 Select **Enable/Disable** in **SQL Assistant**.

Step 4 Click **OK**.

 **NOTE**

Click **Restore Defaults** in **Session Setting** to restore the default value. The default value for **SQL Assistant** is **Enable**.

----End

Query/Function/Procedure Backup

For details about the backup features of Data Studio, see [Backing up Unsaved Queries/Functions/Procedures](#).

Perform the following steps to enable or disable the backup of unsaved data in **SQL Terminal** and **PL/SQL Viewer**:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Environment > Session Setting**.

The **Session Setting** pane is displayed.

Step 3 Select or deselect **Auto Save** in the **Auto Save** area.

Step 4 Set the time interval for data backup in the **Interval** field.

Step 5 Click **OK**.

 **NOTE**

Click **Restore Defaults** in **Session Setting** to restore the default value. By default, data backup is enabled and **Interval** defaults to 5 minutes.

----End

Perform the following steps to enable or disable the encryption of saved data:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Environment > Session Setting**.

The **Session Setting** pane is displayed.

Step 3 Select or deselect **Encryption** in the **Auto Save** area.

Step 4 Click **OK**.

 **NOTE**

Click **Restore Defaults** in **Session Setting** to restore the default value. Encryption is enabled by default.

----**End**

Perform the following steps to configure the **Import Table Data Limit** and **Import File Data Limit** parameters:

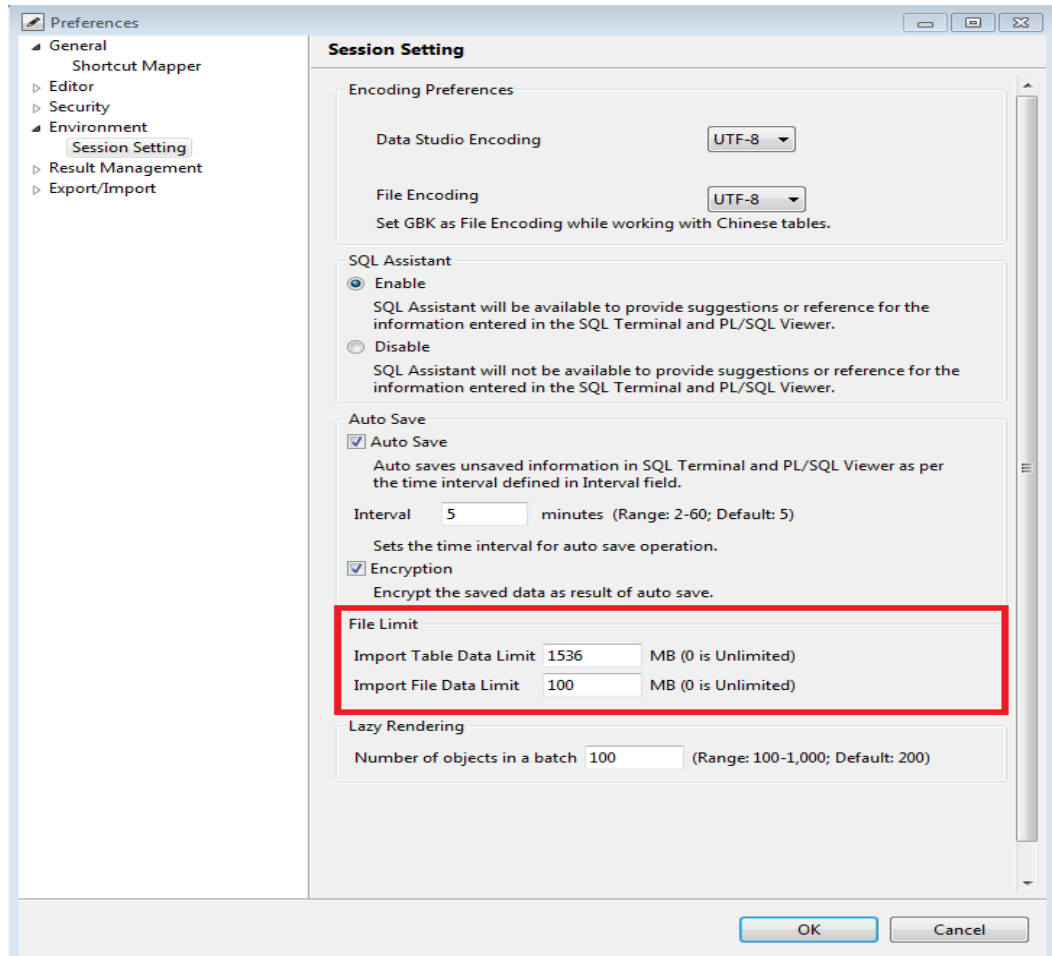
Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Environment > Session Setting**.

The **Session Setting** pane is displayed.

In the **File Limit** area, configure the **Import Table Data Limit** and **Import File Data Limit** parameters.



Import Table Data Limit: specifies the maximum size of the table data to import

Import File Data Limit: specifies the maximum size of the file to import

Step 3 Click **OK**.

 **NOTE**

Values in the preceding figure are default values.

----**End**

Perform the following steps for rendering:

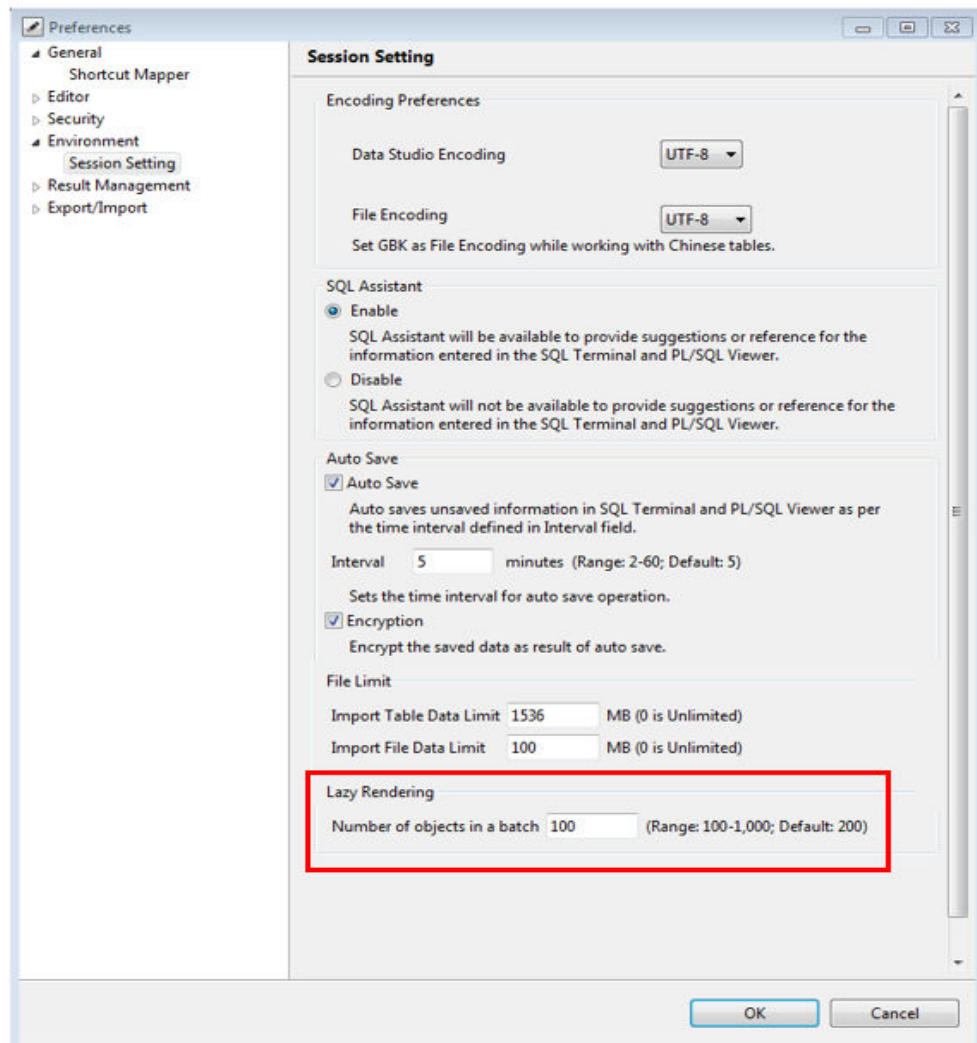
Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Environment > Session Setting**.

The **Session Setting** pane is displayed.

In the **Lazy Rendering** area, the **Number of objects in a batch** parameter is displayed.



Step 3 In the **Lazy Rendering** area, configure the **Number of objects in a batch** parameter, which ranges from 100 to 1000 and defaults to 200.

If the value input is less than 100 or more than 1000, the **Invalid Range, (100 -1000)** error message is displayed.

Step 4 Click **OK**.

----End

4.21.5 Result Management

This section describes how to customize the settings in the **Query Results** pane, including the column width, number of records to be obtained, and copy of column headers or row numbers.

Query Results

Configure the column width of query results:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Result Management > Query Results**.

The **Query Results** pane is displayed.

Step 3 Select the required option.

The options of configuring the column width are as follows.

Option	Outcome
Content Length	You can set the column width based on the content length of the query result.
Custom Length	You can customize the column width. NOTE This value ranges from 100 to 500.

Step 4 Click **OK**.

 **NOTE**

Click **Restore Defaults** in **Query Results** to restore the default value. The default value is **Content Length**.

----**End**

Set the number of records to be obtained in the query results:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Result Management > Query Results**.

The **Query Results** pane is displayed.

Step 3 Select the required option.

Option	Outcome
Fetch All records	You can obtain all records in the query results.
Fetch custom number of records	You can set the number of records to be obtained in the query results. NOTE This value ranges from 100 to 5000.

Step 4 Click **OK**.

 NOTE

Click **Restore Defaults** in **Query Results** to restore the default value. The default value is **Fetch custom number of records (1000)**.

----End

Copy column headers or row numbers from query results:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Result Management > Query Results**.

The **Query Results** pane is displayed.

Step 3 Select the required option.

Option	Outcome
Include column header	You can copy column headers from the query results.
Include row number	You can copy the selected content along with the row number from the query results.

Step 4 Click **OK**.

 NOTE

Click **Restore Defaults** in **Query Results** to restore the default value. The default value is **Include column header**.

----End

Determine how the result set window is opened:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Result Management > Result Window**.

Step 3 Select the required option.

Option	Outcome
Overwrite Resultset	After an opened result set window is closed, a new result set window will be opened.
Retain Current	After a new result set window is opened, the opened result set windows are not closed.

Step 4 Click **OK**.

----End

Edit Table Data

Perform the following steps to determine the data saving mode:

- Step 1** Choose **Settings > Preferences** from the main menu. The **Preferences** dialog box is displayed.
- Step 2** Choose **Result Management > Edit Table Data**. The **Edit Table Data** pane is displayed.

Select the required option:

Table 4-27 Editing table data

Database Type	Auto Commit	Reuse Connection	Table Data Save Option	Behavior
GaussDB(DWS)	ON	ON	Save Valid Data	Only the valid data will be saved and committed.
	ON	ON	Do Not Save	No data will be saved when an error occurs.
	ON	OFF	Save Valid Data	Only the valid data will be saved and committed.
	ON	OFF	Do Not Save	No data will be saved when an error occurs.
	OFF	ON	Save Valid Data	No data will be saved when an error occurs. Execute the COMMIT or ROLLBACK statement to save data.
	OFF	ON	Do Not Save	No data will be saved when an error occurs. Execute the COMMIT or ROLLBACK statement to save data.

- Step 3** Click **OK**.

 **NOTE**

Click **Restore Defaults** in **Edit Table Data** to restore the default value. The default value is **Save Valid Data**.

----End

Result Data Encoding

Perform the following steps to

configure whether data encoding type is displayed in the **Query Results, View Table Data**, and **Edit Table Data** panes.

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Result Management > Query Results**.

The **Query Results** pane is displayed.

Step 3 Select **Include result data encoding** to display the **Encoding** drop-down list in the **Query Results**, **View Table Data**, and **Edit Table Data** panes.

Step 4 Click **OK**.

 **NOTE**

- Click **Restore Defaults** in **Result Management** to restore the default value. **Include result data encoding** will be unselected by default.
- To make the change take effect, you need to edit a table, view table properties, or execute a query again.

----End

4.21.6 Security

This section describes how to customize the display of passwords and security disclaimers.

Saving Password Permanently

You can configure whether to display the option of saving password permanently in the **Connection** pane.

Perform the following steps to modify the display of the option of saving password permanently:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Security > Password**.

The **Password** pane is displayed.

Step 3 Select the required option. For details, see the following table.

Option	Description
Yes	The option of saving password permanently is displayed in the Save Password drop-down list in the Connection pane.
No	The option of saving password permanently is displayed in the Save Password drop-down list in the Connection pane and the saved passwords will be deleted.

Step 4 Click **OK**. The **Restart Data Studio** dialog box is displayed.

Step 5 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, the **Process is running** dialog box is displayed.

Click **Force Restart** to cancel the operations and restart Data Studio.

Step 6 Restart Data Studio, or click **OK** to proceed with the current operations.

 **NOTE**

Click **Restore Defaults** in **Password** to restore the default value. The default value is **No**.

----End

Password Expiry

This topic describes how to continue or stop using Data Studio after password expires using the Password setting.

Perform the following steps to modify the behavior of Data Studio upon password expiry:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Security > Password**.

The **Password** pane is displayed.

Step 3 Select the required option. For details, see the following table.

Option	Description
Yes	You can log in to Data Studio after the password expired. NOTE A message is displayed notifying you that the password has expired and that some operations may not be performed properly in the following scenarios: <ul style="list-style-type: none">• Creating a connection• Editing a connection• Connecting to a database during its creation when no other database is connected in that connection profile• Connecting to a database when no other database is connected in that connection profile
No	You cannot log in to Data Studio after the password expired. A message is displayed notifying you that the password has expired.

Step 4 Click **OK**. The **Restart Data Studio** dialog box is displayed.

Step 5 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, the **Process is running** dialog box is displayed.

Step 6 Click **Force Restart** to cancel the operations and restart Data Studio. Click **OK** to proceed with the current operations.

 **NOTE**

The default value is **Yes**.

----End

Security Disclaimer

You can configure whether to display the security disclaimer for any insecure connection or file operation.

Perform the following steps to modify the display of the security disclaimer:

Step 1 Choose **Settings > Preferences** from the main menu.

The **Preferences** dialog box is displayed.

Step 2 Choose **Security > Security Disclaimer**.

The **Security Disclaimer** pane is displayed.

Step 3 Select the required option. For details, see the following table.

Option	Description
Enable	The security disclaimer is displayed each time you try to establish an insecure connection or perform a file operation.
Disable	The security disclaimer is not displayed each time you try to establish an insecure connection or perform a file operation. You need to agree to the security implications that may arise due to insecure connection.

Step 4 Click **OK**. The **Restart Data Studio** dialog box is displayed.

Step 5 Click **Yes** to restart Data Studio. If any export, import or execution operations are in progress, the **Process is running** dialog box is displayed.

Step 6 Click **Force Restart** to cancel the operations and restart Data Studio. Click **OK** to proceed with the current operations.

NOTE

Click **Restore Defaults** in **Security Disclaimer** to restore the default value. The default value is **Enable**.

----End

4.22 Performance Specifications

The loading and operation performance of Data Studio depends on the number of objects to be loaded in **Object Browser**, including tables, views, and columns.

Memory consumption also depends on the number of loaded objects.

To improve object loading performance and better utilize memory, you are advised to divide an object into multiple namespaces, and to avoid using namespaces that contain a large number of objects and cause data skew. By default, Data Studio loads the namespaces in the *search_path* set for the user logged in. Other namespaces and objects are loaded only when needed.

To improve performance, you are advised to load all objects. Do not load objects based on user permissions. [Table 4-28](#) describes the minimum access permissions required to list objects in the **Object Browser**.

Table 4-28 Minimum permission requirements

Object Type	Type	Object Browser - Minimum Permission
Database	Create, Connect, Temporary/Temp, All	Connect
Schemas	Create, Usage, All	Usage
Tables	Select, Insert, Update, Delete, Truncate, References, All	Select
Columns	Select, Insert, Update, References, All	Select
Views	Select, Insert, Update, Delete, Truncate, References, All	Select
Sequences	Usage, Select, Update, All	Usage
Functions	Execute, All	Execute

To improve the performance of find and replace operations, you are advised to break a line that contains more than 10,000 characters into multiple short lines.

The following test items and results can help you learn the performance of Data Studio.

Recommended maximum memory (current version)		1.4 GB
Performance (The database contains a 150 KB table and a 150 KB view, each containing three columns. The maximum memory configuration is used.)		
>	Time taken to refresh namespaces in Object Browser	15s
>	Time taken for initial loading and expanding of all tables/views in Object Browser	90s-120s
>	Time taken for subsequent loading and expanding of all tables/views in Object Browser	<10s
>	Total used memory	700 MB

 NOTE

The performance data is for reference only. The actual performance may vary according to the application scenario.

4.23 Security Management

4.23.1 Overview

NOTICE

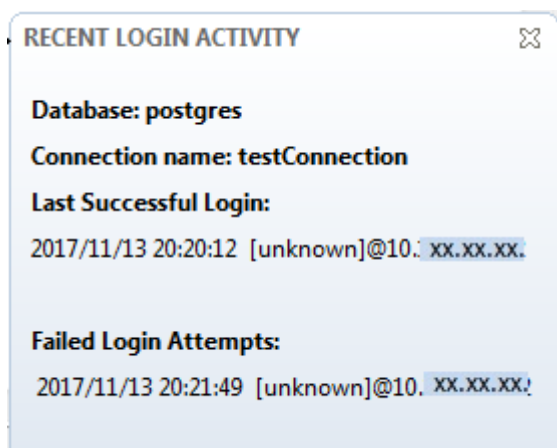
Ensure that the operating system and the required software's (refer to [System Requirements](#) for more details) are updated with the latest patches to prevent vulnerabilities and other security issues.

This section provides the security management information for Data Studio.

4.23.2 Login History

The following information is critical to the security management for Data Studio:

- When you log into a database, Data Studio displays a dialog box that describes the last successful login and the failed login attempts between the last two successful logins.



NOTE

If the message **Last login details not available** is displayed, the connected database cannot display information about the last login.

4.23.3 Password Expiry Notification

The following information is critical to manage security for Data Studio:

- Your password will expire within 7 days from the date of notification. If the password expires, contact the database administrator to reset the password.
- The password must be changed every 90 days.

4.23.4 Securing the Application In-Memory Data

The following information is critical to manage security for Data Studio:

While running Data Studio in a trusted environment, user must ensure to prevent malicious software scanning or accessing the memory which is used to store application data including sensitive information.

Alternatively, you can choose **Do Not Save** while connecting to the database, so that password does not get saved in the memory.

4.23.5 Data Encryption for Saved Data

The following information is critical to manage security for Data Studio:

You can ensure encryption of auto saved data by enabling encryption option from **Preferences** page. Refer to [Query/Function/Procedure Backup](#) section for steps to encrypt the saved data.

4.23.6 SQL History

The following information is critical to manage security for Data Studio:

- SQL History scripts are not encrypted.
- The **SQL History** list does not display sensitive queries that contain the following keywords:
 - Alter Role
 - Alter User
 - Create Role
 - Create User
 - Identified by
 - Password
- Few query syntax examples are listed below:
 - ALTER USER name [[WITH] option [...]]
 - CREATE USER name [[WITH] option [...]]
 - CREATE ROLE name [[WITH] option [...]]
 - ALTER ROLE name [[WITH] option [...]]

4.23.7 SSL Certificates

NOTICE

The information about using SSL certificates is for reference only. For details about the certificates and the security guidelines for managing the certificates and related files, see the database server documentation.

Data Studio can connect to the database using the Secure Sockets Layer (SSL) option. [Adding a Connection](#) lists the files required.

#	Certificate/Key	Description
1	Client SSL Certificate	Provided by the system/database administrator

#	Certificate/Key	Description
2	Client SSL Key	Provided by the system/database administrator
3	Root Certificate	Provided by the system/database administrator

SSL Certificate Generation and Server Configuration

Perform the following steps to generate a certificate:

Step 1 Establish a Certificate Authority (CA) environment: Assume that user **omm** has been created and the CA path is **test**.

Log in to SUSE Linux as user **root** and switch to user **omm**.

Run the following commands:

```
mkdir test
cd /etc/ssl
```

Copy the configuration file **openssl.cnf** to the **test** directory.

Run the following commands:

```
cp openssl.cnf ~/test
cd ~/test
```

Establish the CA environment under the **test** folder.

Create a folder in the **demoCA./demoCA/newcerts./demoCA/private** directory.

Run the following commands:

```
mkdir ./demoCA ./demoCA/newcerts ./demoCA/private
chmod 777 ./demoCA/private
```

Create the **serial** file and write it to **01**.

Run the following command:

```
echo '01'>./demoCA/serial
```

Create the **index.txt** file.

Run the following command:

```
touch /home/omm/test/demoCA/index.txt
```

Modify parameters in the **openssl.cnf** configuration file.

Run the following commands:

```
dir = /home/omm/test/demoCA
default_md = sha256
```

The CA environment has been established.

Step 2 Generate a root private key: Generate a CA private key.

Run the following command:

```
openssl genrsa -aes256 -out demoCA/private/cakey.pem 2048
```

A 2048-bit RSA private key is generated.

Step 3 Generate a root certificate request file: The root certificate application file name is **server.req**.

Run the following commands:

```
openssl req -config openssl.cnf -new -key demoCA/private/cakey.pem -out demoCA/careq.pem
```

Enter the password of **demoCA/private/cakey.pem**.

Enter the private key password of user **root**.

You need to enter information that will be included in your certificate request.

The information you need to enter is a Distinguished Name (DN).

You can leave some fields blank.

For a field that contains a default value, enter a period (.) to leave the field blank. Enter the following information in the generated server certificate and client certificate.

```
Country Name (2 letter code) [AU]:CN
State or Province Name (full name) [Some-State]:xxxx
Locality Name (eg, city) []:xxx
Organization Name (eg, company) [Internet Widgits Pty Ltd]:Abc
Organizational Unit Name (eg, section) []:hello
-Common name can be any name
Common Name (eg, YOUR name) []:world
-Email is optional.
Email Address []:
A challenge password []:
An optional company name []:
```

Step 4 Generate a self-signed root certificate.

Run the following command:

```
openssl ca -config openssl.cnf -out demoCA/cacert.pem -keyfile demoCA/private/cakey.pem -selfsign -infiles demoCA/careq.pem
```

Use the configurations of **openssl.cnf**.

Enter the password of **demoCA/private/cakey.pem**.

Enter the private key password of user **root**.

Check whether the request matches the signature.

```
Signature ok
Certificate Details:
Serial Number: 1 (0x1)
Validity
Not Before: Feb 28 02:17:11 2017 GMT
Not After : Feb 28 02:17:11 2018 GMT
Subject:
countryName = CN
stateOrProvinceName = shanxi
organizationName = Abc
organizationalUnitName = hello
commonName = world
X509v3 extensions:
X509v3 Basic Constraints:
CA:FALSE
Netscape Comment:
OpenSSL Generated Certificate
X509v3 Subject Key Identifier:
F9:91:50:B2:42:8C:A8:D3:41:B0:E4:42:CB:C2:BE:8D:B7:8C:17:1F
X509v3 Authority Key Identifier:
```

```
keyid:F9:91:50:B2:42:8C:A8:D3:41:B0:E4:42:CB:C2:BE:8D:B7:8C:17:1F
Certificate is to be certified until Feb 28 02:17:11 2018 GMT (365 days)
Sign the certificate? [y/n]:y
1 out of 1 certificate requests certified, commit? [y/n]:y
Write out database with 1 new entries
Data Base Updated
```

A CA root certificate named **demoCA/cacert.pem** has been issued.

Step 5 Generate a server certificate private key: Generate the private key file **server.key**.

Run the following command:

```
openssl genrsa -aes256 -out server.key 2048
```

Step 6 Generate a server certificate request file: Generate the server certificate request file **server.req**.

Run the following command:

```
openssl req -config openssl.cnf -new -key server.key -out server.req
```

Enter the password of **server.key**.

You need to enter information that will be included in your certificate request.

The information you need to enter is a Distinguished Name (DN).

You can leave some fields blank.

For a field that contains a default value, enter a period (.) to leave the field blank.

Configure the following information and ensure that the configuration is the same as that upon CA creation.

```
Country Name (2 letter code) [AU]:CN
State or Province Name (full name) [Some-State]:xxxx
Locality Name (eg, city) []:xxxx
Organization Name (eg, company) [Internet Widgits Pty Ltd]:Abc
Organizational Unit Name (eg, section) []:hello
-Common name can be any name
Common Name (eg, YOUR name) []:world
Email Address []:
-- The following information is optional.
A challenge password []:
An optional company name []:
```

Step 7 Generate a server certificate: Set the **demoCA/index.txt.attr** attribute to **no**.

```
vi demoCA/index.txt.attr
```

Issue the generated server certificate request file. After it is issued, the official server certificate **server.crt** is generated.

```
openssl ca -config openssl.cnf -in server.req -out server.crt -days 3650 -md sha256
```

Use the configurations of **/etc/ssl/openssl.cnf**.

Enter the password of **/demoCA/private/cakey.pem**.

Check whether the request matches the signature.

```
Signature ok
Certificate Details:
Serial Number: 2 (0x2)
Validity
Not Before: Feb 27 10:11:12 2017 GMT
Not After : Feb 25 10:11:12 2027 GMT
```

```
Subject:
countryName = CN
stateOrProvinceName = shanxi
organizationName = Abc
organizationalUnitName = hello
commonName = world
X509v3 extensions:
X509v3 Basic Constraints:
CA:FALSE
Netscape Comment:
OpenSSL Generated Certificate
X509v3 Subject Key Identifier:
EB:D9:EE:C0:D2:14:48:AD:EB:BB:AD:B6:29:2C:6C:72:96:5C:38:35
X509v3 Authority Key Identifier:
keyid:84:F6:A1:65:16:1F:28:8A:B7:0D:CB:7E:19:76:2A:8B:F5:2B:5C:6A
Certificate is to be certified until Feb 25 10:11:12 2027 GMT (3650 days)
-- Choose y to sign and issue the certificate.
Sign the certificate? [y/n]y
-- Select y, the certificate signing and issuing is complete.
1 out of 1 certificate requests certified, commit? [y/n]y
Write out database with 1 new entries
Data Base Updated
```

Enable password protection for the private key: If the password protection for the server private key is not enabled, you need to use `gs_guc` to encrypt the password.

```
gs_guc encrypt -M server -K root private key password -D ./
```

After the password is encrypted using `gs_guc`, two private key password protection files `server.key.cipher` and `server.key.rand` are generated.

Step 8 Generate a client certificate and private key:

Generate a client private key.

```
openssl genrsa -aes256 -out client.key 2048
```

Generate a client certificate request file.

```
openssl req -config openssl.cnf -new -key client.key -out client.req
```

After the generated client certificate request file is signed and issued, the official client certificate `client.crt` will be generated.

```
openssl ca -config openssl.cnf -in client.req -out client.crt -days 3650 -md sha256
```

NOTE

If **METHOD** is set to **cert** in the `pg_hba.conf` file of the server, the client must use the **username** (common user) configured in the license file `client.crt` to connect to a database. If **METHOD** is set to **md5** or **sha256**, the client does not have this restriction.

If the password protection for the client private key is not removed, you need to use `gs_guc` to encrypt the password.

```
gs_guc encrypt -M client -K root private key password -D ./
```

After the password is encrypted using `gs_guc`, two private key password protection files `client.key.cipher` and `client.key.rand` are generated.

----End

Replacing Certificates

Default security certificates and keys required for SSL connection are configured in LibrA. Before the operation, obtain official certificates and keys for the server and client from the CA.

Step 1 Prepare for a certificate and a key. The conventions for configuration file names on the server are as follows:

```
l Certificate name: server.crt
l Key name: server.key
l Key password and encrypted file: server.key.cipher and server.key.rand
Conventions for configuration file names on the client:
l Certificate name: client.crt
l Key name: client.key
l Key password and encrypted file: client.key.cipher and client.key.rand
l Certificate name: cacert.pem
l Names of files on in the revoked certificate list: sslcrl-file.crl
```

Step 2 Create a package.

Package name: **db-cert-replacement.zip**

Package format: ZIP

Package file list: **server.crt, server.key, server.key.cipher, server.key.rand, client.crt, client.key, client.key.cipher, client.key.rand, and cacert.pem**

If you need to configure the certificate revocation list (CRL), the package file list must contain **sslcrl-file.crl**.

Run the following commands:

```
zip db-cert-replacement.zip client.crt client.key client.key.cipher client.key.rand server.crt server.key
server.key.cipher server.key.rand
zip -u ../db-cert-replacement.zip cacert.pem
```

Step 3 Call the certificate replacement interface to replace a certificate. Upload the package **db-cert-replacement.zip** to any path of a cluster user, for example, **/home/gaussdba/test/db-cert-replacement.zip**.

Run the following command to replace the certificate in Coordinator (CN):

```
gs_om -t cert --cert-file=/home/gaussdba/test/db-cert-replacement.zip
```

Starting SSL cert files replace.

Backing up old SSL cert files.

Backup SSL cert files on BLR1000029898 successfully.

Backup SSL cert files on BLR1000029896 successfully.

Backup SSL cert files on BLR1000029897 successfully.

Backup gds SSL cert files on successfully.

BLR1000029898 replace SSL cert files successfully.

BLR1000029896 replace SSL cert files successfully.

BLR1000029897 replace SSL cert files successfully.

Replace SSL cert files successfully.

Distribute cert files on all coordinators successfully.

You can run the **gs_om -t cert --rollback** command to remotely call the interface and the **gs_om -t cert --rollback -L** command.

----End

Client Configuration

Step 1 Run the following command on the client key file:

```
openssl pkcs8 -topk8 -inform PEM -outform DER -in Client.key -out client.pk8
```

Step 2 Copy the created **client.pk8**, **client.crt**, and **cacert.pem** files to the client.

 **NOTE**

When you select **Client SSL Key** on Data Studio, the key file cannot be selected and only the *.pk8 file can be selected. However, this file is not included in the downloaded certificate.

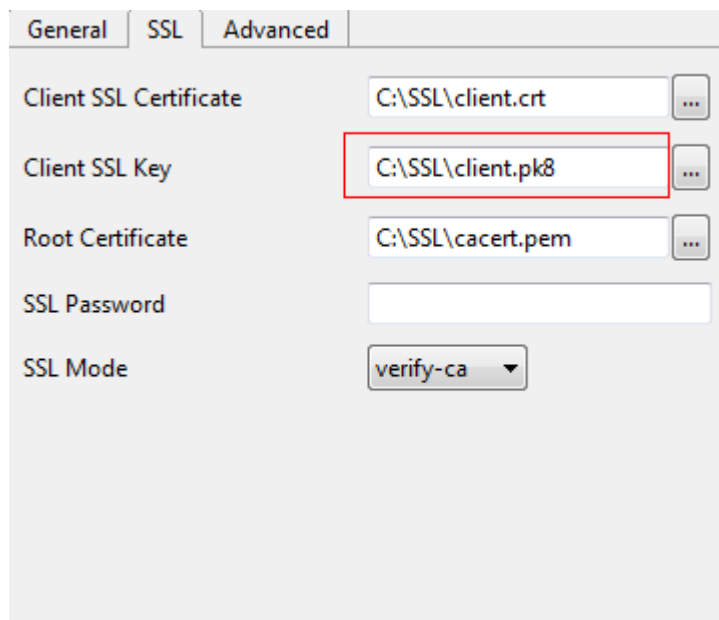
Step 3 Configure **Two way** SSL authentication for the client on the server.

```
hostssl all all 10.18.158.95/32 cert
```

Configure **One way** SSL authentication for the client on the server.

```
hostssl all all 10.18.158.95/32 sha256
```

Step 4 During the login to Data Studio, password is not validated in the two-way SSL authentication.



You need to enter the SSL password.

----End

4.24 Troubleshooting

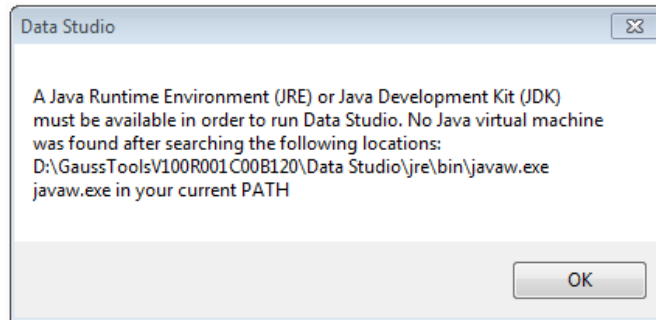
1. The Data Studio cannot be opened for a long time.

Solution: Check whether JRE is found. Verify the Java path configured in the environment. For details about the supported Java JDK versions, see [System Requirements](#).

2. After you double-click the Data Studio.exe file, the Data Studio cannot be opened and a Java running error is displayed.

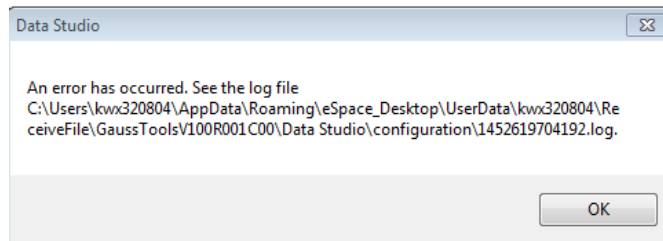
Solution

- Without JRE:



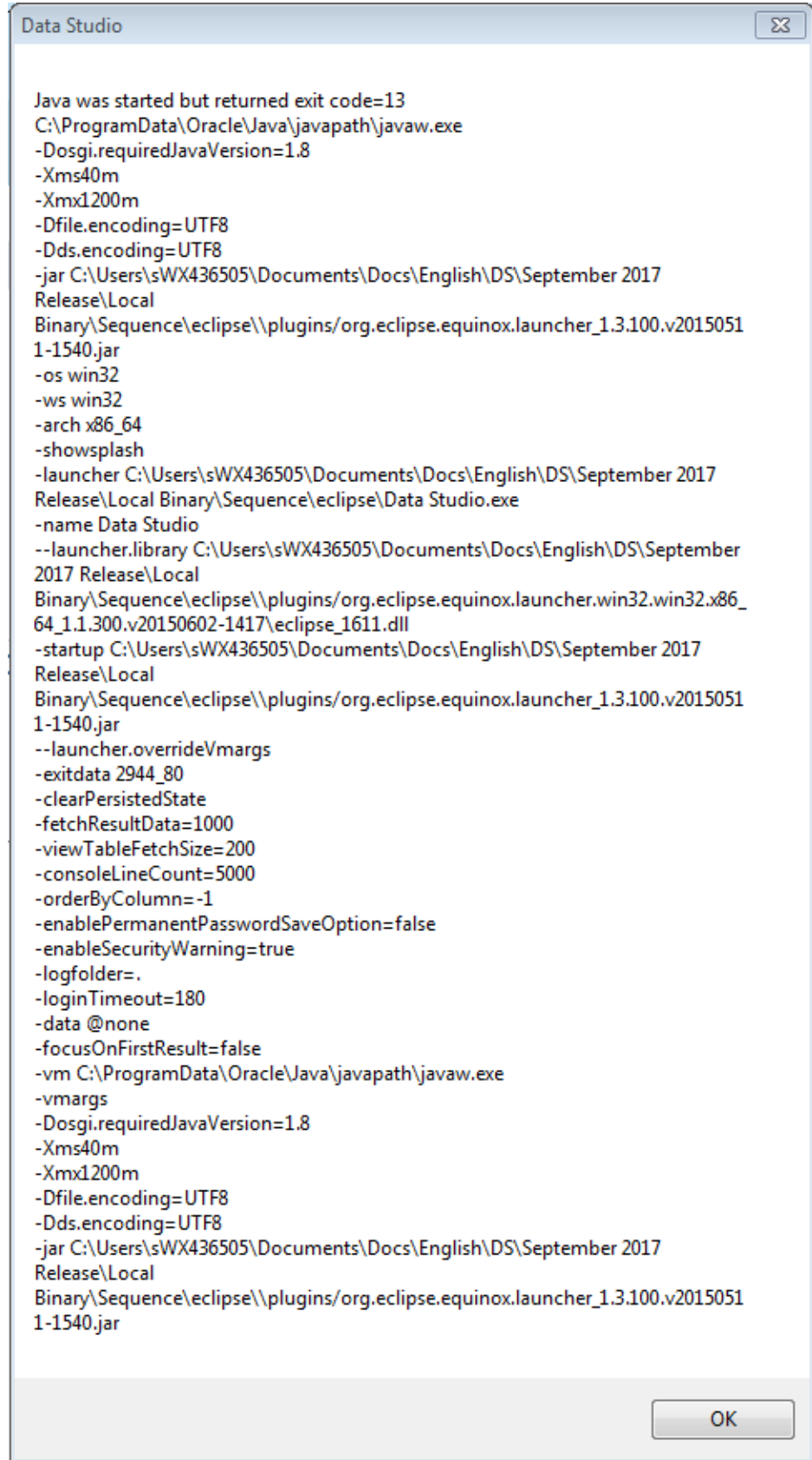
Check whether the Java Runtime Environment (JRE) or Java Development Kit (JDK) version 1.8 that matches the bit version of the operating system has been installed in the system, and set the Java Home path. If multiple Java versions are installed, set the -vm parameter in the configuration file by referring to [Installing and Configuring Data Studio](#). This is the prerequisite for running Data Studio.

- Old JRE version:



Query the version of the installed JRE or JDK. If an earlier version is installed in the system, this error is reported. Upgrade the JRE version to 1.8 that matches the number of bits of the operating system.

- Incompatible with Java



```
Data Studio

Java was started but returned exit code=13
C:\ProgramData\Oracle\Java\javapath\javaw.exe
-Dosgi.requiredJavaVersion=1.8
-Xms40m
-Xmx1200m
-Dfile.encoding=UTF8
-Dds.encoding=UTF8
-jar C:\Users\sWX436505\Documents\Docs\English\DS\September 2017
Release\Local
Binary\Sequence\eclipse\plugins/org.eclipse.equinox.launcher_1.3.100.v2015051
1-1540.jar
-os win32
-ws win32
-arch x86_64
-showsplash
-launcher C:\Users\sWX436505\Documents\Docs\English\DS\September 2017
Release\Local Binary\Sequence\eclipse\Data Studio.exe
-name Data Studio
--launcher.library C:\Users\sWX436505\Documents\Docs\English\DS\September
2017 Release\Local
Binary\Sequence\eclipse\plugins/org.eclipse.equinox.launcher.win32.win32.x86_
64_1.1.300.v20150602-1417\eclipse_1611.dll
-startup C:\Users\sWX436505\Documents\Docs\English\DS\September 2017
Release\Local
Binary\Sequence\eclipse\plugins/org.eclipse.equinox.launcher_1.3.100.v2015051
1-1540.jar
--launcher.overrideVmargs
-exitdata 2944_80
-clearPersistedState
-fetchResultData=1000
-viewTableFetchSize=200
-consoleLineCount=5000
-orderByColumn=-1
-enablePermanentPasswordSaveOption=false
-enableSecurityWarning=true
-logfolder=.
-loginTimeout=180
-data @none
-focusOnFirstResult=false
-vm C:\ProgramData\Oracle\Java\javapath\javaw.exe
-vmargs
-Dosgi.requiredJavaVersion=1.8
-Xms40m
-Xmx1200m
-Dfile.encoding=UTF8
-Dds.encoding=UTF8
-jar C:\Users\sWX436505\Documents\Docs\English\DS\September 2017
Release\Local
Binary\Sequence\eclipse\plugins/org.eclipse.equinox.launcher_1.3.100.v2015051
1-1540.jar

OK
```

Check the version of the JRE or JDK installed in the system. If the installed Java version is incompatible with the system, this error occurs.

Upgrade the JRE version to 1.8 that matches the number of bits of the operating system.

You are advised to run the BAT file to check the Java version compatibility, and then open Data Studio. For details, see [Quick Start](#).

- The following information is displayed when you run the StartDataStudio.bat file:

Solution

information	Solution
You are trying to run 32-bit Data Studio in the following environment: <ul style="list-style-type: none">64-bit OSWindows 7 Professional64-bit Java 1.8 JDK (incompatible) Install 32-bit Java 1.8.	Install 32-bit Java 1.8.
The Java version supported by Data Studio must be 1.8 or later. Before using Data Studio, you need to install Java 1.8.	Install Java 1.8 that matches the number of bits of the operating system.
You are trying to run 64-bit Data Studio in the following environment: <ul style="list-style-type: none">64-bit OSWindows 7 Professional32-bit Java 1.8 JDK (incompatible): Install 64-bit Java 1.8.	Install 64-bit Java 1.8.
You are trying to run 64-bit Data Studio in the following environment: <ul style="list-style-type: none">For a 32-bit OS, run the following command:Windows 7 Professional32-bit Java 1.8 JDK (incompatible) Install the 32-bit Data Studio.	Install the 32-bit Data Studio.

- All entered information is correct, but the Data Studio cannot connect to the server.

Solution: Check whether the server is running on the specified IP address and port. Use `mysql` to connect to a specified user and check the user availability.

- Connection problems occur during the use of Data Studio.

Solution: If a connection problem occurs during the use of Data Studio, see the following example.

Create a database connection.

Used for executing queries.

When a connection exception occurs in any database (PostgreSQL), the connection is closed. When the database connection is closed, all open procedure and function windows are closed.

The system displays an error message. The Object Browser navigation tree displays the database status.

 **NOTE**

Only the current database is interrupted. Other databases remain connected or are reconnected.

Reconnect to the database and continue the query.

6. When a Java application is used to obtain a process that contains Chinese comments, the Chinese characters are invisible. What should we do?

Solution: Choose Preferences > Session Settings > Data Studio Encoding and set the encoding format to GBK so that Chinese characters can be displayed properly.

7. When you connect to the database and load a large number of SQL queries and data on the SQL terminal, the "Out Of Memory" or "Java Heap Error" error may occur in Data Studio. How to solve this problem?

Solution: When the Data Studio has used up the allocated maximum Java memory, the message "Out of Memory" or "Java Heap Error" is displayed. By default, the Data Studio.ini configuration file (in the Data Studio installation path) contains the entry -Xmx1200m. 1200m indicates 1200 MB, which is the maximum Java memory that can be used by Data Studio. The memory usage of Data Studio depends on the size of data obtained by users during the use of Data Studio.

To solve this problem, you can expand the Java memory size to an ideal value. For example, change -Xmx1200m to -Xmx2000m and restart Data Studio. If the updated memory is used up, the same problem may occur again.

 **NOTE**

- For the 32-bit Data Studio with 8 GB RAM, the value of Xmx cannot exceed 2044. For the 64-bit Data Studio with 8 GB RAM, the value of Xmx cannot exceed 6000. The upper limit may vary with the current memory usage of the user.

Examples are as follows:

-Xms1024m

-Xmx1800m

- The maximum file size supported by Data Studio on the SQL terminal depends on the value of Xmx in the Data Studio.ini file and the available memory.

8. If a large amount of data is returned after the SQL query is executed, the Data Studio displays the "Insufficient Memory" error. What should we do?

Solution: Data Studio disconnects from the database specified in the file. Re-establish the connection and continue the operation.

9. Why do I receive an export failure message when exporting DDL or data?

Solution: The possible causes are as follows:

- An invalid client SSL certificate and/or client SSL key file was selected. Select a correct file and try again. For details, see [Adding a Connection](#).
- The identity of the object in the database may have changed. Check whether the identity of the object has changed and try again.

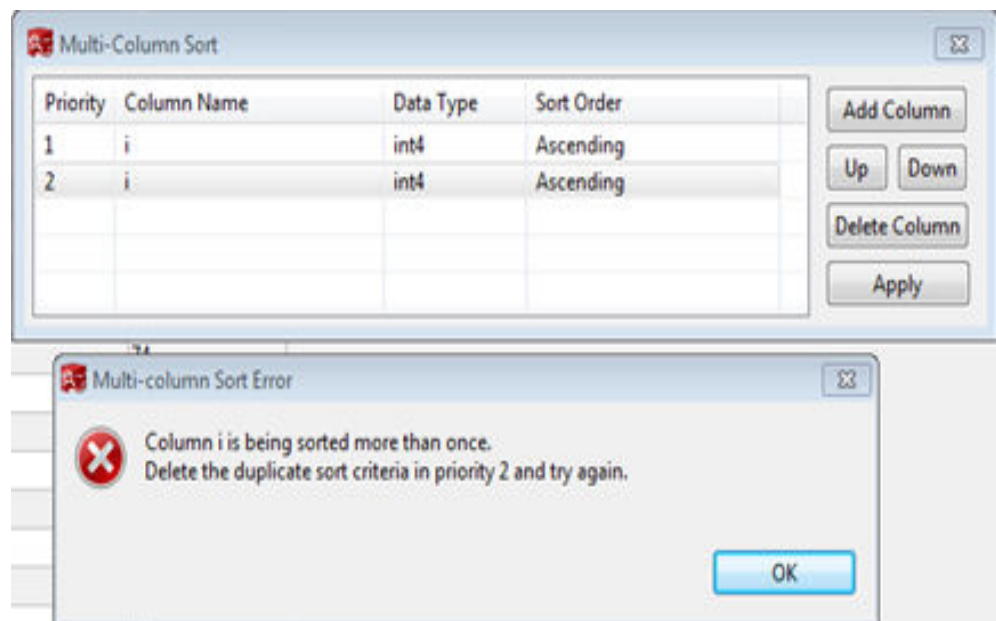
- You do not have the required permissions. Contact the database administrator to obtain required permissions.
10. Why does the system receive a message indicating that the DDL operation fails when the DDL operation is performed?
- Solution: The possible causes are as follows:
- An invalid client SSL certificate and/or client SSL key file was selected. Select a correct file and try again. For details, see [Adding a Connection](#).
 - The identity of the object in the database may have changed. Check whether the identity of the object has changed and try again.
 - You do not have the required permissions. Contact the database administrator to obtain required permissions.
11. Why do I receive the following error message when performing a Show DDL or Export DDL operation?
- "Can't start this program because MSVCRT100.dll is missing on your computer. Try reinstalling the program to resolve the problem."
- Solution:** gs_dump.exe needs to be executed to display or export DDL, which requires the VC Runtime Library file msvcrt100.dll.
- To resolve this issue, copy the msvcrt100.dll file from the \Windows\System32 folder to the \Windows\SysWOW64 folder.
12. Why is the saved connection details not displayed when I try to establish a connection?
- Solution: If the Profile folder in the User Data folder is unavailable or has been manually modified, this problem may occur. Ensure that the Profile folder exists and its name meets the requirements.
13. Why Are Historical SQL Query Records Lost When I Close and Restart Data Studio?
- Solution: If the Profile folder in the User Data folder is lost or manually modified, this problem may occur. Ensure that the Profile folder exists and its name meets the requirements.
14. Why does the system display a message indicating that the modification fails to be saved when I attempt to modify the syntax highlighting setting?
- Solution: This problem may occur if the Preferences file does not exist or its name has been changed. Restart Data Studio.
15. What should I do if the Data Studio is in the idle state but the Data Studio.log file is in the No more handles state?
- Solution: Restart Data Studio.
16. What happens if I send a 303 error after editing a table and I cannot continue to modify the table?
- Solution: All edited data will be lost. Close the Edit Data dialog box and modify the data again.
17. Why is the message "The number of pasted cells does not match the number of selected cells" displayed when the operation is correct?
- Solution: This problem occurs if you choose Preferences > Query Results and set the column headers to be included. The selected cell also contains the column header cell. Modify the settings to disable the Include column headers option and try again.

18. Why can't I edit temporary tables when the Reuse Connections option is disabled?

Answer: After the Reuse Connection option is disabled, the tool creates a new session, but the temporary table can be edited only in the existing connection. To edit temporary tables, enable the Reuse Connections option. For details, see [Managing SQL Terminal Connections](#).

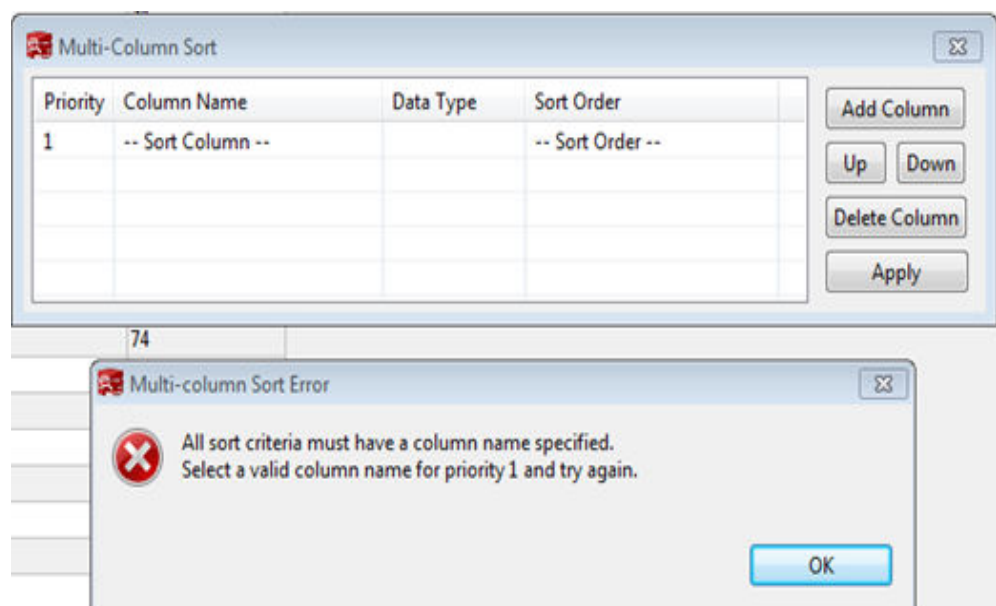
19. What happens when you add the same column multiple times in a multi-column sort dialog box?

Answer: If you add the same column multiple times in the multi-column sorting dialog box and click Apply, the following message is displayed. You need to click OK and select non-duplicate columns for sorting.



20. What happens when no column name is specified and Apply is clicked?

Answer: The following message is displayed. You need to set a valid column name and click Apply again. Then, the message is not displayed.



21. What happens when I click Cancel while multiple table queries are running in the SQL terminal window?

Answer: Canceling a table query that is being executed may cause the console to display the names of tables that are not created. In this case, you are advised to delete the table so that you can perform operations on tables with the same name.

22. What Should I Do If I Cannot Log In to Data Studio Because the Security Key Is Cracked?

Solution: Perform the following steps to generate a new security key:

- a. Choose Datastudio > Userdata and delete Security folder.
- b. Restart Data Studio.
- c. Create a new security folder and generate a new key.
- d. Enter the password again to log in to Data Studio.

4.25 FAQs

1. **What do I need to check if my connection fails?**

Answer: Check the following items:

- Check whether **Connection Properties** are properly configured.
- Check whether the server version is compatible with the client version.
- Check whether the **database\pg_hba.conf** file is correctly configured. For details, see the server manual.
- Check whether the **Data Studio.ini** file is correctly configured.

2. **Why does the connection succeed when I try connecting to another server using an SSL certificate?**

Answer: If the same SSL certificates are used by different servers, then the second connection will succeed because the certificates are cached.

When you establish a connection with a different server using different SSL certificates, the connection will fail due to certificate mismatch.

3. **When I right-click on a function/procedure and refresh it in Object Browser, why does the function/procedure disappear?**

Answer: This problem may occur if you drop a function/procedure and recreate it. In this case, refresh the parent folder to view the function/procedure in **Object Browser**.

4. **What do I do if a critical error occurs in a database session and operations cannot proceed?**

Answer: Critical error may occur in some of the following cases. Check whether:

- The connection is left idle for a long time and has timed out.
- The server is running.
- The server has sufficient memory and whether the Out Of Memory (OOM) error is reported to the server.

5. **What is a constraint?**

Answer: Constraints are used to deny the insertion of unwanted data in columns. You can create restrictions on one or more columns in any table. It maintains the data integrity of the table.

The following constraints are supported:

- Primary Key constraint
- Unique Key constraint
- Check constraint

6. **What is an index?**

Answer: An index is a copy of the selected column of a table that can be searched very efficiently. It also includes a low level disk block address or a direct link to the complete row of data it was copied from.

7. **What is the default encoding for Data Studio's files?**

Answer: Exported, imported, and system files are encoded with the system's default encoding as configured in **Settings > Preferences**. The default encoding is UTF-8.

8. **When I try to open Data Studio, the system displays a message indicating that Data Studio does not support opening multiple instances. Why do I get this error message?**

Answer: A user cannot open multiple instances in Data Studio.

9. **What do I do if a DDL statement running indefinitely and cannot be canceled?**

Answer: This problem may occur if other DML/DDDL operations are being performed on the same object. In this case, stop all the DML/DDDL operations on the object and try again. If the problem persists, there may be another user performing DML/DDDL operations on the object. Try again later. You can customize table data and check the operations in a transaction by following the instructions provided in [Data Studio GUI](#).

10. **Why is the exported query result different from the data available on the Results tab?**

Answer: When a result set data is exported, a new connection is used to execute the query again. The exported results may be different from the data on the **Result** tab.

11. **Why does last login information show "Last login details not available"?**

Answer: This message is displayed when you connect to the database server of an earlier version or log in to the database for the first time after it is created.

12. **Why is the error marked incorrectly in SQL Terminal?**

Answer: This problem occurs when the server returns an incorrect line number. You can view the error message on the **Message** tab and locate the correct row to rectify the fault.


13. **Will deleted columns be displayed after "Show DDL" or "Export DDL" operations?**

Answer: Yes.

14. **Why can't Data Studio be started after the -Xmx parameter is modified?**

Answer: The value of **-Xmx** may be invalid. For details, see [Installing and Configuring Data Studio](#).

15. How do I quickly switch to the desired tab if there are multiple tabs open?

Answer: If the number of opened tabs reaches a certain limit (depending on your screen resolution), the  icon will be displayed at the end of the tab list. Click this icon and select the required tab from the drop-down list. If this icon is not available, use the tooltip to identify the tabs. You also search for a **SQL Terminal** tab by its name. For example:

- *s, this displays all Terminal names that start with s.
- test, this displays all Terminal names that start with test.
- *2, this displays all Terminal names that contain 2 in them.

16. Why does the language not change after I change the language setting and restart Data Studio?

Answer: Sometimes the language may not reflect the selected change post restart. Manually restart DS to open the tool in selected language.

17. Why does the last login details information not display?

Answer: At times the server returns an error while trying to fetch last login details. In such scenarios the last login pop-up message does not display.

18. When viewing/exporting DDL, why does the Chinese text not show properly?

Answer: This happens if the SQL, DDL, object names or data contains Chinese text and the Data Studio file encoding is not set to GBK. To solve this, go to Settings > Preferences > Environment > **File Encoding** and set the encoding to GBK. The supported combinations of Database and Data Studio encoding for export operation are shown in [Table1 Supported combinations of file encoding](#).

To open/view the exported files in Windows Explorer: Files exported with UTF-8 encoding can be opened/viewed by double-clicking it or by right-clicking on the file and selecting **Open**. Files exported with GBK encoding must be opened in Excel using the import external data feature (**Data > Get External Data > From Text**).

Table 4-29 Supported combinations of file encoding

Database Encoding	Data Studio File Encoding	Support for Chinese Text in Table Names	Support for English Text in Table Names
GBK	GBK	Yes	Yes
GBK	UTF-8	No - Incorrect details	No - Incorrect details
UTF-8	GBK	No - Export Fails	No - Incorrect details
UTF-8	UTF-8	Yes	Yes
UTF-8	LATIN1	No - Export Fails	Yes
SQL_ASCII	GBK	Yes	Yes

Database Encoding	Data Studio File Encoding	Support for Chinese Text in Table Names	Support for English Text in Table Names
SQL_ASCII	UTF-8	No - Incorrect details	No - Incorrect details

19. **Why do I get the error message "Conversion between GBK and LATIN1 is not supported"?**

Answer: This message occurs if the Data Studio and Database encoding selected are incompatible. To solve this, select the compatible encoding. Compatible encoding is shown in [Table 4-30](#).

Table 4-30 Compatible encoding formats

Data Studio File Encoding	Database Encoding	Compatible or Not
UTF-8	GBK	Yes
	LATIN1	Yes
	SQL_ASCII	Yes
GBK	UTF-8	Yes
	LATIN1	No
	SQL_ASCII	Yes
SQL_ASCII	UTF-8	Yes
	LATIN1	Yes
	GBK	Yes

20. **Why is the PL/SQL procedure I compiled and executed is saved as PL/SQL function?**

Answer: The database does not differentiate between PL/SQL function and procedure. All procedures in databases are functions. Hence PL/SQL procedure is saved as PL/SQL function.

21. **Why is that I am not able to edit the distribution key?**

Answer: The database allows you to edit the distribution key only for the first insert operation.

22. **While editing table data if I do not enter a value for default value column, will the value be added by the database server?**

Answer: Yes, the database server will add the value but the value will not be visible after save in the **Edit Table Data** tab. Use the refresh option from the **Edit Table Data** tab or re-open the table again to view the added default value(s).

23. **While modifying/deleting table data why do I get a pop-up stating that more than one matching row found?**

Answer: This happens because there are additional rows detected for modification/deletion based on Custom Unique Key or All Columns selection. If Custom Unique Key is selected, then it will delete/modify the rows that have exact match of the data in the column selected for deletion/modification. If All Columns is selected, then it will delete/modify the rows that match data in all columns. Hence the duplicate records matching the Custom Unique Key or All Columns will be deleted/modified if Yes is selected. If No is selected, the row that is not saved will be marked for correction.

24. **When I right-click on a text box I see additional context menu options. Why does this happen?**

Answer: The additional context menu options like Right to left Reading order, Show Unicode control characters and so on are provided by Windows 7 in case the keyboard you are using supports right to left and left to right input.

25. **What are the objects that are not supported for batch export DDL & DDL and Data operations?**

Answer: Following objects are not supported for DDL & DDL and Data operations.

Export DDL:

Connection, database, foreign table, sequence, column, index, constraint, partition, function/procedure group, regular tables group, views group, schemas group, and system catalog group.

Export DDL and Data

Connection, database, namespace, foreign table, sequence, column, index, constraint, partition, function/procedure, view, regular tables group, schemas group, and system catalog group.

26. **Will the queries in SQL Terminal be committed if the resultset is modified and saved with Reuse Connection on and Auto Commit off?**

Answer: No. Queries will only be committed when COMMIT command is executed in the Terminal.

Auto Commit	Reuse Connection	Resultset Save
On	On	Commit
On	Off	Commit
Off	On	Does not commit
Off	Off	Not supported

27. **When I query a temp table from a new SQL Terminal the resultset displays incorrect table details. Why does this happen?**

Answer: When you query a temp table from a new SQL Terminal or with the **Reuse Connection** off, the resultset displays information of a regular/partition/foreign table, if a table with the same name as the temp table exists.

 **NOTE**

If the **Reuse Connection** is **On**, the resultset displays information of the temp table even if another table with the same name exists.

28. **Which are the operations that are performed on a locked object does not run in the background but needs to be manually closed?**

Answer: Following are the operations that do not run in background while the object is locked in another operation:

Operations	
Renaming a table	Creating a constraint
Setting schema on table	Creating an index
Setting description in table	Adding a column
Renaming a partition	-

29. **Do we have a limit on the column and row size while exporting table data to excel?**

Answer: Yes. The .xlsx format supports a maximum of 1 million rows and 16,384 columns. The .xls format supports a maximum of 64,000 rows and 256 columns.

5 GDS: Parallel Data Loader

5.1 Installing, Configuring, and Starting GDS

Scenario

GaussDB(DWS) uses GDS to allocate the source data for parallel data import. Deploy GDS on the data server.

If a large volume of data is stored on multiple data servers, install, configure, and start GDS on each server. Then, data on all the servers can be imported in parallel. The procedure for installing, configuring, and starting GDS is the same on each data server. This section describes how to perform this procedure on one data server.

Context

1. The GDS version must match the cluster version. For example, GDS V100R008C00 matches DWS 1.3.X. Otherwise, the import or export may fail, or the import or export process may fail to respond.

Therefore, use the latest version of GDS. After the database is upgraded, download the latest version of GaussDB(DWS) GDS as instructed in [Procedure](#). When the import or export starts, GaussDB(DWS) checks the GDS versions. If the versions do not match, an error message is displayed and the import or export is terminated.

To obtain the version number of GDS, run the following command in the GDS decompression directory:

```
gds -V
```

To view the database version, run the following SQL statement after connecting to the database:

```
SELECT version();
```

Procedure

- Step 1** For details about how to import or export data using GDS, see "Tutorial: Using GDS to Import Data > Step 1: Preparing an ECS as the GDS Server" in the *Data Warehouse Service User Guide*.

Step 2 Log in as user **root** to the data server where GDS is to be installed and run the following command to create the directory for storing the GDS package:

```
mkdir -p /opt/bin/dws
```

Step 3 Upload the GDS package to the created directory.

Use the SUSE Linux package as an example. Upload the GDS package **dws_client_8.1.x_suse_x64.zip** to the directory created in the previous step.

Step 4 (Optional) If SSL is used, upload the SSL certificates to the directory created in [Step 2](#).

Step 5 Go to the directory and decompress the package.

```
cd /opt/bin/dws  
unzip dws_client_8.1.x_suse_x64.zip
```

Step 6 Create a GDS user and the user group to which the user belongs. This user is used to start GDS and read source data.

```
groupadd gdsgrp  
useradd -g gdsgrp gds_user
```

Step 7 Change the owner of the GDS package directory and source data file directory to the GDS user.

```
chown -R gds_user:gdsgrp /opt/bin/dws/gds  
chown -R gds_user:gdsgrp /input_data
```

Step 8 Switch to user **gds_user**.

```
su - gds_user
```

If the current cluster version is 8.0.x or earlier, skip [Step 9](#) and go to [Step 10](#).

If the current cluster version is 8.1.x, go to the next step.

Step 9 Execute the script on which the environment depends (applicable only to 8.1.x).

```
cd /opt/bin/dws/gds/bin  
source gds_env
```

Step 10 Start GDS.

GDS is green software and can be started after being decompressed. There are two ways to start GDS. One is to run the **gds** command to configure startup parameters. The other is to write the startup parameters into the **gds.conf** configuration file and run the **gds_ctl.py** command to start GDS.

The first method is recommended when you do not need to import data again. The second method is recommended when you need to import data regularly.

- Method 1: Run the **gds** command to start GDS.
 - If data is transmitted in non-SSL mode, run the following command to start GDS:

```
gds -d dir -p ip:port -H address_string -l log_file -D -t worker_num
```

Example:

```
/opt/bin/dws/gds/bin/gds -d /input_data/ -p 192.168.0.90:5000 -H 10.10.0.1/24 -l /opt/bin/dws/gds/gds_log.txt -D -t 2
```

- If data is transmitted in SSL mode, run the following command to start GDS:

```
gds -d dir -p ip:port -H address_string -l log_file -D -t worker_num --enable-ssl --ssl-dir Cert_file
```

Example:

Run the following command to upload the SSL certificate mentioned in [Step 4](#) to `/opt/bin`:

```
/opt/bin/dws/gds/bin/gds -d /input_data/ -p 192.168.0.90:5000 -H 10.10.0.1/24 -l /opt/bin/dws/gds/gds_log.txt -D --enable-ssl --ssl-dir /opt/bin/
```

Replace the information in italic as required.

- **-d** *dir*: directory for storing data files that contain data to be imported. This tutorial uses `/input_data/` as an example.
- **-p** *ip:port*: listening IP address and port for GDS. The default value is **127.0.0.1**. Replace it with the IP address of a 10GE network that can communicate with GaussDB(DWS). The port number ranges from 1024 to 65535. The default port is **8098**. This tutorial uses **192.168.0.90:5000** as an example.
- **-H** *address_string*: specifies the hosts that are allowed to connect to and use GDS. The value must be in CIDR format. Configure this parameter to enable a GaussDB(DWS) cluster to access GDS for data import. Ensure that the network segment covers all hosts in a GaussDB(DWS) cluster.
- **-l** *log_file*: GDS log directory and log file name. This tutorial uses `/opt/bin/dws/gds/gds_log.txt` as an example.
- **-D**: GDS in daemon mode. This parameter is used only in Linux.
- **-t** *worker_num*: number of concurrent GDS threads. If the data server and GaussDB(DWS) have available I/O resources, you can increase the number of concurrent GDS threads.

GDS determines the number of threads based on the number of concurrent import transactions. Even if multi-thread import is configured before GDS startup, the import of a single transaction will not be accelerated. By default, an **INSERT** statement is an import transaction.

- **--enable-ssl**: enables SSL for data transmission.
 - **--ssl-dir** *Cert_file*: SSL certificate directory. Set this parameter to the certificate directory in [Step 4](#).
 - For details about GDS parameters, see "GDS - Parallel Data Loader > gds" in the *Data Warehouse Service (DWS) Tool Guide*.
- Method 2: Write the startup parameters into the **gds.conf** configuration file and run the **gds_ctl.py** command to start GDS.

- a. Run the following command to go to the **config** directory of the GDS package and modify the **gds.conf** configuration file. For details about the parameters in the **gds.conf** configuration file, see [Table 5-1](#).

```
vim /opt/bin/dws/gds/config/gds.conf
```

Example:

The **gds.conf** configuration file contains the following information:

```
<?xml version="1.0"?>
<config>
<gds name="gds1" ip="192.168.0.90" port="5000" data_dir="/input_data/" err_dir="/err"
data_seg="100MB" err_seg="100MB" log_file="/log/gds_log.txt" host="10.10.0.1/24"
daemon='true' recursive="true" parallel="32"></gds>
</config>
```

Information in the configuration file is described as follows:

- The data server IP address is **192.168.0.90** and the GDS listening port is **5000**.

- Data files are stored in the **/input_data/** directory.
 - Error log files are stored in the **/err** directory. The directory must be created by a user who has the GDS read and write permissions.
 - The size of a single data file is 100 MB.
 - The size of a single error log file is 100 MB.
 - Logs are stored in the **/log/gds_log.txt** file. The directory must be created by a user who has the GDS read and write permissions.
 - Only nodes with the IP address **10.10.0.*** can be connected.
 - The GDS process is running in daemon mode.
 - Recursive data file directories are used.
 - The number of concurrent import threads is 2.
- b. Start GDS and check whether it has been started.

```
python3 gds_ctl.py start
```

Example:

```
cd /opt/bin/dws/gds/bin
python3 gds_ctl.py start
Start GDS gds1 [OK]
gds [options]:
-d dir      Set data directory.
-p port     Set GDS listening port.
  ip:port   Set GDS listening ip address and port.
-l log_file Set log file.
-H secure_ip_range
             Set secure IP checklist in CIDR notation. Required for GDS to start.
-e dir      Set error log directory.
-E size     Set size of per error log segment.(0 < size < 1TB)
-S size     Set size of data segment.(1MB < size < 100TB)
-t worker_num Set number of worker thread in multi-thread mode, the upper limit is 32. If
without setting, the default value is 1.
-s status_file Enable GDS status report.
-D          Run the GDS as a daemon process.
-r          Read the working directory recursively.
-h          Display usage.
```

----End

gds.conf Parameter Description

Table 5-1 gds.conf configuration description

Attribute	Description	Value Range
name	Identifier	-
ip	Listening IP address	The IP address must be valid. Default value: 127.0.0.1
port	Listening port	Value range: 1024 to 65535 (integer) Default value: 8098

Attribute	Description	Value Range
data_dir	Data file directory	-
err_dir	Error log file directory	Default value: data file directory
log_file	Log file Path	-
host	Host IP address allowed to be connected to GDS (The value must in CIDR format and this parameter is available for the Linux OS only.)	-
recursive	Whether the data file directories are recursive	Value range: <ul style="list-style-type: none">● true: recursive● false: not recursive Default value: false
daemon	Whether the process is running in daemon mode	Value range: <ul style="list-style-type: none">● true: The process is running in daemon mode.● false: The process is not running in daemon mode. Default value: false
parallel	Number of concurrent data import threads	Value range: 0 to 32 (integer) Default value: 1

5.2 Stopping GDS

Scenarios

Stop GDS after data is imported successfully.

Procedure

Step 1 Log in as user **gds_user** to the data server where GDS is installed.

Step 2 Select the mode of stopping GDS based on the mode of starting it.

- If GDS is started using the **gds** command, perform the following operations to stop GDS:

a. Query the GDS process ID:

```
ps -ef|grep gds
```

For example, the GDS process ID is 128954.

```
ps -ef|grep gds
```

```
gds_user 128954 1 0 15:03 ? 00:00:00 gds -d /input_data/ -p 192.168.0.90:5000 -l /log/gds_log.txt -D  
gds_user 129003 118723 0 15:04 pts/0 00:00:00 grep gds
```

- b. Run the **kill** command to stop GDS. **128954** in the command is the GDS process ID.

```
kill -9 128954
```
 - If GDS is started using the **gds_ctl.py** command, run the following commands to stop GDS:

```
cd /opt/bin/dws/gds  
python3 gds_ctl.py stop
```
- End

5.3 Example of Importing Data Using GDS

Example: Parallel Import from Multiple Data Servers

The data servers reside on the same intranet as the cluster. Their IP addresses are 192.168.0.90 and 192.168.0.91. Source data files are in CSV format.

1. Create the target table **tpcds.reasons**.

```
CREATE TABLE tpcds.reasons  
(  
  r_reason_sk integer not null,  
  r_reason_id char(16) not null,  
  r_reason_desc char(100)  
);
```
2. Log in to each GDS data server as user **root** and create the **/input_data** directory for storing data files on the servers. The following takes the data server whose IP address is 192.168.0.90 as an example. Operations on the other server are the same.

```
mkdir -p /input_data
```
3. (Optional) Create a user and the user group it belongs to. The user is used to start GDS. If the user and user group already exist, skip this step.

```
groupadd gdsgrp  
useradd -g gdsgrp gds_user
```
4. Evenly distribute source data files to the **/input_data** directories on the data servers.
5. Change the owners of source data files and the **/input_data** directory on each data server to **gds_user**. The data server with the IP address 192.168.0.90 is used as an example.

```
chown -R gds_user:gdsgrp /input_data
```
6. Log in to each data server as user **gds_user** and start GDS.
The GDS installation path is **/opt/bin/dws/gds**. Source data files are stored in **/input_data/**. The IP addresses of the data servers are 192.168.0.90 and 192.168.0.91. The GDS listening port is 5000. GDS runs in daemon mode.
Start GDS on the data server whose IP address is 192.168.0.90.

```
/opt/bin/dws/gds/gds -d /input_data -p 192.168.0.90:5000 -H 10.10.0.1/24 -D
```


Start GDS on the data server whose IP address is 192.168.0.91.

```
/opt/bin/dws/gds/gds -d /input_data -p 192.168.0.91:5000 -H 10.10.0.1/24 -D
```
7. Create the foreign table **tpcds.foreign_tpcds_reasons** for the source data.
Set import mode parameters as follows:
 - Set the import mode to **Normal**.

- When GDS is started, the source data file directory is **/input_data** and the GDS listening port is 5000. Therefore, set **location** to **gsfs://192.168.0.90:5000/* | gsfs://192.168.0.91:5000/***.

Information about the data format is set based on data format parameters specified during data export. The parameter settings are as follows:

- **format** is set to **CSV**.
- **encoding** is set to **UTF-8**.
- **delimiter** is set to **E'\x08'**.
- **quote** is set to **0x1b**.
- **null** is set to an empty string without quotation marks.
- **escape** is set to the same value as that of **quote** by default.
- **header** is set to **false**, indicating that the first row is regarded as a data row when a file is imported.

Set import error tolerance parameters as follows:

- Set **PER NODE REJECT LIMIT** (number of allowed data format errors) to **unlimited**. In this case, all the data format errors detected during data import will be tolerated.
- Set **LOG INTO** to **err_tpcds_reasons**. The data format errors detected during data import will be recorded in the **err_tpcds_reasons** table.

Based on the above settings, the foreign table is created using the following statement:

```
CREATE FOREIGN TABLE tpcds.foreign_tpcds_reasons
(
  r_reason_sk integer not null,
  r_reason_id char(16) not null,
  r_reason_desc char(100)
)
SERVER gsmpp_server OPTIONS (location 'gsfs://192.168.0.90:5000/* | gsfs://192.168.0.91:5000/*',
format 'CSV',mode 'Normal', encoding 'utf8', delimiter E'\x08', quote E'\x1b', null '', fill_missing_fields
'false') LOG INTO err_tpcds_reasons PER NODE REJECT LIMIT 'unlimited';
```

8. Import data through the foreign table **tpcds.foreign_tpcds_reasons** to the target table **tpcds.reasons**.

```
INSERT INTO tpcds.reasons SELECT * FROM tpcds.foreign_tpcds_reasons;
```
9. Query data import errors in the **err_tpcds_reasons** table and rectify the errors (if any). For details, see [Handling Import Errors](#).

```
SELECT * FROM err_tpcds_reasons;
```
10. After data import is complete, log in to each data server as user **gds_user** and stop GDS.

The data server with the IP address 192.168.0.90 is used as an example. The GDS process ID is 128954.

```
ps -ef|grep gds
gds_user 128954 1 0 15:03 ? 00:00:00 gds -d /input_data -p 192.168.0.90:5000 -D
gds_user 129003 118723 0 15:04 pts/0 00:00:00 grep gds
kill -9 128954
```

Example: Data Import Using Multiple Threads

The data server resides on the same intranet as the cluster. The server IP address is 192.168.0.90. Source data files are in CSV format. Data will be imported to two tables using multiple threads in **Normal** mode.

1. In the database, create the target tables **tpcds.reasons1** and **tpcds.reasons2**.

```
CREATE TABLE tpcds.reasons1
(
  r_reason_sk integer not null,
  r_reason_id char(16) not null,
  r_reason_desc char(100)
);
CREATE TABLE tpcds.reasons2
(
  r_reason_sk integer not null,
  r_reason_id char(16) not null,
  r_reason_desc char(100)
);
```

2. Log in to the GDS data server as user **root**, and then create the data file directory **/input_data** and its sub-directories **/input_data/import1/** and **/input_data/import2/**.

```
mkdir -p /input_data
```

3. Store the source data files of the target table **tpcds.reasons1** in **/input_data/import1/** and the source data files of the target table **tpcds.reasons2** in **/input_data/import2/**.

4. (Optional) Create a user and the user group it belongs to. The user is used to start GDS. If the user and user group already exist, skip this step.

```
groupadd gdsgrp
useradd -g gdsgrp gds_user
```

5. Change the owners of source data files and the **/input_data** directory on the data server to **gds_user**.

```
chown -R gds_user:gdsgrp /input_data
```

6. Log in to the data server as user **gds_user** and start GDS.

The GDS installation path is **/gds**. Source data files are stored in **/input_data/**. The IP address of the data server is 192.168.0.90. The GDS listening port is 5000. GDS runs in daemon mode. The degree of parallelism is 2. A recursive directory is specified.

```
/gds/gds -d /input_data -p 192.168.0.90:5000 -H 10.10.0.1/24 -D -t 2 -r
```

7. In the database, create the foreign tables **tpcds.foreign_tpcds_reasons1** and **tpcds.foreign_tpcds_reasons2** for the source data.

The foreign table **tpcds.foreign_tpcds_reasons1** is used as an example to describe how to configure parameters in a foreign table.

Set import mode parameters as follows:

- Set the import mode to **Normal**.
- When GDS is started, the configured source data file directory is **/input_data** and the GDS listening port is 5000. However, source data files are actually stored in **/input_data/import1/**. Therefore, set **location** to **gsfs://192.168.0.90:5000/import1/***.

Information about the data format is set based on data format parameters specified during data export. The parameter settings are as follows:

- **format** is set to **CSV**.
- **encoding** is set to **UTF-8**.
- **delimiter** is set to **E'\x08'**.
- **quote** is set to **0x1b**.
- **null** is set to an empty string without quotation marks.
- **escape** is set to the same value as that of **quote** by default.

- **header** is set to **false**, indicating that the first row is regarded as a data row when a file is imported.

Set import error tolerance parameters as follows:

- Set **PER NODE REJECT LIMIT** (number of allowed data format errors) to **unlimited**. In this case, all the data format errors detected during data import will be tolerated.
- Set **LOG INTO** to **err_tpcds_reasons1**. The data format errors detected during data import will be recorded in the **err_tpcds_reasons1** table.
- If the last column (**fill_missing_fields**) in a source data file is missing, the **NULL** column will be automatically added to the target file.

Based on the preceding settings, the foreign table **tpcds.foreign_tpcds_reasons1** is created as follows:

```
CREATE FOREIGN TABLE tpcds.foreign_tpcds_reasons1
(
  r_reason_sk integer not null,
  r_reason_id char(16) not null,
  r_reason_desc char(100)
) SERVER gsmpp_server OPTIONS (location 'gsfs://192.168.0.90:5000/import1/*', format 'CSV',mode
'Normal', encoding 'utf8', delimiter E'\x08', quote E'\x1b', null '',fill_missing_fields 'on')LOG INTO
err_tpcds_reasons1 PER NODE REJECT LIMIT 'unlimited';
```

Based on the preceding settings, the foreign table **tpcds.foreign_tpcds_reasons2** is created as follows:

```
CREATE FOREIGN TABLE tpcds.foreign_tpcds_reasons2
(
  r_reason_sk integer not null,
  r_reason_id char(16) not null,
  r_reason_desc char(100)
) SERVER gsmpp_server OPTIONS (location 'gsfs://192.168.0.90:5000/import2/*', format 'CSV',mode
'Normal', encoding 'utf8', delimiter E'\x08', quote E'\x1b', null '',fill_missing_fields 'on')LOG INTO
err_tpcds_reasons2 PER NODE REJECT LIMIT 'unlimited';
```

8. Import data to **tpcds.reasons1** using the foreign table **tpcds.foreign_tpcds_reasons1**, and to **tpcds.reasons2** using the foreign table **tpcds.foreign_tpcds_reasons2**.

```
INSERT INTO tpcds.reasons1 SELECT * FROM tpcds.foreign_tpcds_reasons1;
INSERT INTO tpcds.reasons2 SELECT * FROM tpcds.foreign_tpcds_reasons2;
```

9. Query data import errors in the **err_tpcds_reasons1** and **err_tpcds_reasons2** tables and rectify the errors (if any). For details, see [Handling Import Errors](#).

```
SELECT * FROM err_tpcds_reasons1;
SELECT * FROM err_tpcds_reasons2;
```

10. After data import is complete, log in to the data server as user **gds_user** and stop GDS.

The GDS process ID is 128954.

```
ps -ef|grep gds
gds_user 128954 1 0 15:03 ? 00:00:00 gds -d /input_data -p 192.168.0.90:5000 -D -t 2 -r
gds_user 129003 118723 0 15:04 pts/0 00:00:00 grep gds
kill -9 128954
```

5.4 gds

Context

gds is used to import and export data of GaussDB(DWS).

Syntax

```
gds [ OPTION ] -d DIRECTORY
```

The **-d** and **-H** parameters are mandatory and **option** is optional. **gds** provides the file data from DIRECTORY for GaussDB(DWS) to access.

Before starting GDS, you need to ensure that your GDS version is consistent with the database version. Otherwise, the database will display an error message and terminate the import and export operations. You can view the specific version through the **-V** parameter.

Parameter Description

- **-d dir**
Set the directory of the data file to be imported. If the GDS process permission is sufficient, the directory specified by **-d** is automatically created.
- **-p ip:port**
Set the IP address and port to be listened to of the GDS.
Value range of the IP address: The IP address must be valid.
Default value: **127.0.0.1**
Value range of the listening port is a positive integer ranging from 1024 to 65535.
Default value of **port**: **8098**
- **-l log_file**
Set the log file. This feature adds the function of automatical log splitting. After the **-R** parameter is set, GDS generates a new file based on the set value to prevent a single log file from being too large.
Generation rule: By default, GDS identifies only files with the **.log** extension name and generates new log files.
For example, if **-l** is set to **gds.log** and **-R** is set to 20 MB, a **gds-2020-01-17_115425.log** file will be created when the size of **gds.log** reaches 20 MB.
If the log file name specified by **-l** does not end with **.log**, for example, **gds.log.txt**, the name of the new log file is **gds.log-2020-01-19_122739.txt**.
When GDS is started, it checks whether the log file specified by **-l** exists. If the log file exists, a new log file is generated based on the current date and time, and the original log file is not overwritten.
- **-H address_string**
Set the hosts that can be connected to the GDS. This parameter must be the CIDR format and it supports the Linux system only. If multiple network segments need to be configured, use commas (,) to separate them. For example, **-H 10.10.0.0/24, 10.10.5.0/24**.
- **-e dir**
Set the saving path of error logs generated when data is imported.
Default value: **data file directory**
- **-E size**
Set the upper thread of error logs generated when data is imported.

Value range: $0 < \text{size} < 1 \text{ TB}$. The value must be a positive integer plus the unit. The unit can be KB, MB, or GB.

- -S size

Set the upper limit of the exported file size.

Value range: $1 \text{ MB} < \text{size} < 100 \text{ TB}$. The value must be a positive integer plus the unit. The unit can be KB, MB, or GB. If KB is used, the value must be greater than 1024 KB.

- -R size

Set the maximum size of a single GDS log file specified by -l.

Value range: $1 \text{ MB} < \text{size} < 100 \text{ TB}$. The value must be a positive integer plus the unit. The unit can be KB, MB, or GB. If KB is used, the value must be greater than 1024 KB.

Default value: 16 MB

- -t worker_num

Set the number of concurrent imported and exported working threads.

Value range: The value is a positive integer ranging between 0 and 200 (included).

Default value: **8**

Recommended value: 2 x CPU cores in the common file import and export scenario; in the pipe file import and export scenario, set the value to **64**.

NOTE

If a large number of pipe files are imported and exported concurrently, the value of this parameter must be greater than or equal to the number of concurrent services.

- -s status_file

Set the status file. This parameter supports the Linux system only.

- -D

The GDS is running on the backend and this parameter supports the Linux system only.

- -r

Traverse files in the recursion directory and this parameter supports the Linux system only.

- -h

Show help information.

- --enable-ssl

Use the SSL authentication mode to communicate with clusters.

- --ssl-dir Cert_file

Before using the SSL authentication mode, specify the path for storing the authentication certificates.

- --debug-level

Set the debug log level of the GDS to control the output of GDS debug logs.

Value range: 0, 1, and 2

- **0:** Only the file list related to log import and export is printed. If the log volume is small, set the parameter to this value only when the system is at normal state.

- **1:** All the log information is printed, including the connection information, session switch information, and statistics on each node.
- **2:** Detailed interaction logs and their status are printed to generate a huge number of debug logs to help identify the fault causes. You are advised to set the parameter to this value only during troubleshooting.

Default value: 0

- --pipe-timeout

Specify the timeout period for GDS to wait for operating a pipe.

NOTE

- This parameter is used to prevent the following situation: One end of the pipe file is not read or written for a long time due to human or program problems. As a result, the read or write operation on the other end of the pipe is hung.
- This parameter does not indicate the maximum duration of a data import or export task. It indicates the maximum timeout duration of each read, open, or write operation on the pipe. If the timeout duration exceeds the value of **--pipe-timeout**, an error is reported to the frontend.

Value range: greater than 1s Use a positive integer with the time unit, seconds (s), minutes (m), or hours (h). Example: **3600s**, **60m**, or **1h**, indicating one hour.

Default value: **1h/60m/3600s**

Examples

Data file is saved in the **/data** directory, the IP address is 192.168.0.90, and the listening port number is 5000.

```
gds -d /data/ -p 192.168.0.90:5000 -H 10.10.0.1/24
```

Data file is saved in the subdirectory of the **/data** directory, the IP address is 192.168.0.90, and the listening port number is 5000.

```
gds -d /data/ -p 192.168.0.90:5000 -H 10.10.0.1/24 -r
```

Data file is saved in the **/data** directory, the IP address is 192.168.0.90, and the listening port number is 5000 which is running on the backend. The log file is saved in the **/log/gds_log.txt** file, and the specified number of the concurrently imported working threads is 32.

```
gds -d /data/ -p 192.168.0.90:5000 -H 10.10.0.1/24 -l /log/gds_log.txt -D -t 32
```

Data file is saved in the **/data** directory, the IP address is 192.168.0.90, and the listening port number is 5000. Only the IP address of **10.10.0.*** can be connected.

```
gds -d /data/ -p 192.168.0.90:5000 -H 10.10.0.1/24
```

Data files are stored in the **/data/** directory, the IP address of the directory is **192.168.0.90**, and the listening port number is **5000**. Only the node whose IP address is **10.10.0.*** can be connected to. The node communicates with the cluster using the SSL authentication mode, and the certificate files are stored in the **/certfiles/** directory.

```
gds -d /data/ -p 192.168.0.90:5000 -H 10.10.0.1/24 --enable-ssl --ssl-dir /certfiles/
```

 NOTE

- One GDS provides the import and export services for one cluster only at a time.
- For security purpose, specify the IP address and the listening port through **-p**.
- The certificate file includes the root certificate **cacert.pem**, level-2 certificate file **client.crt**, and private key file **client.key**.
- The password protection files **client.key.rand** and **client.key.cipher** are used when the system loading certificates.

5.5 gds_ctl.py

Context

gds_ctl.py can be used to start and stop **gds** if **gds.conf** has been configured.

Prerequisites

Run the following commands on Linux OS: You need to ensure that the directory structure is as follows before the execution:

```
|---gds
|---gds_ctl.py
|---config
|-----gds.conf
|-----gds.conf.sample
or
|---gds
|---gds_ctl.py
|-----gds.conf
|-----gds.conf.sample
```

Content of **gds.conf**:

```
<?xml version="1.0"?>
<config>
<gds name="gds1" ip="127.0.0.1" port="8098" data_dir="/data" err_dir="/err" data_seg="100MB"
err_seg="1000MB" log_file="/gds.log" host="10.10.0.1/24" daemon='true' recursive="true" parallel="32"></
gds>
</config>
```

Configuration description of **gds.conf**:

- name: tag name
- ip: IP addresses to be listened to
- port: Port number to be listened to
Value range: an integer ranging from 1024 to 65535
Default value: **8098**

- **data_dir**: data file directory
- **err_dir**: error log file directory
- **log_file**: log file path
- **host**: hosts that can be connected to the GDS.
- **recursive**: whether the data file directory is recursive
Value range:
 - **true**: indicates the recursion data file directory.
 - **false**: indicates the data file directory is not recursive.
- **daemon**: specifies whether the service is running in DAEMON mode.
Value range:
 - **true** indicates the server is running in the DAEMON mode.
 - **false** indicates the server is not running in the DAEMON mode.
- **parallel**: indicates the number of concurrently imported and exported working threads.
The default number of concurrencies is **8** and the maximum number is **200**.

Syntax

```
gds_ctl.py [ start | stop all | stop [ ip: ] port | stop | status ]
```

Description

gds_ctl.py can be used to start or stop GDS if **gds.conf** is configured.

Parameter Description

- start
Enable the GDS configured in **gds.conf**.
- stop
Stop the running instance started by the configuration file in the GDS that can be disabled by the current users.
- stop all
Stop all the running instances in the GDS that can be disabled by the current users.
- stop [ip:] port
Stop the specific running GDS instance that can be closed by the current user. If **ip:port** is specified when the GDS is started, stop the corresponding **ip:port** to be specified. If the IP address is not specified when the GDS is started, you need to stop the specified port only. The stop fails if different information is specified when the GDS is started or stopped.
- status
Query the running status of the GDS instance started by the **gds.conf**.

Examples

Start the GDS.

```
python3 gds_ctl.py start
```

Stop the GDS started by the configuration file.

```
python3 gds_ctl.py stop
```

Stop all the GDS instances that can be stopped by the current user.

```
python3 gds_ctl.py stop all
```

Stop the GDS instance specified by **[ip:]port** that can be stopped by the current user.

```
python3 gds_ctl.py stop 127.0.0.1:8098
```

Query the GDS status.

```
python3 gds_ctl.py status
```

5.6 Handling Import Errors

Scenarios

Handle errors that occurred during data import.

Querying Error Information

Errors that occur when data is imported are divided into data format errors and non-data format errors.

- Data format error

When creating a foreign table, specify **LOG INTO** *error_table_name*. Data format errors occurring during the data import will be written into the specified table. You can run the following SQL statement to query error details:

```
SELECT * FROM error_table_name;
```

Table 5-2 lists the columns of the *error_table_name* table.

Table 5-2 Columns in the *error_table_name* table

Column	Type	Description
nodeid	integer	ID of the node where an error is reported
begintime	timestamp with time zone	Time when a data format error is reported
filename	character varying	Name of the source data file where a data format error occurs If you use GDS for importing data, the error information includes the IP address and port number of the GDS server.
rownum	bigint	Number of the row where an error occurs in a source data file

Column	Type	Description
rawrecord	text	Raw record of the data format error in the source data file
detail	text	Error details

- Non-data format error

A non-data format error leads to the failure of an entire data import task. You can locate and troubleshoot a non-data format error based on the error message displayed during data import.

Handling data import errors

Troubleshoot data import errors based on obtained error information and the description in the following table.

Table 5-3 Handling data import errors

Error Information	Cause	Solution
missing data for column "r_reason_desc"	<ol style="list-style-type: none"> The number of columns in the source data file is less than that in the foreign table. In a TEXT format source data file, an escape character (for example, \) leads to delimiter or quote mislocation. Example: The target table contains three columns as shown in the following command output. The escape character (\) converts the delimiter () into the value of the second column, causing loss of the value of the third column. BE Belgium\ 1 	<ol style="list-style-type: none"> If an error is reported due to missing columns, perform the following operations: <ul style="list-style-type: none"> Add the r_reason_desc column to the source data file. When creating a foreign table, set the parameter fill_missing_fields to on. In this way, if the last column of a row in the source data file is missing, it is set to NULL and no error will be reported. Check whether the row where an error occurred contains the escape character (\). If the row contains such a character, you are advised to set the parameter noescaping to true when creating a foreign table, indicating that the escape character (\) and the characters following it are not escaped.
extra data after last expected column	The number of columns in the source data file is greater than that in the foreign table.	<ul style="list-style-type: none"> Delete the unnecessary columns from the source data file. When creating a foreign table, set the parameter ignore_extra_data to on. In this way, if the number of columns in a source data file is greater than that in the foreign table, the extra columns at the end of rows will not be imported.

Error Information	Cause	Solution
invalid input syntax for type numeric: "a"	The data type is incorrect.	In the source data file, change the data type of the columns to be imported. If this error information is displayed, change the data type to numeric .
null value in column "staff_id" violates not-null constraint	The not-null constraint is violated.	In the source data file, add values to the specified columns. If this error information is displayed, add values to the staff_id column.
duplicate key value violates unique constraint "reg_id_pk"	The unique constraint is violated.	<ul style="list-style-type: none"> • Delete the duplicate rows from the source data file. • Run the SELECT statement with the DISTINCT keyword to ensure that all imported rows are unique. <pre>INSERT INTO reasons SELECT DISTINCT * FROM foreign_tpcds_reasons;</pre>
value too long for type character varying(16)	The column length exceeds the upper limit.	In the source data file, change the column length. If this error information is displayed, reduce the column length to no greater than 16 bytes (VARCHAR2).

6 DSC: SQL Syntax Migration Tool

6.1 Overview

After switching to GaussDB(DWS) databases, you may need to migrate user data and application SQL scripts to new databases. In particular, the migration of application SQL scripts is complex, risky, and time-consuming.

Database Schema Converter (DSC) is a CLI tool running on Linux or Windows. It is designed to provide simple, fast, and reliable migration of application SQL scripts. DSC parses the SQL scripts of source database applications using its syntax migration logic and converts the scripts to the ones applicable to GaussDB(DWS) databases.

DSC does not require a connection to databases, and performs migration offline. The tool also displays the status of a migration process and logs the errors that occur during the process, helping quickly locate faults.

Migration Objects

DSC can migrate the following objects of Teradata, Oracle, Netezza, MySQL, and DB2:

- Common objects supported by Teradata, Oracle, Netezza, MySQL, and DB2: SQL schemas and SQL queries
- Objects supported only by Oracle and Netezza: PL/SQL objects
- Objects supported only by Teradata: Perl files containing **BTEQ** and **SQL_LANG** scripts

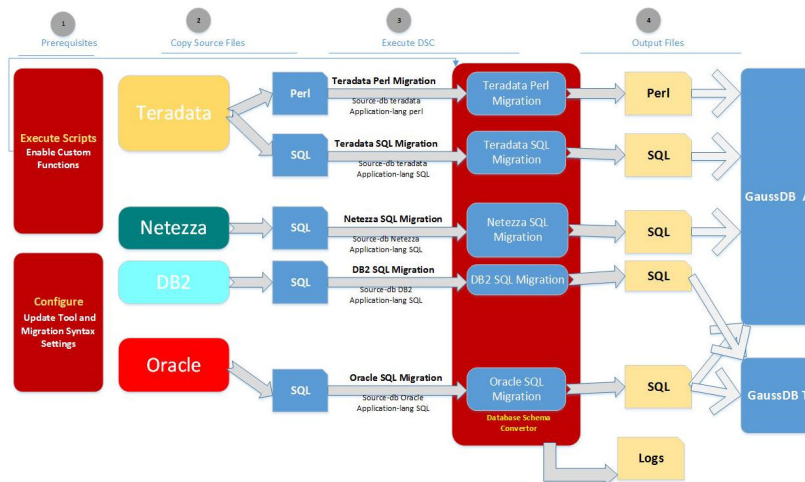
Migration Process

The process of using DSC to migrate SQL scripts is as follows:

1. Export the SQL scripts from a Teradata or Oracle database to the Linux or Windows server installed with DSC.
2. Use DSC to migrate syntax. Specify the paths of the input files, output files, and logs in the command.

3. DSC automatically archives the migrated SQL scripts and the logs into the specified paths.

Figure 6-1 Migration process using DSC



6.2 Supported Keywords and Features

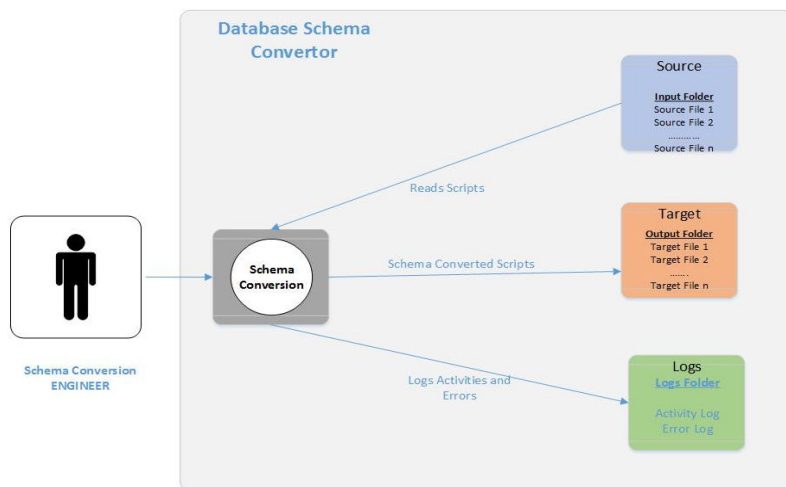
This section provides the system context of DSC. DSC is a CLI tool that helps data migration engineers migrate scripts of source databases, such as Teradata, Oracle, Netezza, MySQL, and DB2, to GaussDB(DWS) databases.

DSC reads the scripts from the input folder. After the migration is complete, the migrated scripts are saved in the output folder. DSC also logs operations and errors to the log folder.

The rules of migrating keywords in SQL scripts are essential to the syntax migration using DSC. This section describes the Teradata, Oracle, Netezza, and MySQL keywords and features supported by DSC, and the parameters for keyword migration rules. Configure these parameters based on source databases, target databases, and migration scenarios.

Keywords that cannot be migrated are recorded in error logs after migration. Error logs also contain details about the files to which the error keywords belong, such as file names and locations. For details, see [Log Reference](#) and [Troubleshooting](#).

Figure 6-2 System context of DSC



6.3 Constraints and Limitations

This section describes the constraints and limitations of DSC.

General

- DSC is used only for syntax migration and not for data migration.
- If the **SELECT** clause of a subquery contains an aggregate function when the **IN** or **NOT IN** operator is converted to **EXISTS** or **NOT EXISTS**, errors may occur during script migration.

Teradata

- DSC will migrate all occurrences of **mod** in the input scripts. If **mod** is not a keyword, it will be replaced with **%**.

For example, the following input query contains **mod**:

```
SELECT sal
FROM employee
WHERE name LIKE 'mod (%)';
```

After the migration, the query is as follows:

```
SELECT sal
FROM employee
WHERE name LIKE 'mod (%)';
```

- If a **case** statement containing **FORMAT** is not enclosed in parentheses, this statement will not be processed.

For example:

```
case when column1='0' then column1='value' end (FORMAT 'YYYYMMDD')as alias1
```

In this example, **case when column1= "0"**, **column1= "value" end** is not enclosed in parentheses and it will not be processed.

- If **SELECT *** and **QUALIFY** clauses are both used in an input query, the migrated query returns an additional column for the **QUALIFY** clause.

An example is as follows:

Teradata query

```
SELECT * FROM dwQErrDtl_mc.C03_CORP_TIME_DPSIT_ACCT
WHERE 1 = 1
AND Data_Dt = CAST( '20150801' AS DATE FORMAT 'YYYYMMDD' )
QUALIFY ROW_NUMBER( ) OVER( PARTITION BY Agt_Num, Agt_Modif_Num ORDER BY NULL ) = 1;
```

Query after migration

```
SELECT * FROM (
SELECT *, ROW_NUMBER( ) OVER( PARTITION BY Agt_Num, Agt_Modif_Num ORDER BY NULL )
AS ROW_NUM1
FROM dwQErrDtl_mc.C03_CORP_TIME_DPSIT_ACCT
WHERE 1 = 1
AND Data_Dt = CAST( '20150801' AS DATE )
) Q1
WHERE Q1.ROW_NUM1 = 1;
```

In the migrated query, the **ROW_NUMBER() OVER(PARTITION BY Agt_Num and Agt_Modif_Num ORDER BY NULL) AS ROW_NUM1** column is returned additionally.

- Named references to a table in a query cannot be migrated from subqueries or functions.

For example, if the input query contains a table named **foo**, DSC will not migrate any named references to the table from a subquery (**foo.fooid**) or when called from a function (**getfoo(foo.fooid)**).

```
SELECT * FROM foo
WHERE foosubid IN (
SELECT foosubid
FROM getfoo(foo.fooid) z
WHERE z.fooid = foo.fooid
);
```

Oracle

- **ROWID** is not processed in the following case:
SELECT empno,ename ,d.deptno,d.rowid FROM (SELECT * FROM employees where deptno is not null) e , dept d WHERE d.deptno = e.deptno;
- The aggregate function in Window functions (RANK and ROW_NUMBER) is not available in the column list.

For example:

```
SELECT
TIME, Region, ROW_NUMBER ( ) OVER (ORDER BY SUM (profit) DESC) AS rownumber
, GROUPING (TIME) AS T
, GROUPING (Region) AS R
FROM Sales GROUP BY
CUBE (TIME, Region)
ORDER BY
TIME, Region;
```

- The **INSERT FIRST** and **INSERT ALL** queries cannot be migrated if an asterisk (*) is specified in the **SELECT** statement and the **VALUES** clause is not specified.
- DSC supports the **ROWNUM** condition specified at the end of the **WHERE** clause.

For example:

```
SELECT ROWNUM, ename,empid
FROM employees
WHERE empid = 10 AND deptno = 10 AND ROWNUM < 3
ORDER BY ename;
```

- DSC does not support the **ROWNUM** function in the **UPDATE** clause.

For example:

```
UPDATE tableName SET empno = ROWNUM
where column = "value";
```

- DSC does not support **PARTITION BY LIST** in the **INDEX** clause.

For example:

```
CREATE TABLE sales(acct_no NUMBER(5)
ORGANIZATION INDEX
INCLUDING acct_no
OVERFLOW TABLESPACE example
PARTITION BY LIST (acct_no)
(PARTITION VALUES (1)
PARTITION VALUES (DEFAULT)
TABLESPACE example);
```

- DSC does not support the **JOIN** condition without a table name or table alias.
- Stored procedures and functions must end with a slash (/).

6.4 System Requirements

Supported Databases

[Table 6-1](#) lists the source databases supported by DSC.

Table 6-1 Supported source databases

Database Name	Database Version
Netezza	7.0
Teradata	13.1
Oracle	11g Release 2 12c Release 1
MySQL	5.6

Software Requirements

OS requirements

[Table 6-2](#) lists the operating systems compatible with DSC.

Table 6-2 Compatible OSs

Server	Operating System	Version
x86 servers	SUSE Linux Enterprise Server 11	SP1 (SUSE 11.1)
		SP2 (SUSE 11.2)
		SP3 (SUSE 11.3)
		SP4 (SUSE 11.4)

Server	Operating System	Version
	SUSE Linux Enterprise Server 12	SP0 (SUSE 12.0)
		SP1 (SUSE 12.1)
		SP2 (SUSE 12.2)
		SP3 (SUSE 12.3)
	RHEL	6.4-x86_64 (RHEL 6.4)
		6.5-x86_64 (RHEL 6.5)
		6.6-x86_64 (RHEL 6.6)
		6.7-x86_64 (RHEL 6.7)
		6.8-x86_64 (RHEL 6.8)
		6.9-x86_64 (RHEL 6.9)
		7.0-x86_64 (RHEL 7.0)
		7.1-x86_64 (RHEL 7.1)
		7.2-x86_64 (RHEL 7.2)
		7.3-x86_64 (RHEL 7.3)
		7.4-x86_64 (RHEL 7.4)
	CentOS	6.4 (CentOS 6.4)
		6.5 (CentOS 6.5)
		6.6 (CentOS 6.6)
		6.7 (CentOS 6.7)
		6.8 (CentOS 6.8)
		6.9 (CentOS 6.9)
		7.0 (CentOS 7.0)
		7.1 (CentOS 7.1)
		7.2 (CentOS 7.2)
		7.3 (CentOS 7.3)
	7.4 (CentOS 7.4)	
	Windows	7.0, 10

Other software requirements

Table 6-3 lists the requirements of DSC on other software versions.

Table 6-3 Requirements of DSC on other software versions

Software	Description
JDK 1.8.0_141 or later	Used to run DSC.
Perl 5.8.8	Used to migrate Perl files.
Perl 5.28 or later	Used to migrate Perl files in Windows.

NOTE

Perl 5.8.8 is a fixed version. To ensure syntax compatibility, do not use a later version.

6.5 Installing DSC

Before using DSC, install it on a Linux or Windows server. DSC supports [64-bit Linux OSs](#). For details about other OSs supported by DSC, see [Compatible OSs](#).

Prerequisites

- In Linux, do not install or perform operations on DSC as the **root** user. To execute the **install.sh** script, you must have the permission for creating folders.
- The size of the target folder must be at least four times that of the SQL files in the input folder.

For example, if the size of the SQL files in the input folder is 100 KB, the target folder must have available disk space of at least 400 KB to process the SQL files.

NOTE

- To query the available disk space of the target folder in Linux, run the following command:

```
df -P <Folder path>
```
- To query the size of the input file in Linux, run the following command in the directory where the file resides:

```
ls -l
```
- JRE 1.8 or later and Perl have been installed. For details about the hardware and software requirements, see [System Requirements](#).

To check the installed Java version and set the Java path, perform the following steps:

- a. Check whether the Java version meets requirements.

```
java -version
```
- b. Ensure that the Java path is correctly set.
 - Linux
 - 1) Check whether the Java path is correctly set.

```
echo $JAVA_HOME
```
 - 2) If no information is returned, add the following two lines to the **.bashrc** file of the current user, save the modification, and exit.

Assume that the Java installation path is **/home/user/Java/jdk1.8.0_141**.

```
export JAVA_HOME=/home/user/Java/jdk1.8.0_141
export PATH=$JAVA_HOME/bin:$PATH
```

- 3) Activate Java environment variables.

```
source ~/.bashrc
```

- Windows

- 1) Right-click **My Computer** and choose **Properties** from the shortcut menu. The **System** window is displayed.
- 2) Click **Advanced System Settings**. The **System Properties** dialog box is displayed.
- 3) On the **Advanced** tab page, click **Environment Variables**. The **Environment Variables** dialog box is displayed.
- 4) Select **Path** in the **System variables** area. Click **Edit** and check the Java installation path.

If the Java installation path does not exist or is incorrect, add the Java path of this PC to **Path**.

Assume that the Java installation path is **C:\Program Files\Java\jdk1.8.0_141\bin** and the environment variable in **Path** is **c:\windows\system32**; Set **Path** to **c:\windows\system32;C:\Program Files\Java\jdk1.8.0_141\bin**;

Procedure

DSC is an installation-free tool. You can use it after downloading and decompressing the software package.

The following procedure describes how to obtain the package. Decompress the package **DSC.zip** and then **DSC.rar** to obtain the files shown in [Table 6-4](#).

Windows:

Step 1 Log in to the GaussDB(DWS) management console and download the DCS software package. For details, see [Downloading Client Tools](#).

Step 2 Decompress the **DSC.zip** package.

The **DSC** folder is generated.

 **NOTE**

You can decompress **DSC.zip** to any folder you need.

Step 3 Go to the **DSC** directory.

Step 4 Find and check the files in the **DSC** directory.

[Table 6-4](#) describes the obtained folders and files.

----End

Linux:

Step 1 Log in to the GaussDB(DWS) management console and download the DCS software package. For details, see [Downloading Client Tools](#).

Step 2 Extract files from **DSC.zip**.

```
sh install.sh
```

Step 3 Go to the **DSC** directory.

```
cd DSC
```

Step 4 Check the files in the **DSC** directory.

```
ls  
config lib scripts bin input output runDSC.sh runDSC.bat
```

----End

Table 6-4 DSC directory

Folder or File		Description
DSC	bin	DSC-related JAR package (executable)
	config	Configuration file of DSC
	input	Input folder
	lib	Library files required for the normal running of DSC
	output	Output folder
	scripts	Customized configuration scripts for Oracle and Teradata migration, which can be executed to implement corresponding functions
	runDSC.sh	Application executed on the Linux OS
	runDSC.bat	Application executed on the Windows OS
changelog		To notify users of the current modifications
Install.sh		To set the file permissions for DSC
readme		Instructions of installation and configuration

 **NOTE**

If you do not need DSC, you can uninstall it by deleting the **DSC** folder.

6.6 Configuring DSC

6.6.1 Overview

DSC provides configuration files and parameters to configure migration logic and rules. Before migrating scripts, you need to configure the following as required:

1. Tool configuration before migration: Configure DSC after its installation. For details, see [DSC Configuration](#).

2. Rule configuration before migration: Configure migration rules by modifying configuration files for [Teradata SQL](#), [Oracle SQL](#), [Teradata Perl](#), or [MySQL SQL](#).
3. Custom configuration after migration: [Customize rules](#) in the destination database to migrate the input keywords that are not supported by the destination database.

6.6.2 DSC Configuration

Configure the following items:

- **Setting application.properties:** Configure the migration behavior of DSC, for example, whether to overwrite the files in the target folder and whether to format the SQL files.
- **Setting Java Memory Allocation:** Configure the memory that can be used by DSC. If the memory usage exceeds the threshold, DSC displays an error and exits.

Setting application.properties

The **application.properties** file contains the application parameters that are used to configure the behavior of DSC. They are general parameters and are applicable to Teradata, Oracle.

Perform the following steps to configure the parameters:

Step 1 Open the **application.properties** file in the **config** folder.

Step 2 Set parameters in the **application.properties** file as needed.

Table 6-5 describes the parameters in the **application.properties** file.

NOTE

- Parameter values are case-insensitive.
- Do not modify any other parameter except the listed ones.

Step 3 Save the configuration and exit.

----End

Table 6-5 Parameters in the application.properties file

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none">• formatterrequired	If there are any changes in this configuration item, then the tool will not function as expected.	<ul style="list-style-type: none">• true• false	true	formatterrequired=true

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> prevalidationFlag 	If there are any changes in this configuration item, then the tool will not function as expected.	<ul style="list-style-type: none"> true false 	true	prevalidationFlag=true
<ul style="list-style-type: none"> commentSeparatorFlag 	If there are any changes in this configuration item, then the tool will not function as expected.	<ul style="list-style-type: none"> true false 	true	commentSeparatorFlag=true
<ul style="list-style-type: none"> queryDelimiter 	If there are any changes in this configuration item, then the tool will not function as expected.	NA	N/A	queryDelimiter=;
<ul style="list-style-type: none"> blogicDelimiter 	If there are any changes in this configuration item, then the tool will not function as expected.	NA	N/A	blogicDelimiter=/'
<ul style="list-style-type: none"> Timeout 	Tool migration timeout duration. If any changes in this configuration item, then the tool will not function as expected.	-	4 hours	Timeout=4

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> fileExtension 	<p>Valid file extension separated by comma.</p> <p>If there are any modifications in this configuration item, then the tool will not function as expected.</p> <p>NOTE The exported scripts must be with the following postfix such as:</p> <ul style="list-style-type: none"> .sql .txt .fnc .proc .tbl .tbs .pl <p>and so on.</p>	<ul style="list-style-type: none"> csv txt SQL 	SQL	fileExtension=SQL
<ul style="list-style-type: none"> formattedSourceRequired 	<p>Whether to use SQL Formatter to format the source SQL files.</p> <p>If this parameter is set to true, the copies of the input files are formatted and saved to the <i>Output path</i>/formattedSource directory.</p>	<ul style="list-style-type: none"> true false 	true	formattedSourceRequired=true

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> target_files 	<p>Specifies the operations to be performed on the output folder.</p> <p>Overwrite: overwrites the output folder. This option specifies whether the files in the output folder must be overwritten.</p> <p>Delete: deletes all files in the output folder.</p> <p>Cancel: cancels an operation on the output folder that contains files.</p>	<ul style="list-style-type: none"> overwrite delete cancel 	overwrite	target_files=overwrite

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> encodingFormat 	<p>Encoding format of input files.</p> <p>If this parameter is not set (or is commented out), DSC uses the default encoding format based on locale settings.</p> <p>NOTE</p> <ul style="list-style-type: none"> The auto detection of file encoding is inaccurate. To ensure that the correct encoding format is used, specify the format using this parameter. 	<ul style="list-style-type: none"> UTF8 UTF16 UTF32 GB2312 ASCII, etc. 	Default based on locale.	encodingFormat=UTF8
<ul style="list-style-type: none"> NoOfThreads 	Number of threads used for migration.	Depending on available system resources	3	NoOfThreads=3

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> MaxFileSizeWarning 	<p>Warning threshold for the input file size (unit: KB, MB, or GB).</p> <p>If an invalid value is specified, the default value is used.</p> <p>The following warning will be displayed if the specified source file size exceeds the threshold:</p> <pre>***** [WARNING] : Migration of the following files(>100KB) will take more time: bigfile001.SQL bigfile008.SQL *****</pre>	10 KB 1 GB	10MB	MaxFileSizeWarning=10MB
<ul style="list-style-type: none"> MaxFileSize 	<p>Maximum size of the input file allowed. If crossing this limit, the file migration will be skipped.</p>	-	20MB	MaxFileSize=20 MB

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> MaxSqlLen 	<p>Maximum size of a query to be migrated.</p> <p>If an invalid value is specified, DSC resets it to the default value and displays the following warning:</p> <p>The query length parameter (MaxSqlLen) value is out of range. Resetting to default value.</p> <p>If an input query exceeds the specified maximum length, the pre-validation of the query migration will fail. DSC skips this query and logs the following error:</p> <p>2018-07-06 12:05:57,598 ERROR TeradataBulkHandler: 195 Error occurred during processing of input in Bulk Migration. PreQueryValidation failed due to: Invalid termination; OR exclude keyword found in query; OR query exceeds maximum length (MaxSqlLen config parameter). filename.SQL for Query in position : xx</p>	<p>1 to 52,428,800 bytes</p> <p>(1 byte to 50 MB)</p>	<p>1048576</p> <p>(1 MB)</p>	<p>MaxSqlLen=1048576</p>
<ul style="list-style-type: none"> initialJVMMemory 	<p>Initial memory</p>	<p>N/A</p>	<p>256 MB</p>	<p>initialJVMMemory=256MB</p> <p>This indicates, process will startup with 256 MB of memory</p>

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> maxJVMMemory 	Maximum memory	N/A	1024 MB	maxJVMMemory=2048m This indicates, the process will use up to 2048 MB of memory.

NOTE

- If a parameter is set to an incorrect or invalid value, DSC uses the default value of the parameter.
- If the extensions (for example, **.doc**) are not supported, then it is recommended you add extension in **fileExtension** configuration parameter in **application.properties** file.

Setting Java Memory Allocation

DSC has preset settings for the memory allocation of the Java Virtual Machine (JVM).

If the memory usage exceeds the limit during migration, DSC displays the "java.lang.OutOfMemoryError: GC overhead limit exceeded" error and exit. In this case, you can increase the values of **initialJVMMemory** and **maxJVMMemory** in the **application.properties** file to allocate more memory.

NOTE

The available system resources also determine the memory allocation.

Table 6-6 Parameters for JVM Memory Allocation

Parameter	Description	Recommended Value
Xms	Initial memory allocation (unit: MB)	The minimum value is 256 MB. The maximum value depends on the available system resources. Default value: 256
Xmx	Upper limit for memory allocation (unit: MB)	The minimum value is 1024 MB. The maximum value depends on the available system resources. Default value: 1024

6.6.3 Teradata SQL Configuration

Teradata parameters are used to customize rules for Teradata script migration.

Open the **features-teradata.properties** file in the **config** folder and set the parameters in **Table 6-7** as required.

Table 6-7 Parameters in the **features-teradata.properties** file

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none">deleteToTruncate	<p>Rule for migrating DELETE statements without a WHERE clause.</p> <p>true: enables the migration of DELETE to TRUNCATE. false: disables the migration of DELETE to TRUNCATE.</p>	<ul style="list-style-type: none">truefalse	false	deleteToTruncate=true
<ul style="list-style-type: none">distributeByHash	<p>Which columns specified in the primary index will be used for data distribution across nodes in the cluster.</p> <p>one: Data is distributed based on the first column specified in the primary index.</p> <p>many: Data is distributed based on all the columns specified in the primary index.</p> <p>This function is addressed by using the DISTRIBUTE BY clause.</p> <p>NOTE This parameter is set to one in V100R002C60 because this version does not support multiple columns in the DISTRIBUTE BY clause.</p>	<ul style="list-style-type: none">onemany	many	distributeByHash=many

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> extendedGroupByClause 	<p>Whether to enable the migration of 3 (grouping sets/cube/rollup).</p> <p>true: enables the migration of GROUP BY().</p> <p>false: disables the migration of GROUP BY().</p>	<ul style="list-style-type: none"> true false 	false	extendedGroupByClause=false
<ul style="list-style-type: none"> inToExists 	<p>Whether to enable the migration of IN and NOT IN Conversion to EXISTS/NOT EXISTS for query optimization.</p>	<ul style="list-style-type: none"> true false 	false	inToExists=false
<ul style="list-style-type: none"> rowstoreToColumnstore 	<p>Whether to convert row-store tables to column-store tables.</p> <p>If this parameter is set to true, all row-store tables are converted to column-store tables during script migration.</p>	<ul style="list-style-type: none"> true false 	false	rowstoreToColumnstore=false
<ul style="list-style-type: none"> session_mode 	<p>Default table type (SET/MULTISET) for creating a table.</p> <p>Teradata: The default table type is SET.</p> <p>ANSI: The default table type is MULTISET.</p>	<ul style="list-style-type: none"> Teradata ANSI 	Teradata	session_mode=ANSI
<ul style="list-style-type: none"> tdMigrateALIAS 	<p>Whether to enable the migration of ALIAS.</p> <p>true: enables the migration of ALIAS.</p> <p>false: disables the migration of ALIAS.</p>	<ul style="list-style-type: none"> true false 	false	tdMigrateALIAS=true

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> tdMigrateDOLLAR 	<p>Whether to enable the migration of static objects whose name start with a dollar sign (\$). This parameter is not applicable to dynamic objects, in format of \${}.</p> <p>true: Enclose the name of a static object with double quotation marks (").</p> <p>false: Disable the migration of static objects.</p> <p>NOTE For details, see Object Names Starting with \$.</p>	<ul style="list-style-type: none"> true false 	true	tdMigrateDOLLAR=true
<ul style="list-style-type: none"> tdMigrateLOCKoption 	<p>Whether to enable the migration of queries with the LOCK keyword.</p> <p>true: enables the migration of such queries and comments out the LOCK keyword.</p> <p>false: disables the migration of such queries. DSC Migration Tool skips this query and logs the following information: Gauss does not have equivalent syntax for LOCK option in CREATE VIEW and INSERT statement. Please enable the config_param tdMigrateLockOption to comment the LOCK syntax in the statement.</p> <p>NOTE For details, see ACCESS LOCK.</p>	<ul style="list-style-type: none"> true false 	false	tdMigrateLOCKoption=true

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> tdMigrateNULLIFZERO 	<p>Whether to enable the migration of NULLIFZERO().</p> <p>true: enables the migration of NULLIFZERO().</p> <p>false: disables the migration of NULLIFZERO().</p>	<ul style="list-style-type: none"> true false 	true	tdMigrateNullIFZero=true
<ul style="list-style-type: none"> tdMigrateVIEWCHECKOPTION 	<p>Whether to enable the migration of views containing CHECK OPTION.</p> <p>true: Comment out such views during migration.</p> <p>false: Disable the migration of such views. The migration tool copies the query and logs the following information:</p> <p>Gauss does not support WITH CHECK OPTION in CREATE VIEW. Please enable the config_param tdMigrateViewCheckOption to comment the WITH CHECK OPTION syntax in the statement.</p>	<ul style="list-style-type: none"> true false 	false	tdMigrateVIEWCHECKOPTION=true
<ul style="list-style-type: none"> tdMigrateZEROIFNULL 	<p>Whether to enable the migration of ZEROIFNULL().</p> <p>true: enables the migration of ZEROIFNULL().</p> <p>false: disables the migration of ZEROIFNULL().</p>	<ul style="list-style-type: none"> true false 	true	tdMigrateZEROIFNULL=true

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> volatile 	<p>Type of tables whose data is specific to a session and is stored only for the session. When the session ends, the data and tables are deleted.</p> <p>The value can be local temporary or unlogged.</p> <p>NOTE unlogged is supported in V100R002C60 and local temporary is not.</p>	<ul style="list-style-type: none"> local temporary unlogged 	local temporary	volatile=unlogged
<ul style="list-style-type: none"> tdMigrateCharsetCase 	<p>Whether to enable the migration of CHARACTER SET and CASESPECIFIC.</p> <p>true: Comment out CHARACTER SET and CASESPECIFIC during script migration.</p> <p>false: Disable the migration of CHARACTER SET and DSC. In this case, DSC copies CHARACTER SET, CASESPECIFIC and logs the following information with query details (such as the file name and statement position): Gauss does not have an equivalent syntax for CHARACTER SET & CASE SPECIFIC option in column-level. You can rewrite this statement or set the configuration parameter tdMigrateCharsetCase to TRUE to comment the Character set & Case specific syntax in this statement.</p>	<ul style="list-style-type: none"> true false 	false	tdMigrateCharsetCase=false NOTE If tdMigrateCharsetCase is set to true , comment out the special keyword of the character.

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> terdataUtilities 	Migration support for teradata utilities. Possible values - TRUE/FALSE <ul style="list-style-type: none"> true false 	<ul style="list-style-type: none"> true false 	true	terdataUtilities=true
<ul style="list-style-type: none"> unique_primary_index_in_column_table 	Creating a unique index for a column store table is not supported.	<ul style="list-style-type: none"> true false 	true	unique_primary_index_in_column_table=true
<ul style="list-style-type: none"> default_charset 	Migration support for default_charset. Possible values: LATIN/UNICODE/GRAPHIC	<ul style="list-style-type: none"> LATIN UNICODE GRAPHIC 	LATIN	default_charset=LATIN
<ul style="list-style-type: none"> mergeImplementation 	mergeImplementation has the following two types: <ul style="list-style-type: none"> using WITH clause splitting the queries Possible values: <ul style="list-style-type: none"> With Split None 	<ul style="list-style-type: none"> With Split None 	None	mergeImplementation=None
<ul style="list-style-type: none"> dsqSupport 	This parameter supports dsq. Possible values: <ul style="list-style-type: none"> true false 	<ul style="list-style-type: none"> true false 	false	dsqSupport=false
<ul style="list-style-type: none"> tdcolumnInSensitive 	Whether to remove column names that contain double quotes during migration. Possible values: <ul style="list-style-type: none"> true false 	<ul style="list-style-type: none"> true false 	false	tdcolumnInSensitive=false

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> tdMigrateCASE_N 	<p>Specifies the migration mode of the CASE_N for partitioning. Gauss does not support multilevel (nested) partitioning:</p> <p>The following options are supported:</p> <ul style="list-style-type: none"> comment none 	<ul style="list-style-type: none"> comment none 	comment	tdMigrateCASE_N=comment
<ul style="list-style-type: none"> tdMigrateRANGE_N 	<p>Specifies the migration mode of the RANGE_N for partitioning. Gauss does not support multilevel (nested) partitioning:</p> <p>The following options are supported:</p> <ul style="list-style-type: none"> comment none range 	<ul style="list-style-type: none"> comment none range 	range	tdMigrateRANGE_N=range
<ul style="list-style-type: none"> tdMigrateAddMonth 	<p>Migration support for addMonth.</p> <p>Possible values: TRUE and FALSE</p>	<ul style="list-style-type: none"> true false 	false	tdMigrateAddMonth=false

6.6.4 Oracle SQL Configuration

Oracle parameters are used to customize rules for Oracle script migration.

Open the **features-oracle.properties** file in the **config** folder and set parameters in [Table 6-8](#) as needed.

Table 6-8 Parameters in the `features-oracle.properties` file

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> exceptionHandler 	<p>Whether to comment out exception blocks in PL/SQL.</p> <p>true: Comment out the exception blocks.</p> <p>false: Retain the exception blocks as they are.</p> <p>NOTE exceptionHandler is not supported in V100R002C60.</p>	<ul style="list-style-type: none"> true false 	false	exceptionHandler=TRUE
<ul style="list-style-type: none"> TxHandler 	<p>Whether to comment out COMMIT and ROLLBACK operations in PL/SQL.</p> <p>true: Comment out the operations.</p> <p>false: Retain the operations as they are.</p>	<ul style="list-style-type: none"> True False 	True	TxHandler=True
<ul style="list-style-type: none"> foreignKeyHandler 	<p>Whether to comment out foreign key constraints.</p> <p>true: Comment out the constraints.</p> <p>false: Retain the constraints as they are.</p>	<ul style="list-style-type: none"> true false 	true	foreignKeyHandler=true

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> globalTempTable 	<p>Valid values are GLOBAL and LOCAL. Currently, the target database does not support GLOBAL.</p>	<ul style="list-style-type: none"> GLOBAL LOCAL 	LOCAL	encodingFormat=LOCAL
<ul style="list-style-type: none"> onCommitDeleteRows 	<p>Valid values are DELETE and PRESERVE. Current Version V100R008</p>	<ul style="list-style-type: none"> DELETE PRESERVE 	DELETE	onCommitDeleteRows=DELETE
<ul style="list-style-type: none"> maxValInSequence 	<p>Maximum sequence value supported by the database. Currently, the maximum value supported by the database is 9223372036854775807.</p>	1-9223372036854775807	9223372036854775807	maxValInSequence=9223372036854775807
<ul style="list-style-type: none"> mergeImplementation 	<p>Method for migrating a merge statement. SPLIT: The merge statement is split into individual queries during migration for query optimization. WITH: The merge statement is migrated using a WITH clause.</p>	<ul style="list-style-type: none"> WITH SPLIT None 	WITH	mergeImplementation=None

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> RemoveHash Partition 	<p>Whether to comment out HASH PARTITION statements.</p> <p>true: Comment out the constraints.</p> <p>false: Retain the HASH PARTITION statements as they are.</p>	<ul style="list-style-type: none"> true false 	true	RemoveHashPartition=false
<ul style="list-style-type: none"> RemoveHash SubPartition 	<p>Whether to comment out HASH SUBPARTITION statements.</p> <p>true: Comment out the constraints.</p> <p>false: Retain HASH SUBPARTITION statements as they are.</p>	<ul style="list-style-type: none"> true false 	true	RemoveHashSubPartition=false
<ul style="list-style-type: none"> RemoveListPartition 	<p>Whether to comment out LIST PARTITION statements.</p> <p>true: Comment out the constraints.</p> <p>false: Retain LIST PARTITION statements as they are.</p>	<ul style="list-style-type: none"> true false 	true	RemoveListPartition=false

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> RemoveListSubPartition 	<p>Whether to comment out LIST SUBPARTITION statements.</p> <p>true: Comment out the constraints.</p> <p>false: Retain the LIST SUBPARTITION statements as they are.</p>	<ul style="list-style-type: none"> true false 	true	RemoveListSubPartition=false
<ul style="list-style-type: none"> RemoveRangeSubPartition 	<p>Whether to comment out RANGESUBPARTITION statements.</p> <p>true: Comment out the constraints.</p> <p>false: Retain the RANGESUBPARTITION statements as they are.</p>	<ul style="list-style-type: none"> true false 	true	RemoveRangeSubPartition=false
<ul style="list-style-type: none"> MigSupportSequence 	<p>Whether to enable the migration of SEQUENCE statements.</p> <p>true: enables the conversion of CREATE to INSERT.</p> <p>false: disables the migration of CREATE.</p>	<ul style="list-style-type: none"> true false 	true	MigSupportSequence=false

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> RemovePartitionTS 	<p>Whether to comment out PartitionTS statements.</p> <p>true: Comment out the PartitionTS statements.</p> <p>false: Retain the PartitionTS statements as they are.</p>	<ul style="list-style-type: none"> true false 	true	RemovePartitionTS=true
<ul style="list-style-type: none"> BitmapIndexSupport 	<p>Whether to comment out for BitmapIndex</p> <p>COMMENT will comment the entire input script BTREE will retain as they are</p>	<ul style="list-style-type: none"> comment btree 	comment	BitmapIndexSupport=comment
<ul style="list-style-type: none"> pkgSchemaNaming 	<p>The following options are supported:</p> <p>TRUE - schema1.package1#procedure1 should be changed to package1.procedure1</p> <p>FALSE - schema1.package1#procedure1 will not be removed</p>	<ul style="list-style-type: none"> true false 	true	pkgSchemaNaming=true
<ul style="list-style-type: none"> plsqlCollection 	<p>The following options are supported:</p> <ul style="list-style-type: none"> varray localtable none 	<ul style="list-style-type: none"> varray localtable none 	varray	plsqlCollection=varray

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> commentstorageparameter 	<p>Whether to comment out the storage parameters in a table or index.</p> <p>true: Comment out the storage parameters.</p> <p>false: Retain the storage parameters as they are.</p>	<ul style="list-style-type: none"> true false 	true	commentStorageParameter=true
<ul style="list-style-type: none"> MigSupportForListAgg 	<p>Whether to enable the migration of ListAgg statements.</p> <p>true: enables the migration of ListAgg.</p> <p>false: disables the migration of ListAgg.</p>	<ul style="list-style-type: none"> true false 	true	MigSupportForListAgg=false
<ul style="list-style-type: none"> MigSupportForRegexReplace 	<p>Whether to enable the migration of RegexReplaces statements.</p> <p>true: enables the migration of RegexReplace.</p> <p>false: disables the migration of RegexReplace.</p>	<ul style="list-style-type: none"> true false 	true	MigSupportForRegexReplace=false

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> commentPragmaAutomationTrans 	<p>Whether to comment out the AutomationTrans parameters in a table or index.</p> <p>true: Comment out the AutomationTrans. false: Retain the AutomationTrans parameters as they are.</p>	<ul style="list-style-type: none"> true false 	true	commentPragmaAutomationTrans=true
<ul style="list-style-type: none"> supportJoinOperator 	<p>Indicates whether the left/right outer join operator (+) is supported.</p> <p>The following options are supported:</p> <ul style="list-style-type: none"> true false 	<ul style="list-style-type: none"> true false 	false	supportJoinOperator=false
<ul style="list-style-type: none"> migInsertWithTableAlias 	<p>The following options are supported:</p> <ul style="list-style-type: none"> true false 	<ul style="list-style-type: none"> true false 	true	migInsertWithTableAlias=true
<ul style="list-style-type: none"> varraySize 	Varray datatype size	<ul style="list-style-type: none"> NA 	1024	varraySize=1024
<ul style="list-style-type: none"> varrayObjectSize 	VarrayObject datatype size	<ul style="list-style-type: none"> NA 	10240	varrayObjectSize= 10240
<ul style="list-style-type: none"> migrationScope 	Whether to package split or migrate completely.	<ul style="list-style-type: none"> pkgSplit complete Migration 	complete Migration	migrationScope=completeMigration

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> migSupportConnectBy 	<p>The following options are supported:</p> <ul style="list-style-type: none"> true false <p>true: enables the migration of connectBy.</p>	<ul style="list-style-type: none"> true false 	true	migSupportConnectBy = true
<ul style="list-style-type: none"> migrate_ConnectBy_Unnest 	<p>Whether to migrate connectBy and Unnest.</p> <p>true: enables the migration of connectBy and Unnest.</p> <p>false: retains the original value.</p>	<ul style="list-style-type: none"> true false 	true	migrate_ConnectBy_Unnest=true
<ul style="list-style-type: none"> extendedGroupByClause 	<p>Whether to migrate the following extended functions of GROUP BY:</p> <ul style="list-style-type: none"> grouping sets cube rollup 	<ul style="list-style-type: none"> true false 	false	extendedGroupByClause=false
<ul style="list-style-type: none"> supportDupValOnIndex 	<p>Whether to migrate DUP_VAL_ON_INDEX.</p>	<ul style="list-style-type: none"> UNIQUE_VIOLATION(V1R8) OTHERS(older versions) 	UNIQUE_VIOLATION	supportDupValOnIndex=UNIQUE_VIOLATION
<ul style="list-style-type: none"> pkgvariable 	<p>Whether to migrate pkgvariable.</p>	<ul style="list-style-type: none"> localtable sys_set_context none 	localtable	pkgvariable = localtable

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> addPackageNameList 	<p>The following options are supported:</p> <ul style="list-style-type: none"> true false <p>Set package_name_list to <i><schema_name></i> and invoke this schema.</p>	<ul style="list-style-type: none"> true false 	false	addPackageNameList = false
<ul style="list-style-type: none"> addPackageTag 	<p>The following options are supported:</p> <ul style="list-style-type: none"> true false <p>If this parameter is set to true, PACKAGE is added in front of AS IS in the stored procedure/function declaration.</p>	<ul style="list-style-type: none"> true false 	false	addPackageTag = true
<ul style="list-style-type: none"> addGrantLine 	<p>The following options are supported:</p> <ul style="list-style-type: none"> true false <p>true: adds GRANT rows to each stored procedure/function at the end of the file.</p>	<ul style="list-style-type: none"> true false 	false	addGrantLine = true

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> MigDbmsLob 	The following options are supported: <ul style="list-style-type: none"> true false TRUE - DBMS_LOB is migrated. FALSE - DBMS_LOB is not migrated 	<ul style="list-style-type: none"> true false 	false	MigDbmsLob=false
<ul style="list-style-type: none"> uniqueConsForPartitionedTable 	Unique or primary key constraint for partitioned table.	<ul style="list-style-type: none"> comment_partition comment_unique none 	comment_partition	uniqueConsForPartitionedTable = comment_partition
<ul style="list-style-type: none"> MigSupportForRegexFunc 	Possible values for MigSupportForRegexReplace .	<ul style="list-style-type: none"> true false 	false	MigSupportForRegexFunc=false
<ul style="list-style-type: none"> migSupportUnnest 	Possible values for migSupportUnnest .	<ul style="list-style-type: none"> true false 	true	migSupportUnnest = true
<ul style="list-style-type: none"> MDSYS.MBRCOORDLIST 	Replace the unsupported datatype MDSYS.MBRCOORDLIST with a user-defined datatype.	<ul style="list-style-type: none"> None Can enter any free text 	None	MDSYS.MBRCOORDLIST=None
<ul style="list-style-type: none"> MDSYS.SDO_GEOMETRY 	Replace the unsupported datatype MDSYS.SDO_GEOMETRY with a user-defined datatype.	<ul style="list-style-type: none"> None Can enter any free text 	None	MDSYS.SDO_GEOMETRY=None

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> GEOMETRY 	Replace the unsupported datatype GEOMETRY with a user-defined datatype.	<ul style="list-style-type: none"> None Can enter any free text 	None Input should not migrate.	GEOMETRY=None
<ul style="list-style-type: none"> tdMigrateAddMonth 	Possible values for addMonth .	<ul style="list-style-type: none"> true false 	None	tdMigrateAddMonth=false IF TRUE THEN mig_ORA_ext.ADD_MONTHS (APPENDING mig_ORA_ext) OTHERWISE NOT APPEND. tdMigrateAddMonth=false

 NOTE

DSC provides parameters for deleting partitions and subpartitions because the keywords for these features are not supported currently. You can comment out the statements containing these parameters or retain them as they are during script migration.

6.6.5 Teradata Perl Configuration

Teradata Perl parameters are used to customize rules for Teradata Perl script migration.

Open the **perl-migration.properties** file in the **config** folder and set parameters in [Table 6-9](#) as required.

 NOTE

- Parameter values are case-insensitive.
- You can modify value of the following two parameters **db-bteq-tag-name** and **db-tdsql-tag-name** parameters in the following table:

Table 6-9 Parameters in the perl-migration.properties file

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> db-bteq-tag-name 	<p>Scripts to be processed in Perl files.</p> <p>BTEQ: Only the scripts under the BTEQ tag will be processed.</p>	<ul style="list-style-type: none"> bteq 	bteq	db-bteq-tag-name=bteq
<ul style="list-style-type: none"> db-tdsql-tag-name 	<p>Only the scripts under the db-tdsql-tag-name tag will be processed.</p> <p>SQL_LANG: Only the scripts under the SQL_LANG tag will be processed.</p>	sql_lang	sql_lang	db-tdsql-tag-name=sql_lang
<ul style="list-style-type: none"> add-timing-on 	<p>Whether to enable the insertion of scripts to calculate execution time.</p> <p>If it is enabled, the script will be added to each input file.</p>	<ul style="list-style-type: none"> true false 	false	add-timing-on=true

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> remove-intermediate-files 	<p>Whether to delete the intermediate SQL file generated by the DSC after the migration is complete.</p> <p>The intermediate files contain the BTEQ and SQL_LANG syntax in SQL files. These files are used as input for DSC.</p> <p>true: Delete the intermediate files.</p> <p>false: Do not delete the intermediate files.</p>	<ul style="list-style-type: none"> true false 	true	remove-intermediate-files=true

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> migrate-variables 	<p>Whether to enable the migration of Perl variables containing SQL statements.</p> <p>Perl files can contain Perl variables with SQL statements. These variables are executed by using the PREPARE and EXECUTE statement in Perl. DSC can extract SQL statements from Perl variables and migrate them.</p> <p>true: enables the migration of Perl variables containing SQL statements.</p> <p>false: disables the migration of Perl variables containing SQL statements.</p> <p>Example 1:</p> <p>migrate-variables is set to true and input is as follows:</p> <pre>\$V_SQL = "CT X1(C1 INT,C2 CHAR(30));"</pre> <p>Output</p> <pre>CREATE TABLE X1(C1 INT,C2 CHAR(30));</pre> <p>Example 2:</p> <p>Input</p> <pre>\$onesql ="SELECT trim(tablename) from dbc.tables WHERE</pre>	<ul style="list-style-type: none"> true false 	true	migrate-variables=true

Parameter	Description	Value Range	Default Value	Example
	<pre> databasename = '\$ {AUTO_DQDB}' and tablename like 'V_%' order by 1;"; \$sth_rundq = \$dbh- >execute_query(\$one sql); </pre> <p>Output</p> <pre> \$onesql ="SELECT TRIM(tablename) FROM dbc.tables WHERE databasename = '\$ {AUTO_DQDB}' AND tablename LIKE 'V_%' ORDER BY 1 ; "; \$sth_rundq = \$dbh- >execute_query(\$one sql); </pre>			
<ul style="list-style-type: none"> logging-level 	<p>Logging level of Teradata Perl migration log files.</p> <p>error: Log only errors.</p> <p>warning: Log errors and warnings.</p> <p>info: Log errors, warnings, and activity information. This level contains all log information.</p>	<ul style="list-style-type: none"> error warning info 	info	logging-level=info

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> log-file-count 	<p>Maximum number of log files retained, including the log files in use and archived log files.</p> <p>If the number of log files exceeds the upper limit, the earliest files will be deleted until the new log files are successfully archived.</p>	3 - 10	5	log-file-count=10
<ul style="list-style-type: none"> log-file-size 	<p>Maximum file size.</p> <p>Upon reaching the specified size, a file is archived by adding a timestamp to the file name.</p> <p>Example: perlDSC_2018-07-08_16_12_08.log</p> <p>After the archiving, a new log file <i>perlDSC.log</i> with a timestamp is generated.</p>	1MB - 10MB	5MB	log-file-size=10MB

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none">migrate-executequery	<p>Whether to enable the migration of execute_query containing SQL statements.</p> <p>true: enables the migration of execute_query containing SQL statements.</p> <p>false: disables the migration of execute_query containing SQL statements.</p> <p>For example:</p> <p>migrate-executequery is set to true and input is as follows:</p> <pre>my \$rows1=\$conn1->execute_query("sel \${selectclause} from \${databasename}.\${tablename};");</pre> <p>Output</p> <pre>my \$rows1=\$conn1->execute_query("SELECT \${selectclause} FROM \${databasename}.\${tablename} ;");</pre>	<ul style="list-style-type: none">truefalse	true	migrate-executequery=true

6.6.6 MySQL SQL Configuration

MySQL parameters are used to customize rules for MySQL script migration.

Open the **features-mysql.properties** file in the **config** folder and configure **parameters in the features-mysql.properties file** as required.

Table 6-10 Parameters in the **features-mysql.properties** file

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> • table.databaseAsSchema • table.defaultSchema 	<p>Whether to use a database name as the schema name. If a database name does not exist, the user-defined schema specified by table.schema will be used. If table.schema is not specified, the default schema will be used.</p>	<ul style="list-style-type: none"> • true • false • public 	<ul style="list-style-type: none"> • true • public 	<ul style="list-style-type: none"> • table.databaseAsSchema=true • table.defaultSchema=public
<ul style="list-style-type: none"> • table.schema 	<p>Name of the user-defined schema. If this parameter is specified, it will be directly used. In this case, even if useDatabaseAsSchema is set to true, the name of the current schema will be used.</p>	<ul style="list-style-type: none"> • schemaName 	<ul style="list-style-type: none"> • null 	<ul style="list-style-type: none"> • table.schema=

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> table.orientation 	Default data storage mode. Value ROW means row storage, and value COLUMN means column storage.	<ul style="list-style-type: none"> ROW COLUMN 	<ul style="list-style-type: none"> ROW 	<ul style="list-style-type: none"> table.orientation=ROW
<ul style="list-style-type: none"> table.type 	Default table type, which can be partitioned table (HASH) or replication table (REPLICATION)	<ul style="list-style-type: none"> HASH REPLICATION 	<ul style="list-style-type: none"> HASH 	<ul style="list-style-type: none"> table.type=HASH
<ul style="list-style-type: none"> table.tablespace 	Tablespace options	<ul style="list-style-type: none"> COMMENT RESERVE 	<ul style="list-style-type: none"> RESERVE 	<ul style="list-style-type: none"> table.tablespace=RESERVE
<ul style="list-style-type: none"> table.partition-key.choose.strategy 	Policy for selecting the partition key	<ul style="list-style-type: none"> com.huawei.hwclouds.scws.dws.DWSPartitionKeyChooserStrategy 	<ul style="list-style-type: none"> com.huawei.hwclouds.scws.dws.DWSPartitionKeyChooserStrategy 	<ul style="list-style-type: none"> table.partition-key.choose.strategy=com.huawei.hwclouds.scws.dws.DWSPartitionKeyChooserStrategy

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> table.partition-key.name 	<p>Partition key. If this parameter is not specified, the default selection policy will be used. If there are multiple columns, separate them with commas (,). The column names are case insensitive.</p>	<ul style="list-style-type: none"> Reserved parameter 	<ul style="list-style-type: none"> null 	<ul style="list-style-type: none"> table.partition-key.name=
<ul style="list-style-type: none"> table.compress.mode 	<p>Compression mode. If keyword COMPRESS is specified in CREATE TABLE, the compression feature will be triggered in the case of bulk INSERT operations. If this feature is enabled, a scan will be performed on all tuple data within the page to generate a dictionary and then the tuple data will be compressed and stored. If NOCOMPRESS is used, tables will not be compressed.</p>	<ul style="list-style-type: none"> COMPRESS NOCOMPRESS 	<ul style="list-style-type: none"> NOCOMPRESS 	<ul style="list-style-type: none"> table.compress.mode=NOCOMPRESS

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none">• table.compress.row• table.compress.column	<p>Compression level of table data. It determines the compression ratio and duration. Generally, the higher the level of compression, the higher the ratio, the longer the duration, vice versa. The actual compression ratio depends on the distribution mode of table data loaded. Valid values for row-store tables are YES and NO, and the default is NO. Valid values for column-store tables are YES, NO, LOW, MIDDLE, and HIGH, and the default is LOW.</p>	<ul style="list-style-type: none">• YES• NO• YES• NO• LOW• MIDDLE• HIGH	<ul style="list-style-type: none">• NO• LOW	<ul style="list-style-type: none">• table.compress.row=NO• table.compress.column=LOW

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none">• table.compress.level	Table data compression ratio and duration at the same compression level. This divides a compression level into sublevels, providing more choices for the compression ratio and duration. As the value becomes larger, the compression ratio becomes higher and duration longer at the same compression level.	<ul style="list-style-type: none">• 0• 1• 2• 3	<ul style="list-style-type: none">• 0	<ul style="list-style-type: none">• table.compress.level=0
<ul style="list-style-type: none">• table.database.template	Database template	<ul style="list-style-type: none">• Reserved parameter	<ul style="list-style-type: none">• template0	table.database.template=template0

6.6.7 Netezza Configuration

Netezza parameters are used to customize rules for Netezza script migration.

Open the **features-netezza.properties** file in the **config** folder and set parameters in [Table 6-11](#) as required.

Table 6-11 Parameters in the `features-netezza.properties` file

Parameter	Description	Value Range	Default Value	Example
<ul style="list-style-type: none"> rowstoreToColumnstore 	Whether to convert rowstore tables to columnstore tables.	<ul style="list-style-type: none"> true false 	false	rowstoreToColumnstore=false
<ul style="list-style-type: none"> cstore_blob 	The options are as follows: <ul style="list-style-type: none"> bytea none 	<ul style="list-style-type: none"> bytea none 	bytea	cstore_blob=bytea
<ul style="list-style-type: none"> keywords_addressed_using_as 	The options are as follows: <ul style="list-style-type: none"> OWNER ATTRIBUTE SOURCE FREEZE 	<ul style="list-style-type: none"> OWNER ATTRIBUTE SOURCE FREEZE 	OWNER	keywords_addressed_using_as=OWNER
<ul style="list-style-type: none"> keywords_addressed_using_doublequote 	Possible values of addressed_using_doublequote	FREEZE	FREEZE	keywords_addressed_using_doublequote=FREEZE

6.7 Using DSC

6.7.1 Migration Process

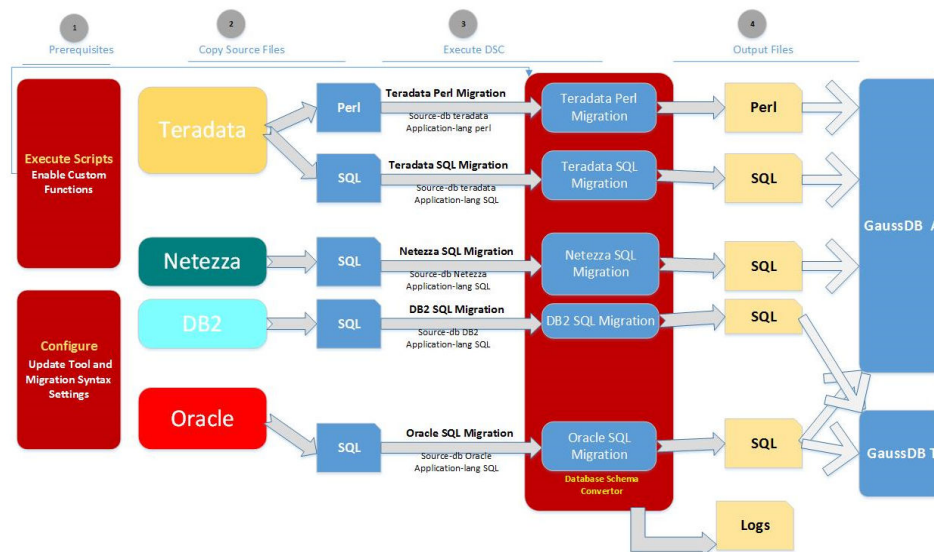
6.7.1.1 Overview

The following use cases for migration are supported by DSC:

- Migrate Teradata SQL
- Migrate Oracle SQL
- Migrate Teradata Perl files
- Migrate Netezza
- Migrate MySQL SQL
- Migrate DB2

Figure 6-3 shows the DSC Migration Process.

Figure 6-3 Syntax migration process



This section describes the prerequisites for starting the migration process.

Executing Custom Scripts

The DSC configuration contains the following custom DB scripts in the *DSC/scripts*:

- *date_functions.sql*: Custom DB script for Oracle date functions
- *environment_functions.sql*: Custom DB script for Oracle environment functions
- *string_functions.sql*: Custom DB script for Oracle string functions
- *pkg_variable_scripts.sql*: Custom DB script for Oracle package variable functions
- *sequence_scripts.sql*: Custom DB script for Oracle sequence functions
- *mig_fn_get_datatype_short_name.sql*: Custom DB script for Teradata functions
- *mig_fn_castasint.sql*: Custom DB script for migration of CAST AS INTEGER
- *vw_td_dbc_tables.sql*: Custom DB script for migration of DBC.TABLES
- *vw_td_dbc_indices.sql*: Custom DB script for migration of DBC.INDICES

These DB scripts are required to support certain input keywords not present in one or more versions of the target DB. These scripts need to be executed once in the target DB prior to migration.

For details about executing custom database scripts, see [Custom DB Script Configuration](#).

Use any of the following methods to execute the required scripts in all target GaussDB(DWS) databases for which migration is to be performed:

- Run the following command to connect to the GaussDB(DWS) database and paste all content in the .sql file to **gsql**, which will automatically execute the pasted content.

Run the following command to connect to the GaussDB(DWS) database:

```
gsql -h <host_addr_xxx.xxx.xxx.xxx> -d <database_name> -U <user_name> -W <password> -p  
<port_number> -r
```

- Use gsql to connect to the GaussDB(DWS) database and execute the **.sql** file:
Run the following command to connect to the GaussDB(DWS) database and execute the **.sql** file:

```
gsql -h <host_addr_xxx.xxx.xxx.xxx> -d <database_name> -U <user_name> -W <password> -p  
<port_number> -f <filename.sql> -o <output_filename> -L <log_filename.log> -r
```

- Use Data Studio to connect to the GaussDB(DWS) database, and open and execute the **.sql** file in Data Studio.
- Before Oracle PL/SQL objects (procedures or functions) are migrated, migrate all DDL and DML using the **Bulk** migration type. Then, migrate the scripts containing PL/SQL objects using the **BLogic** migration type.

NOTE

If the migration type is **Bulk**, the input file cannot contain any PL/SQL objects.

Similarly, if the migration type is **BLogic**, the input files must not contain any DDL/DML.

Configuring DSC and Migration Properties

The DSC configuration contains the following configuration files in the *DSC/config* folder:

- *application.properties*: Configuration parameters for the DSC
- *features-teradata.properties*: Configuration parameters for Teradata SQL Migration
- *features-oracle.properties*: Configuration parameters for Oracle SQL Migration
- *oracle-migration.properties*: Configuration parameters for Oracle (Beta) SQL Migration
- *perl-migration.properties*: Configuration parameters for Perl Migration
- *features-netezza.properties*: Configuration parameters for Netezza Migration
- *features-mysql.properties*: Configuration parameters for MySQL SQL Migration

For details about how to update configuration parameters, see [DSC Configuration](#).

6.7.1.2 Prerequisites

Executing Custom DB Scripts

Custom scripts are executed to support input keywords that do not exist in certain versions of the target database. These scripts must be executed in each target database before the migration.

[Table 6-12](#) describes the custom scripts in the *DSC/scripts/* directory. For details about how to execute custom scripts, see [Custom DB Script Configuration](#).

Table 6-12 Custom DB scripts

Script	Description
date_functions.sql	Custom DB script for Oracle date functions
environment_functions.sql	Custom DB script for Oracle environment functions
string_functions.sql	Custom DB script for Oracle string functions.
pkg_variable_scripts.sql	Custom DB script for Oracle package variable functions
sequence_scripts.sql	Custom DB script for Oracle sequence functions
mig_fn_get_datatype_short_name.sql	Custom DB script for Teradata functions
mig_fn_castasint.sql	Custom DB script for migration of CAST AS INTEGER
vw_td_dbc_tables.sql	Custom DB script for migration of DBC.TABLES
vw_td_dbc_indices.sql	Custom DB script for migration of DBC.INDICES

Table 6-13 Custom DB scripts (Oracle to GaussDB T)

Script	Description
create_user_and temptable_enable.sql	Custom DB script for create user and local temporary table is used to address Oracle Package feature.
pkg_variable_scripts.sql	Custom DB script for Oracle package variable functions

Follow the steps to execute custom DB scripts:

Step 1 Use any of the following methods to execute the required scripts in all target databases for which migration is to be performed:

- Use **gsql**.
 - Use **gsql** to connect to the target database and paste all content in the SQL file to **gsql**, which will automatically execute the pasted contents.

Run the following command to connect to the database:

```
gsql -h <host_addr_xxx.xxx.xxx.xxx> -d <database_name> -U <user_name> -W <password> -p <port_number> -r
```

- Use **gsql** to connect to the target database and execute a SQL file.

Run the following command to connect to the database and run the SQL file:

```
gsql -h <host_addr_xxx.xxx.xxx.xxx> -d <database_name> -U <user_name> -W <password> -p <port_number> -f <filename.sql> -o <output_filename> -L <log_filename.log> -r
```

- Use Data Studio.

Use Data Studio to connect to the target database, and then open and run the SQL file in Data Studio.

----End

Custom DB Script Configuration

Custom scripts are SQL files used to migrate from Teradata/Oracle the input keywords that do not exist in the target database.

These scripts must be executed in each target database before the migration.

Open the **scripts** folder in the release package. [Table 6-14](#) lists the folders and files in the **scripts** folder.

The SQL files contain the scripts for the custom migration functions. These functions are required to support the specific features of Teradata and Oracle.

Table 6-14 Custom DB scripts for DSC

Folder	Script File	Description
-- scripts	-	Folder: all scripts
----- oracle	-	Folder: Oracle functions and scripts
----- sequence	-	Folder: scripts to configure Oracle sequences
-	sequence_scripts.sql	Script: used to enable migration of Oracle sequence
----- package	-	Folder: scripts to configure Oracle package variables
-	pkg_variable_scripts.sql	Script: used to enable migration of Oracle package variables
----- function	-	Folder: scripts to configure Oracle system functions
-	date_functions.sql	Script: used to enable migration of Oracle date functions

Folder	Script File	Description
-	environment_functions.sql	Script: used to enable migration of Oracle environment functions
-	string_functions.sql	Script: used to enable migration of Oracle string functions
----- teradata	-	Folder: Teradata functions and scripts
----- view	-	Folder: scripts to configure views
-	vw_td_dbc_tables.sql	Script: used to enable migration of Teradata DBC.TABLES
-	vw_td_dbc_indices.sql	Script: used to enable migration of Teradata DBC.INDICES
----- function	-	Folder: scripts to configure Teradata system functions
-X	mig_fn_get_datatype_short_name.sql	Script: used to enable migration of Teradata DBC.COLUMNNS
-	mig_fn_castasint.sql	Script: used to enable migration of CAST AS INTEGER
-----db_scripts	-	Folder: scripts to enable Teradata custom functions
-	mig_fn_get_datatype_short_name.sql	Script: used to enable migration of Teradata DBC.COLUMNNS
-----core	-	Folder: Teradata core scripts
-	teratacore.pm	Script: used to perform Perl migration

Configuring DSC and Migration Properties

To configure DSC, configure parameters in the configuration files in the **config** folder of DSC. [Table 6-15](#) describes the parameters.

Table 6-15 Parameters for configuring DSC

Scenario	Configuration File	Parameter
Teradata SQL Migration	<ul style="list-style-type: none"> DSC: <i>application.properties</i> Teradata SQL Configuration: <i>features-teradata.properties</i> 	deleteToTruncate=True/ False distributeByHash=one/ many extendedGroupByClause=True/ False inToExists=True/ False rowstoreToColumnstore=True/ False session_mode= Teradata /ANSI tdMigrateDollar= True /False tdMigrateALIAS=True/ False tdMigrateNULLIFZero= True /False tdMigrateZEROIFNULL=True/ False volatile= local temporary /unlogged
Oracle SQL Migration	<ul style="list-style-type: none"> DSC: <i>application.properties</i> Oracle SQL Configuration: <i>features-oracle.properties</i> 	exceptionHandler=True/ False TxHandler= True /False foreignKeyHandler= True /False globalTempTable= GLOBAL /LOCAL onCommitDeleteRows=Delete/ Preserve maxValInSequence=0.. 9223372036854775807 mergeImplementation= WITH /SPLIT RemoveHashPartition= True /False RemoveHashSubPartition= True /False RemoveListPartition= True /False RemoveListSubPartition= True /False RemoveRangeSubPartition= True /False MigSupportSequence= True /False
Teradata Perl Migration	<ul style="list-style-type: none"> DSC: <i>application.properties</i> Teradata Perl Configuration: <i>perl-migration.properties</i> 	add-timing-on=True/ False db-bteq-tag-name=bteq db-tdsql-tag-name=sql_lang logging-level=error/warning/ info migrate-variables=True/ False remove-intermediate-files=True/ False target_files= overwrite /cancel migrate-executequery= True /False
MySQL SQL Migration	<ul style="list-style-type: none"> DSC: <i>application.properties</i> MySQL SQL Configuration: <i>features-mysql.properties</i> 	table.databaseAsSchema=true table.defaultSchema=public table.schema= table.orientation=ROW table.type=HASH table.partition-key.choose.strategy=com.huawei.hwclouds.scs.dws.DWSPartitionKeyChooserStrategy table.partition-key.name= table.compress.mode=NOCOMPRESS table.compress.level=0 table.compress.row=NO table.compress.column=LOW table.database.template=template0
Netezza SQL Migration	<ul style="list-style-type: none"> DSC: <i>application.properties</i> Netezza Configuration: <i>features-netezza.properties</i> 	rowstoreToColumnstore=false

Scenario	Configuration File	Parameter
DB2 Syntax Migration	DSC: <i>application.properties</i>	exceptionHandler= True/False TxHandler= True/False foreignKeyHandler= True/False globalTempTable= GLOBAL/LOCAL onCommitDeleteRows=Delete/ Preserve maxValInSequence=0.. 92233720368 54775807 mergeImplementation= WITH/SPLIT RemoveHashPartition= True/False RemoveHashSubPartition= True/False RemoveListPartition= True/False RemoveListSubPartition= True/False RemoveRangeSubPartition= True/False MigSupportSequence= True/False

6.7.1.3 Preparations

Before the migration, create an input folder and an output folder, and copy all the SQL scripts to be migrated to the input folder. The following procedure describes how to prepare for the migration in Linux.

- Step 1** Run the following commands to create an input folder and an output folder. You can create the folder anywhere based on your preferences. You can also use the default folders for input, output, provided as part of package.

```
mkdir input
mkdir output
```

DANGER

The tool reads the input folder in batches randomly. After the migration starts, it is recommended the users should not perform any modification on the input folder and files. Abnormal operations will affect the output result of the tool.

- Step 2** Copy all SQL scripts to be migrated to the input folder.

NOTE

- If the encoding format of source files is not UTF-8, perform the following steps:
 - Open the **application.properties** file in the **config** folder.
 - Change the value of **encodingFormat** in the **application.properties** file to the required encoding format.

DSC supports the UTF-8, ASCII, and GB2312 encoding formats. The values of **encodingFormat** are case-insensitive.
- To obtain the encoding format of a source file in Linux, run the following command on the server where the source file is located:


```
file -bi <Input file name>
```

----End

6.7.1.4 Migrating Data Using DSC

Precautions

- Before starting DSC, specify the output folder path. Separate the input folder path, output folder path, and log path with spaces. The input folder path cannot contain spaces, which will cause an error when DSC is used for migrating data. For details, see [Troubleshooting](#).
- If the output folder contains subfolders or files, DSC deletes the subfolders and files or overwrites them based on parameter settings in the **application.properties** configuration file in the **config** folder before the migration. Deleted or overwritten subfolders or files cannot be restored using DSC.
- If migration tasks are performed concurrently on the same server (by the same or different DSCs), different migration tasks must use different output folder paths and log paths.
- You can specify a log path by configuring optional parameters. If the path is not specified, DSC automatically creates a log folder under **TOOL_HOME**. For details, see [Log Reference](#).

Migration Methods

You can run the **runDSC.sh** in Linux or **runDSC.bat** in Windows perform a migration task. For details, see [Table 6-16](#).

Table 6-16 Migration on Windows and Linux

Scenario	CLI Parameter
Teradata SQL Migration	<pre>> ./runDSC.sh --source-db Teradata [--application-lang SQL] [--input-folder <input-script-path>] [--output-folder <output-script-path>] [--log-folder <log-path>] [--target-db/-T][Optional] > runDSC.bat --source-db Teradata [--application-lang SQL] [--input-folder <input-script-path>] [--output-folder <output-script-path>] [--log-folder <log-path>] [--target-db/-T][Optional]</pre>

Scenario	CLI Parameter
<p>Oracle SQL Migration</p>	<pre>./runDSC.sh --source-db Oracle [--application-lang SQL] [--input-folder <input-script-path>] [--output-folder <output-script-path>] [--log-folder <log-path>] [--conversion-type <Conversion-Type-BulkOrBlogic>] [--target-db/-T] runDSC.bat --source-db Oracle [--application-lang SQL] [--input-folder <input-script-path>] [--output-folder <output-script-path>] [--log-folder <log-path>] [--conversion-type <Conversion-Type-BulkOrBlogic>] [--target-db/-T]</pre>
<p>Teradata Perl Migration</p>	<pre>> ./runDSC.sh --source-db Teradata [--application-lang Perl] [--input-folder <input-script-path>] [--output-folder <output-script-path>] [--log-folder <log-path>] [--target-db/-T][Optional] > runDSC.bat --source-db Teradata [--application-lang Perl] [--input-folder <input-script-path>] [--output-folder <output-script-path>] [--log-folder <log-path>] [--target-db/-T][Optional]</pre>
<p>MySQL SQL Migration</p>	<pre>> ./runDSC.sh --source-db MySQL [--application-lang SQL] [--input-folder <input-script-path>] [--output-folder <output-script-path>] [--log-folder <log-path>] [--conversion-type <conversion-Type-BulkOrBlogic>] [--target-db/-T] > runDSC.bat --source-db MySQL [--application-lang SQL] [--input-folder <input-script-path>] [--output-folder <output-script-path>] [--log-folder <log-path>] [--conversion-type <conversion-Type-BulkOrBlogic>] [--target-db/-T]</pre>
<p>Netezza SQL Migration</p>	<pre>> ./runDSC.sh --source-db Netezza [--application-lang SQL] [--input-folder <input-script-path>] [--output-folder <output-script-path>] [--log-folder <log-path>] [--target-db/-T][Optional] > runDSC.bat --source-db Netezza [--application-lang SQL] [--input-folder <input-script-path>] [--output-folder <output-script-path>] [--log-folder <log-path>] [--target-db/-T][Optional]</pre>

Scenario	CLI Parameter
DB2 Syntax Migration	<pre>> ./runDSC.sh --source-db db2 [--application-lang SQL] [--input-folder <input-script-path>] [--output-folder <output-script-path>] [--log-folder <log-path>] [--conversion-type <Conversion-Type-BulkOrBlogic>] [--target-db/-T] > runDSC.bat --source-db db2 [--application-lang SQL] [--input-folder <input-script-path>] [--output-folder <output-script-path>] [--log-folder <log-path>] [--conversion-type <Conversion-Type-BulkOrBlogic>] [--target-db/-T]</pre>

 NOTE

- The CLI parameters are described as follows:
 - source-db** specifies the source database. The value can be **Teradata** or **Oracle**, which is case-insensitive.
 - conversion-type** specifies the migration type. This parameter is optional. DSC supports the following migration types:
 - Bulk**: migrates DML and DDL scripts.
 - BLogic**: migrates service logic, such as stored procedures and functions. **BLogic** is applicable to Oracle PL/SQL and Netezza.
 - target-db** specifies the target database. The value is **GaussDB(DWS)**.
- Command output description:
 - Migration process start time** indicates the migration start time and **Migration process end time** indicates the migration end time. **Total process time** indicates the total migration duration, in milliseconds. In addition, the total number of migrated files, total number of processors, number of used processors, log file path, and error log file path are also displayed on the console.
- For details about CLI parameters, see [Database Schema Conversion](#).

Task Example

- Example 1: Run the following command to migrate the SQL file of the Oracle database to the SQL script of GaussDB(DWS) on Linux:


```
./runDSC.sh --source-db Oracle --input-folder D:\test\conversion\input --output-folder D:\test\conversion\output --log-folder D:\test\conversion\log --conversion-type bulk --target-tdb gaussdbA
```
- Example 2: Run the following command to migrate the SQL file of the Oracle database to the SQL script of GaussDB(DWS) on Windows:


```
runDSC.bat --source-db Oracle --input-folder D:\test\conversion\input --output-folder D:\test\conversion\output --log-folder D:\test\conversion\log --conversion-type bulk --target-db gaussdbA
```

Migration details are displayed on the console (including the progress and completion status):

```
***** Schema Conversion Started *****
DSC process start time : Mon Jan 20 17:24:49 IST 2020
Statement count progress 100% completed [FILE(1/1)]
Schema Conversion Progress 100% completed
*****
Total number of files in input folder : 1
```



```
Total number of valid files in input folder : 1
*****
Log file path :...../DSC/DSC/log/dsc.log
Error Log file :
DSC process end time : Mon Jan 20 17:24:49 IST 2020
DSC total process time : 0 seconds
***** Schema Conversion Completed *****
```

6.7.1.5 Viewing Output Files and Logs

Viewing and Verifying Output Files

After the migration is complete, you can use a comparison tool (for example, BeyondCompare®) to compare the output file with its input file. Input SQL files can also be **formatted** for easier comparison.

1. Run the following command in Linux and view output files in the output folder. Operations in Windows are not described here.

```
cd OUTPUT
ls
```

Information similar to the following is displayed:

```
formattedSource output
user1@node79:~/Documentation/DSC/OUTPUT> cd output
user1@node79:~/Documentation/DSC/OUTPUT/output> ls
in_index.sql input.sql Input_table.sql in_view.sql MetadataInput.sql
user1@node79:~/Documentation/DSC/OUTPUT/output>
```

2. Use the comparison tool to compare the output file with its input file. Check whether the keywords in the migrated SQL file meet the requirements of the target database. If they do not, contact technical engineer support.

Viewing Log Files

Execution information and error messages are written into corresponding log files. For details, see [Log Reference](#).

Check whether errors are logged. If they are, rectify the faults by following the instructions in [Troubleshooting](#).

6.7.1.6 Troubleshooting

Migration related issues can be classified into:

- Tool execution issues: No output or incorrect output is displayed because DSC partially or fully failed to be executed. For details, see [Troubleshooting](#) and [FAQs](#).
- Migration syntax issues: DSC did not correctly recognize or migrate the migration syntax. For details, see [Constraints and Limitations](#).

6.7.2 Teradata SQL Migration

DSC supports the migration from Teradata to GaussDB(DWS), including the migration of schemas, DML, queries, system functions, and type conversion.

Performing Teradata SQL Migration

Run the following commands to set the source database, input and output folder paths, log path, and application language:

Linux:

```
./runDSC.sh
--source-db Teradata
[--input-folder <input-script-path>]
[--output-folder <output-script-path>]
[--log-folder <log-path>]
[--application-lang SQL]
```

Windows:

```
runDSC.bat
--source-db Teradata
[--input-folder <input-script-path>]
[--output-folder <output-script-path>]
[--log-folder <log-path>]
[--application-lang SQL]
```

For example:

Linux:

```
./runDSC.sh --source-db Teradata --target-db GaussDBA --input-folder /opt/DSC/DSC/input/teradata/ --
output-folder /opt/DSC/DSC/output/ --log-folder /opt/DSC/DSC/log/ --application-lang SQL --conversion-
type Bulk
```

Windows:

```
runDSC.bat --source-db Teradata --target-db GaussDBA --input-folder D:\test\conversion\input --output-
folder D:\test\conversion\output --log-folder D:\test\conversion\log --application-lang SQL --conversion-
type Bulk
```

During the execution of DSC, the migration summary, including the progress and completion status, is displayed on the console. Execution information and errors are written into [log files](#).

```
***** Schema Conversion Started *****
DSC process start time : Mon Jan 20 17:24:49 IST 2020
Statement count progress 100% completed [FILE(1/1)]
Schema Conversion Progress 100% completed
*****
Total number of files in input folder : 1
*****
Log file path :...../DSC/DSC/log/dsc.log
DSC process end time : Mon Jan 20 17:24:49 IST 2020
DSC total process time : 0 seconds
***** Schema Conversion Completed *****
```

For details about how to migrate Teradata SQL using DSC, see [Migrating Data Using DSC](#).

 NOTE

During the migration, the metadata of the input script can be called and is stored in the following files:

- Teradata migration
 - teradata-set-table.properties
- Oracle migration
 1. global-temp-table.properties
 2. global-temp-tables.properties
 3. primary-key-constraints.properties
 4. package-definition.properties
 5. package-names-oracle.properties
 6. create-types-UDT.properties

Clear the preceding files in the following scenarios:

- Migration of different files
- Migration of the same file with different parameter settings

6.7.3 Oracle SQL Migration

DSC supports the migration from Oracle to GaussDB(DWS), including the migration of schemas, DML, queries, system functions, and PL/SQL.

Performing Oracle SQL Migration

Run the following commands to set the source database, input and output folder paths, log paths, application language, and conversion type:

Linux:

```
./runDSC.sh
--source-db Oracle
[--input-folder <input-script-path>]
[--output-folder <output-script-path>]
[--log-folder <log-path>]
[--application-lang Oracle]
[--conversion-type <conversion-type>]
```

Windows:

```
runDSC.bat
--source-db Oracle
[--input-folder <input-script-path>]
[--output-folder <output-script-path>]
[--log-folder <log-path>]
[--application-lang Oracle]
[--conversion-type <conversion-type>]
```

- When migrating common DDL statements (such as tables, views, indexes, sequences, and so on) that do not contain PL/SQL statements, use the Bulk mode (that is, set **conversion-type** to **Bulk**).

Run the following commands, which include the folder paths in the example and the **conversion-type** set to **Bulk**:

Linux:

```
./runDSC.sh --source-db Oracle --input-folder /opt/DSC/DSC/input/oracle/ --output-  
folder /opt/DSC/DSC/output/ --log-folder /opt/DSC/DSC/log/ --application-lang SQL --conversion-  
type bulk --target-db gaussdbA
```

Windows:

```
runDSC.bat --source-db Oracle --input-folder D:\test\conversion\input --output-folder D:\test\conversion\output --log-folder D:\test\conversion\log --application-lang SQL --conversion-type bulk --target-db gaussdba
```

During the execution of DSC, the migration summary, including the progress and completion status, is displayed on the console. Execution information and errors are written into [log files](#).

```
***** Schema Conversion Started *****
DSC process start time : Mon Jan 20 17:24:49 IST 2020
Statement count progress 100% completed [FILE(1/1)]

Schema Conversion Progress 100% completed
*****
Total number of files in input folder : 1
*****
Log file path :...../DSC/DSC/log/dsc.log
DSC process end time : Mon Jan 20 17:24:49 IST 2020
DSC total process time : 0 seconds
***** Schema Conversion Completed *****
```

- When migrating objects such as functions, procedures, and packages that contain PL/SQL statements, use the BLogic mode. That is, set **conversion-type** to **BLogic**.

Run the following command, which includes the folder paths in the example and the **conversion-type** set to **BLogic**:

```
runDSC.bat --source-db Oracle --input-folder D:\test\migration\input --output-folder D:\test\migration\output --log-folder D:\test\migration\log --application-lang SQL --conversion-type blogic --target-db gaussdba
```

During the execution of DSC, the migration summary, including the progress and completion status, is displayed on the console. Execution information and errors are written into [log files](#).

```
***** Schema Conversion Started *****
DSC process start time : Mon Jan 20 17:24:49 IST 2020
Statement count progress 100% completed [FILE(1/1)]

Schema Conversion Progress 100% completed
*****
Total number of files in input folder : 1
Total number of valid files in input folder : 1
*****
Log file path :...../DSC/DSC/log/dsc.log
Error Log file :
DSC process end time : Mon Jan 20 17:24:49 IST 2020
DSC total process time : 0 seconds
***** Schema Conversion Completed *****
```

Common DDL scripts and PL/SQL scripts should be stored in different input folders for migration.

Oracle PACKAGE Migration Precautions

1. The package specifications (that is, the package header) and the package body should be stored in different files and in the same input path for migration.
2. You need to migrate common DDL statements in Bulk mode, including all table structure information referenced in the **PACKAGE** script, to form a dictionary in the **config/create-types-UDT.properties** file. Then, migrate the package specifications (that is, the package header) and the package body in Blogic mode. The details are as follows:

When some Oracle **PACKAGE** packages define package specifications, the **tbName.colName%TYPE** syntax is used to declare custom record types based on other table objects.

```
For example:
CREATE OR REPLACE PACKAGE p_emp
AS
  --Define the RECORD type
  TYPE re_emp IS RECORD(
    rno emp.empno%TYPE,
    rname emp.empname%TYPE
  );
END;
```

The column data type cannot be specified using the **tbName.colName%TYPE** syntax in a **CREATE TYPE** statement on GaussDB(DWS). Therefore, DSC needs to build a database context environment containing the **EMP** table information during migration. In this case, you need to use DSC to migrate all table creation scripts, that is, to migrate common DDL statements in Bulk mode. DSC automatically generates corresponding data dictionaries. After the context environment containing various table information is built, you can migrate the Oracle PACKAGE in Blogic mode. In this case, the **re_emp** record type is migrated based on the column type of the **EMP** table.

```
Expected output
CREATE TYPE p_emp.re_emp AS (
  rno NUMBER(4),
  rname VARCHAR2(10)
);
```

For details about how to migrate Oracle SQL using DSC, see [Migrating Data Using DSC](#).

6.7.4 Teradata Perl Migration

Overview

This section describes how to migrate Teradata Perl files.

Run the **runDSC.sh** or **runDSC.bat** command and set **--application-lang** to **perl** to migrate Teradata **BTEQ** or **SQL_LANG** scripts in Perl files to Perl-compatible GaussDB(DWS). After migrating Perl files, you can verify the migration by comparing the output file with its input file using a comparison tool.

The procedure of migrating Perl files is as follows:

1. Perform the operations in [Prerequisites](#).
2. Create an input folder and copy the Perl files to be migrated to the folder. For example, create a **/migrationfiles/perlfiles** folder.
3. Execute DSC to migrate Perl scripts and set **db-bteq-tag-name** to **BTEQ** or **db-tdsql-tag-name** to **SQL_LANG**.
 - a. The DSC extracts the **BTEQ** or **SQL_LANG** scripts from the Perl files.
 - i. BTEQ is the tag name, which contains a set of BTEQ scripts. This tag name is configurable using the **db-bteq-tag-name** configuration parameter in **perl-migration.properties** file.
 - ii. SQL_LANG is another tag name, which contains Teradata SQL statements. This is also configurable using the **db-tdsql-tag-name** configuration parameter.

- b. The DSC invokes the Teradata SQL to migrate the extracted SQL scripts. For details about Teradata SQL migration, see [Teradata Syntax Migration](#).
 - c. Perl files are embedded in the migrated scripts.
 4. DSC creates the migrated files in the specified output folder. If no output folder is specified, DSC creates an output folder named **converted** in the input folder, for example, **/migrationfiles/perlfiles/converted**.

NOTE

- Perl variables containing SQL statements can also be migrated to SQL by setting the **migrate-variables** parameter.
- For perl v 5.10.0 and later are compatible.

Teradata Perl Migration

To migrate Perl files, execute DSC with **--source-db Teradata** and **--application-lang Perl** parameter values. DSC supports the migration of **BTEQ** and **SQL_LANG** scripts. You can specify the scripts to be migrated by setting **db-bteq-tag-name** or **db-tdsql-tag-name**.

Run the following commands to set the source database, input and output folder paths, log paths, and application language.

Linux:

```
./runDSC.sh
--source-db|-S Teradata
[--application-lang|-A Perl]
[--input-folder|-I <input-script-path>]
[--output-folder|-O <output-script-path>]
[--conversion-type|-M <Bulk or BLogic>]
[--log-folder|-L <log-path>]
```

Windows:

```
runDSC.bat
--source-db|-S Teradata
[--application-lang|-A Perl]
[--input-folder|-I <input-script-path>]
[--output-folder|-O <output-script-path>]
[--conversion-type|-M <Bulk or BLogic>]
[--log-folder|-L <log-path>]
```

For example:

```
./runDSC.sh --input-folder /opt/DSC/DSC/input/teradata_perl/ --output-folder /opt/DSC/DSC/output/ --
source-db teradata --conversion-type Bulk --application-lang PERL
```

During the execution of DSC, the migration summary, including the progress and completion status, is displayed on the console.

```
***** Schema Conversion Started *****
DSC process start time : Mon Jan 20 17:24:49 IST 2020
Statement count progress 100% completed [FILE(1/1)]
Schema Conversion Progress 100% completed
*****
Total number of files in input folder : 1
*****
Log file path :...../DSC/DSC/log/dsc.log
DSC process end time : Mon Jan 20 17:24:49 IST 2020
DSC total process time : 0 seconds
***** Schema Conversion Completed *****
```

For details about the parameters for Teradata Perl migration, see [Teradata Perl Configuration](#).

For details about CLI parameters, see [Database Schema Conversion](#).

NOTE

- DSC formats the input files and saves them in the output folder. You can compare the formatted input files with the output files.
- Ensure that there are no spaces in the input path. If there is a space, DSC throws an error. For details, see [Troubleshooting](#).
- For details about logs, see [Log Reference](#).
- If the output folder contains subfolders or files, DSC deletes the subfolders and files or overwrites them based on parameter settings in the **application.properties** configuration file in the **config** folder before the migration. Deleted or overwritten subfolders and files cannot be restored by DSC.
- **Process start time** indicates the migration start time and **Process end time** indicates the migration end time. **Process total time** indicates the total migration duration, in milliseconds. In addition, the total number of migrated files, total number of processors, number of used processors, log file path, and error log file path are also displayed on the console.
- Set **--add-timing-on** to **true** in the **perl-migration.properties** file to add a custom script to calculate statement execution time.

Example:

Input

```
$V_SQL2 = "SELECT T1.userTypeInd FROM T07_EBM_CAMP T1 WHERE T1.Camp_List_Id = '$abc'";  
$STH = $dbh->prepare($V_SQL2);  
$sth->execute();  
@rows = $sth->fetchrow();
```

Output

```
$V_SQL2 = "SELECT T1.userTypeInd FROM T07_EBM_CAMP T1 WHERE T1.Camp_List_Id = '$abc'";  
$STH = $dbh->prepare($V_SQL2);  
use Time::HiRes qw/gettimeofday/;  
my $start = [Time::HiRes::gettimeofday()];  
$sth->execute();  
my $elapsed = Time::HiRes::tv_interval($start);  
$elapsed = $elapsed * 1000;  
printf("Time: %.3f ms\n", $elapsed);  
@rows = $sth->fetchrow();
```

- GROUP and OTHERS must not have write permission for the files or folders specified by **--input-folder**. That is, the privilege for the folder specified by **--input-folder** must not be higher than **755**. For security purposes, DSC will not be executed if the input files or folders have the write permission.
- If migration tasks are executed concurrently, the input folder must be unique for each task.

Best Practices

To optimize the migration, you are advised to follow the standard practices:

- **BTEQ** scripts must be in the following format:

```
print BTEQ <<ENDOFINPUT;  
TRUNCATE TABLE employee;  
ENDOFINPUT  
close(BTEQ);
```
- **SQL_LANG** scripts must be in the following format:

```
my $$SQL=<<SQL_LANG;  
TRUNCATE TABLE employee;  
SQL_LANG
```

- Comment must not contain the following information:
 - print BTEQ <<ENDOFINPUT
 - ENDOFINPUT
 - close(BTEQ)
 - my \$sSQL=<<SQL_LANG
 - SQL_LANG

6.7.5 Netezza SQL Migration

DSC supports the migration from Netezza to GaussDB(DWS), including the migration of schemas, DML, queries, system functions, and PL/SQL.

Run the following commands to set the source database, input and output folder paths, log paths, application language, and conversion type:

Linux:

```
./runDSC.sh
--source-db Netezza
[--input-folder <input-script-path>]
[--output-folder <output-script-path>]
[--log-folder <log-path>]
[--application-lang SQL]
[--conversion-type <conversion-type>]
```

Windows:

```
runDSC.bat
--source-db Netezza
[--input-folder <input-script-path>]
[--output-folder <output-script-path>]
[--log-folder <log-path>]
[--application-lang SQL]
[--conversion-type <conversion-type>]
```

For example:

Linux:

```
./runDSC.sh --source-db Netezza --input-folder /opt/DSC/DSC/input/mysql/ --output-folder /opt/DSC/DSC/output/ --application-lang SQL --conversion-type BULK --log-folder/opt/DSC/DSC/log/
```

Windows:

```
runDSC.bat --source-db Netezza --target-db GaussDBA --input-folder D:\test\conversion\input --output-folder D:\test\conversion\output --log-folder D:\test\conversion\log --application-lang SQL --conversion-type Bulk
```

During the execution of DSC, the migration summary, including the progress and completion status, is displayed on the console. Execution information and errors are written into [log files](#).

```
***** Schema Conversion Started *****
DSC process start time : Mon Jan 20 17:24:49 IST 2020
Statement count progress 100% completed [FILE(1/1)]
Schema Conversion Progress 100% completed
*****
Total number of files in input folder : 1
*****
Log file path :...../DSC/DSC/log/dsc.log
DSC process end time : Mon Jan 20 17:24:49 IST 2020
DSC total process time : 0 seconds
***** Schema Conversion Completed *****
```


For details about how to migrate Netezza SQL using DSC, see [Migrating Data Using DSC](#).

6.7.6 MySQL SQL Migration

DSC supports the migration from MySQL to GaussDB(DWS), including the migration of schemas, DML, queries, system functions, and PL/SQL.

Performing MySQL Migration on Linux

Run the following command on Linux to start the migration. You need to specify the source database, input and output folder paths, and log paths. The application language can be SQL or Perl. The default language is SQL. The migration type can be **Bulk** or **BLogic**.

```
./runDSC.sh
--source-db MySQL
[--input-folder <input-script-path>]
[--output-folder <output-script-path>]
[--application-lang SQL]
[--conversion-type <conversion-type>]
[--log-folder <log-path>]
```

During the execution of DSC, the migration summary, including the progress and completion status, is displayed on the console.

```
***** Schema Conversion Started *****
DSC process start time : Mon Jan 20 17:24:49 IST 2020
Statement count progress 100% completed [FILE(1/1)]
Schema Conversion Progress 100% completed
*****
Total number of files in input folder : 1
Total number of valid files in input folder : 1
*****
Log file path :...../DSC/DSC/log/dsc.log
Error Log file :
DSC process end time : Mon Jan 20 17:24:49 IST 2020
DSC total process time : 0 seconds
***** Schema Conversion Completed *****
```

Performing MySQL Migration on Windows

Run the following command on Windows to start the migration. You need to specify the source database, input and output folder paths, and log paths. The application language can be SQL or Perl. The default language is SQL. The migration type can be **Bulk** or **BLogic**.

```
runDSC.bat
--source-db MySQL
[--input-folder <input-script-path>]
[--output-folder <output-script-path>]
[--application-lang SQL]
[--conversion-type <conversion-type>]
[--log-folder <log-path>]
```

During the execution of DSC, the migration summary, including the progress and completion status, is displayed on the console.

```
***** Schema Conversion Started *****
DSC process start time : Mon Jan 20 17:24:49 IST 2020
Statement count progress 100% completed [FILE(1/1)]
Schema Conversion Progress 100% completed
*****
```

```
Total number of files in input folder : 1
*****
Log file path :...../DSC/DSC/log/dsc.log
DSC process end time : Mon Jan 20 17:24:49 IST 2020
DSC total process time : 0 seconds
***** Schema Conversion Completed *****
```

- Run the following commands to migrate objects, such as functions, store procedures, and packages that contain PL/SQL statements:

Linux:

```
./runDSC.sh --source-db MySQL --input-folder /opt/DSC/DSC/input/mysql/ --output-
folder /opt/DSC/DSC/output/ --application-lang SQL --conversion-type BULK --log-
folder /opt/DSC/DSC/log/
```

Windows:

```
runDSC.bat --source-db MySQL--target-db GaussDBA --input-folder D:\test\conversion\input --output-
folder D:\test\conversion\output --log-folder D:\test\conversion\log --application-lang SQL --
conversion-type Bulk
```

During the execution of DSC, the migration summary, including the progress and completion status, is displayed on the console. Execution information and errors are written into **log files**.

```
***** Schema Conversion Started *****
DSC process start time : Mon Jan 20 17:24:49 IST 2020
Statement count progress 100% completed [FILE(1/1)]

Schema Conversion Progress 100% completed
*****
Total number of files in input folder : 1
*****
Log file path :...../DSC/DSC/log/dsc.log
DSC process end time : Mon Jan 20 17:24:49 IST 2020
DSC total process time : 0 seconds
***** Schema Conversion Completed *****
```

6.7.7 SQL Formatter

SQL Formatter improves the readability of SQL statements. It formats SQL statements by adding/deleting rows and indenting context, and is used to format migrated output files. It can also be used for importing files.

Use the **formattedSourceRequired** parameter to enable/disable the SQL formatter for the source SQL files. If this parameter is set to **true**, the copy of the input file is formatted and saved to the *Output path*\formattedSource directory.

SQL Formatter also supports Teradata SQL migration and Oracle SQL migration. SQL scripts in Teradata Perl file migration are also formatted. The Oracle (Beta) tool does not support SQL Formatter.

Input: SQL FORMATTER

```
select
p1.parti_encode          ,p1.accting_type_cd          ,p1.prod_code          ,p1.cust_type_cd
,p1.accting_amt_type_cd ,p1.accting_num_1          ,p1.accting_num_2          ,p1.accti
ng_num_3                ,p1.accting_num_4          ,p1.accting_num_5          ,p1.accting_num_6
,p1.start_dt            ,p1.pre_effect_debit_gl_num ,p1.pre_effect_crdt_gl_num          ,p
1.after_effect_debit_gl_num ,p1.after_effect_crdt_gl_num ,coalesce( p2.start_dt ,cast( '3
0001231' as date format 'yyyymmdd' ) ) ,p1.accting_term          ,p1.etl_job
from (
select
rank (
start_dt
) as
start_dt_id
,parti_encode
,accting_type_cd
,prod_c
ode
,cust_type_cd
,accting_amt_type_cd
,accting_
num_1
,accting_num_2
,accting_num_3
,accting_num_4
,accting_num_5
,accting_num_6
,start_dt
,pre_effect_debit_gl_num
,pre_effect_crdt_gl_num
,after
```

```

_effect_debit_gl_num      ,after_effect_crdr_gl_num      ,accting_term
,etl_job                  from                    ccting_subj_para_h_mf0_a_cur_i      )
p1 left join (           select                    rank (                               start_dt
asc                       ) - 1 as
start_dt_id              ,parti_encode
e                         ,accting_type_cd
m_1                      ,cust_type_cd      ,accting_amt_type_cd      ,prod_cod
                        ,accting_num_2      ,accting_num_3      ,accting_num_4
                        ,accting_num_5      ,accting_num_6      ,start_dt
                        ,accting_term
ccting_subj_para_h_mf0_a_cur_i      ) p2
and p1.parti_encode = p2.parti_encode      and p1.accting_type_cd = p2.accting_type_cd
and p1.prod_code = p2.prod_code      and p1.cust_type_cd = p2.cust_type_cd      and
p1.accting_amt_type_cd = p2.accting_amt_type_cd      and p1.accting_num_1 =
p2.accting_num_1      and p1.accting_num_2 = p2.accting_num_2      and p1.accting_num_3
= p2.accting_num_3      and p1.accting_num_4 = p2.accting_num_4      and
p1.accting_num_5 = p2.accting_num_5      and p1.accting_num_6 = p2.accting_num_6
and p1.accting_term = p2.accting_term ;

```

Output

```

SELECT
  p1.parti_encode      ,p1.accting_type_cd
  ,p1.prod_code
  ,p1.cust_type_cd      ,p1.accting_amt_type_cd
  ,p1.accting_num_1
  ,p1.accting_num_2
  ,p1.accting_num_3
  ,p1.accting_num_4
  ,p1.accting_num_5
  ,p1.accting_num_6
  ,p1.start_dt
  ,p1.pre_effect_debit_gl_num
  ,p1.pre_effect_crdr_gl_num
  ,p1.after_effect_debit_gl_num
  ,p1.after_effect_crdr_gl_num
  ,COALESCE( p2.start_dt ,CAST( '30001231' AS DATE ) )
  ,p1.accting_term      ,p1.etl_job
FROM
  (
    SELECT
      rank (
        ) over( ORDER BY start_dt ASC ) AS start_dt_id
      ,parti_encode
      ,accting_type_cd
      ,prod_code
      ,cust_type_cd
      ,accting_amt_type_cd
      ,accting_num_1
      ,accting_num_2
      ,accting_num_3
      ,accting_num_4
      ,accting_num_5
      ,accting_num_6
      ,start_dt
      ,pre_effect_debit_gl_num
      ,pre_effect_c
rdt_gl_num
      ,after_effect_debit_gl_num
      ,after_effect_crdr_gl_num
      ,accting_term      ,etl_job
      ,ccting_subj_para_h_mf0_a_cur_i
    ) p1 LEFT JOIN (
      SELECT
        rank (
        ) over( ORDER BY start_dt ASC ) - 1 AS start_dt_id
        ,parti_encode
        ,accting_type_cd
        ,prod_code
        ,cust_type_cd
        ,accting_amt_type_cd
        ,accting_num_1
        ,accting_num_2

```

```
,accting_num_3
,accting_num_4
,accting_num_5
,accting_num_6
,start_dt
,accting_term
FROM
    accting_subj_para_h_mf0_a_cur_i
) p2
    ON p1.start_dt_id = p2.start_dt_id
AND p1.parti_encode = p2.parti_encode
AND p1.accting_type_cd = p2.accting_type_cd
AND p1.prod_code = p2.prod_code
AND p1.cust_type_cd = p2.cust_type_cd
AND p1.accting_amt_type_cd = p2.accting_amt_type_cd
AND p1.accting_num_1 = p2.accting_num_1
AND p1.accting_num_2 = p2.accting_num_2
AND p1.accting_num_3 = p2.accting_num_3
AND p1.accting_num_4 = p2.accting_num_4
AND p1.accting_num_5 = p2.accting_num_5
AND p1.accting_num_6 = p2.accting_num_6
AND p1.accting_term = p2.accting_term
```

6.8 Teradata Syntax Migration

6.8.1 Overview

This section lists the Teradata features supported by the syntax migration tool, and provides the Teradata syntax and the equivalent GaussDB syntax for each feature. The syntax listed in this section illustrates the internal migration logic for Teradata script migration.

This section is also a reference for the database migration team and for the on-site verification of Teradata script migration.

6.8.2 Schema Objects

This section describes the syntax for migrating Teradata schema objects. The migration syntax determines how the keywords and features are migrated.

The schema refers to the data structure of a database. DSC facilitates schema migration from Teradata to GaussDB(DWS).

This section includes the following sub-chapters:

Table Migration, Index Migration, View Migration, COLLECT STATISTICS, ACCESS LOCK, DBC.COLUMNS, DBC.TABLES, DBC.INDICES, and SHOW STATS VALUES SEQUENCED. For details, see [Table Migration](#) to [SHOW STATS VALUES SEQUENCED](#).

6.8.2.1 Table Migration

The table-specific keyword **MULTISET VOLATILE** is provided in the input file, but the keyword is not supported by GaussDB(DWS). Therefore, the tool replaces it with the **LOCAL TEMPORARY/UNLOGGED** keyword during the migration process. Use the [session_mode](#) configuration parameter to set the default table type (SET/MULTISET) for CREATE TABLE.

For details, see the following topics:

[CREATE TABLE](#)

[CHARACTER SET and CASESPECIFIC](#)

[VOLATILE](#)

[SET](#)

[MULTISET](#)

[TITLE](#)

[INDEX](#)

[CONSTRAINT](#)

[COLUMN STORE](#)

[PARTITION](#)

[ANALYZE](#)

[Data Types](#)

[Support for Specified Columns](#)

CREATE TABLE

The Teradata **CREATE TABLE** ([short key](#) CT) statements are used to create new tables.

Example:

Input: CREATE TABLE

```
CT tab1 (  
  id INT  
);
```

Output

```
CREATE  
TABLE  
  tab1 (  
    id INTEGER  
  )  
;
```

When using **CREATE *tab2* AS *tab1***, a new table *tab2* is created with the structure copied from *tab1*. If the **CREATE TABLE** statement includes **WITH DATA** operator, then the data from *tab1* is also copied into *tab2*. When using **CREATE AS**, the behavior of the **CONSTRAINT** from the source table is retained in the new target table.

- If **session_mode** = *Teradata*, the default table type is **SET** in which duplicate records must be removed. This is done by adding the **MINUS** operator in the migrated scripts.
- If **session_mode** = *ANSI*, the default table type is **MULTISET** in which duplicate records must be allowed.

If the source table has a PRIMARY KEY or a UNIQUE CONSTRAINT, then it will not contain any duplicate records. In this case, the MINUS operator is not required or added to remove duplicate records.

Example:**Input: CREATE TABLE AS with DATA (session_mode=Teradata)**

```
CREATE TABLE tab2
  AS tab1 WITH DATA;
```

Output

```
BEGIN
  CREATE TABLE tab2 (
    LIKE tab1 INCLUDING ALL EXCLUDING PARTITION EXCLUDING RELOPTIONS
  );

  INSERT INTO tab2
  SELECT * FROM tab1
  MINUS SELECT * FROM tab2;
END
;
```

Example: Input: CREATE TABLE AS with DATA AND STATISTICS

```
CREATE SET VOLATILE TABLE tab2025
  AS ( SELECT * from tab2023 )
  WITH DATA AND STATISTICS
  PRIMARY INDEX (LOGTYPE, OPERSEQ);
```

Output

```
CREATE LOCAL TEMPORARY TABLE tab2025
  DISTRIBUTE BY HASH ( LOGTYPE, OPERSEQ )
  AS ( SELECT * FROM tab2023 );

ANALYZE tab2025;
```

CHARACTER SET and CASESPECIFIC

CHARACTER SET is used to specify the server character set for a character column. CASESPECIFIC specifies the case for character data comparisons and collations.

Use the [tdMigrateCharsetCase](#) configuration parameter to configure migration of CHARACTER SET and CASESPECIFIC. If tdMigrateCharsetCase is set to false, the tool will skip migration of the query and will log a message.

Input (tdMigrateCharsetCase=True)

```
CREATE MULTISET VOLATILE TABLE TAB1
(
  col1 INTEGER NOT NULL
  ,col2 INTEGER NOT NULL
  ,col3 VARCHAR(100) NOT NULL CHARACTER SET UNICODE CASESPECIFIC )
PRIMARY INDEX (col1,col2)
ON COMMIT PRESERVE ROWS
;
```

Output

```
CREATE LOCAL TEMPORARY TABLE TMP_RATING_SYS_PARA
(
  col1 INTEGER NOT NULL
  ,col2 INTEGER NOT NULL
  ,col3 VARCHAR(100) NOT NULL /* CHARACTER SET UNICODE CASESPECIFIC */)
;
```

```
)  
ON COMMIT PRESERVE ROWS  
DISTRIBUTE BY HASH (col1,col2)  
;
```

Input-Migration support for Character-based data type

In Teradata, the following character sets support character-based length for string data types:

- LATIN
- UNICODE
- GRAPHIC

However, the KANJISJIS character set support byte-based length for string data types.

For example, COLUMN_NAME VARCHAR(100) CHARACTER SET UNICODE CASESPECIFIC COLUMN_NAME VARCHAR(100) CHARACTER SET LATIN CASESPECIFIC This can store up to 100 characters (not bytes).

In GaussDB(DWS), string data types are byte-based (not character-based). VARCHAR (100) and VARCHAR2 (100) can store up to 100 byte (not characters). However, NVARCHAR2 (100) can store up to 100 characters.

So, if TD's LATIN, UNICODE and GRAPHIC character sets, VARCHAR should be migrated to NVARCHAR.

```
CREATE TABLE tab1  
(  
  col1 VARCHAR(10),  
  COL2 CHAR(1)  
);
```

Output

a)when default_charset = UNICODE/GRAPHIC

```
CREATE  
TABLE  
  tab1 (  
    col1 NVARCHAR2 (10)  
    ,COL2 NVARCHAR2 (1)  
  );
```

b)when default_charset = LATIN

```
CREATE  
TABLE  
  tab1 (  
    col1 VARCHAR2 (10)  
    ,COL2 VARCHAR2 (1)  
  );
```

Input

```
CREATE TABLE tab1  
(  
  col1 VARCHAR(10) CHARACTER SET UNICODE,  
  COL2 CHAR(1)  
);
```

Output

a) when default_charset = UNICODE/GRAPHIC

```
CREATE  
TABLE  
  tab1 (  
    col1 NVARCHAR2 (10)  
    ,COL2 NVARCHAR2 (1)  
  );
```

```

        col1 NVARCHAR2 (10) /* CHARACTER SET UNICODE*/
        ,COL2 NVARCHAR2( 1 )
    );

b) when default_charset = LATIN
CREATE
  TABLE
    tab1 (
      col1 NVARCHAR2 (10) /* CHARACTER SET UNICODE*/
      ,COL2 CHAR(1)
    )

```

VOLATILE

The table-specific keyword **VOLATILE** is provided in the input file, but the keyword is not supported by GaussDB(DWS). The tool replaces it with the **LOCAL TEMPORARY** keyword during the migration process. Volatile tables are migrated as local temporary or unlogged based on the config input.

Input: CREATE VOLATILE TABLE

```
CREATE VOLATILE TABLE T1 (c1 int ,c2 int);
```

Output

```

CREATE
  LOCAL TEMPORARY TABLE
  T1 (
    c1 INTEGER
    ,c2 INTEGER
  )
;

```

Input: CREATE VOLATILE TABLE AS WITH DATA (session_mode=Teradata)

If the source table has a PRIMARY KEY or a UNIQUE CONSTRAINT, then it will not contain any duplicate records. In this case, the MINUS operator is not required or added to remove duplicate records.

```

CREATE VOLATILE TABLE tabV1 (
  C1 INTEGER DEFAULT 99
  ,C2 INTEGER
  ,C3 INTEGER
  ,C4 NUMERIC (20,0) DEFAULT NULL (BIGINT)
  ,CONSTRAINT XX1 PRIMARY KEY ( C1, C2 )
) PRIMARY INDEX (C1, C3 );

CREATE TABLE tabV2 AS tabV1 WITH DATA PRIMARY INDEX (C1)
ON COMMIT PRESERVE ROWS;

```

Output

```

CREATE LOCAL TEMPORARY TABLE tabV1 (
  C1 INTEGER DEFAULT 99
  ,C2 INTEGER
  ,C3 INTEGER
  ,C4 NUMERIC (20,0) DEFAULT CAST( NULL AS BIGINT )
  ,CONSTRAINT XX1 PRIMARY KEY ( C1, C2 )
) DISTRIBUTE BY HASH (C1);

BEGIN
  CREATE TABLE tabV2 (
    LIKE tabV1 INCLUDING ALL EXCLUDING PARTITION EXCLUDING RELOPTIONS EXCLUDING
    DISTRIBUTION
  ) DISTRIBUTE BY HASH (C1);
  INSERT INTO tabV2 SELECT * FROM tabV1;
END

```



```
;  
/
```

SET

SET is a unique feature in Teradata. It does not allow duplicate records. It is addressed using the **MINUS** set operator. Migration tool supports MULTISET and SET tables. SET table can be used with VOLATILE.

Input: SET TABLE

```
CREATE SET VOLATILE TABLE tab1 ... ;  
INSERT INTO tab1  
SELECT expr1, expr2, ...  
FROM tab1, ...  
WHERE ....;
```

Output

```
CREATE LOCAL TEMPORARY TABLE tab1  
... ; INSERT INTO tab1  
SELECT expr1, expr2, ...  
FROM tab1, ...  
WHERE ....  
MINUS  
SELECT * FROM tab1 ;
```

MULTISET

MULTISET is a normal table, which is supported by all the DBs. Migration tool supports MULTISET and SET tables.

MULTISET table can be used with VOLATILE.

Input: CREATE MULTISET TABLE

```
CREATE VOLATILE MULTISET TABLE T1 (c1 int ,c2 int);
```

Output

```
CREATE  
LOCAL TEMPORARY TABLE  
T1 (  
c1 INTEGER  
,c2 INTEGER  
)  
;
```

TITLE

The keyword **TITLE** is supported for Teradata Permanent, Global Temporary and Volatile tables. In the migration process, the TITLE text is migrated as a comment.

NOTE

If the TITLE text is split across multiple lines, then in the migrated script, the line breaks (ENTER) are replaced with a space.

Input: CREATE TABLE with TITLE

```
CREATE TABLE tab1 (  
c1 NUMBER(2) TITLE 'column_a'  
);
```

Output

```
CREATE TABLE tab1 (
  c1 NUMBER(2) /* TITLE 'column_a' */
);
```

Input: TABLE with multiline TITLE

```
CREATE TABLE tab1 (
  c1 NUMBER(2) TITLE 'This is a
very long title'
);
```

Output

```
CREATE TABLE tab1 (
  c1 NUMBER(2) /* TITLE 'This is a very long title' */
);
```

Input: TABLE with COLUMN TITLE

DSC migrates COLUMN TITLE as a new outer query.

```
SELECT customer_id (TITLE 'cust_id')
FROM Customer_T
WHERE cust_id > 10;
```

Output

```
SELECT
  customer_id AS "cust_id"
FROM
  (
    SELECT
      customer_id
    FROM
      Customer_T
    WHERE
      cust_id > 10
  )
;
```

Input: TABLE with COLUMN TITLE and QUALIFY

```
SELECT ord_id
(TITLE 'Order_Id'), order_date, customer_id
FROM order_t
WHERE Order_Id > 100
QUALIFY ROW_NUMBER() OVER(PARTITION BY customer_id ORDER BY order_date DESC) <= 5;
```

Output

```
SELECT
  "mig_tmp_alias1" AS "Order_Id"
FROM
  (
    SELECT
      ord_id AS "mig_tmp_alias1"
      ,ROW_NUMBER( ) OVER( PARTITION BY customer_id ORDER BY order_date DESC ) AS
ROW_NUM1
    FROM
      order_t
    WHERE
      Order_Id > 100
  ) Q1
WHERE
  Q1.ROW_NUM1 <= 5
;
```

1. TITLE with ALIAS

If the TITLE is accompanied with an ALIAS, the tool will migrate it as follows:

- **TITLE with AS:** Tool will migrate it with the AS alias.
- **TITLE with NAMED:** Tool will migrate it with NAMED alias.
- **TITLE with NAMED and AS:** Tool will migrate it with AS alias.

Input: TABLE TITLE with NAMED and AS

```
SELECT Acct_ID (TITLE 'Acc Code') (NAMED XYZ) AS "Account Code"
      ,Acct_Name (TITLE 'Acc Name')
FROM   GT_JCB_01030_Acct_PBU
where "Account Code" > 500 group by "Account Code" ,Acct_Name ;
```

Output

```
SELECT
      Acct_ID AS "Account Code"
      ,Acct_Name AS "Acc Name"
FROM   GT_JCB_01030_Acct_PBU
WHERE  Acct_ID > 500
GROUP BY
      Acct_ID ,Acct_Name
;
```

 **NOTE**

Currently the Migration tool supports the migration of the TITLE command included in the initial CREATE/ALTER statement. The subsequent references of the TITLE specified column are not supported. For example, in the CREATE TABLE statement below, the column *eid* with the TITLE Employee ID will be migrated to a comment but the reference of *eid* in the SELECT statement will be retained as it is.

Input

```
CREATE TABLE tab1 ( eid INT TITLE 'Employee ID');
SELECT eid FROM tab1;
```

Output

```
CREATE TABLE tab1 (eid INT /*TITLE 'Employee ID*/);
SELECT eid from tab1;
```

2. TITLE with CREATE VIEW

Input

```
REPLACE VIEW ${STG_VIEW}.B971_AUMSUMMARY${TABLE_SUFFIX_INC}
AS
LOCK TABLE ${STG_DATA}.B971_AUMSUMMARY${TABLE_SUFFIX_INC} FOR ACCESS
SELECT  AUM_DATE (TITLE ' ')
      ,CLNTCODE (TITLE ' ')
      ,ACCTYPE (TITLE ' ')
      ,CCY (TITLE ' ')
      ,BAL_AMT (TITLE ' ')
      ,MON_BAL_AMT (TITLE ' ')
      ,HK_CLNTCODE (TITLE ' ')
      ,MNT_DATE (TITLE ' ')
FROM ${STG_DATA}.B971_AUMSUMMARY${TABLE_SUFFIX_INC};
it should be migrated as below:
CREATE OR REPLACE VIEW ${STG_VIEW}.B971_AUMSUMMARY${TABLE_SUFFIX_INC}
AS
/*LOCK TABLE ${STG_DATA}.B971_AUMSUMMARY${TABLE_SUFFIX_INC} FOR ACCESS */
SELECT  AUM_DATE /* (TITLE ' ') */
      ,CLNTCODE /* (TITLE ' ') */
      ,ACCTYPE /* (TITLE ' ') */
      ,CCY /* (TITLE ' ') */
      ,BAL_AMT /* (TITLE ' ') */
      ,MON_BAL_AMT /* (TITLE ' ') */
      ,HK_CLNTCODE /* (TITLE ' ') */
```

```
,MNT_DATE /* (TITLE ' ') */
FROM ${STG_DATA}.B971_AUMSUMMARY${TABLE_SUFFIX_INC};
```

Output

```
CREATE OR REPLACE VIEW ${STG_VIEW}.B971_AUMSUMMARY${TABLE_SUFFIX_INC}
AS
/*LOCK TABLE ${STG_DATA}.B971_AUMSUMMARY${TABLE_SUFFIX_INC} FOR ACCESS */
SELECT AUM_DATE /* (TITLE ' ') */
,CLNTCODE /* (TITLE ' ') */
,ACCTYPE /* (TITLE ' ') */
,CCY /* (TITLE ' ') */
,BAL_AMT /* (TITLE ' ') */
,MON_BAL_AMT /* (TITLE ' ') */
,HK_CLNTCODE /* (TITLE ' ') */
,MNT_DATE /* (TITLE ' ') */
FROM ${STG_DATA}.B971_AUMSUMMARY${TABLE_SUFFIX_INC};
```

INDEX

The CREATE TABLE statement supports creation of an index. Migration tool supports the TABLE statement with PRIMARY INDEX and UNIQUE INDEX.

The tool will not add DISTRIBUTE BY HASH which is used to create a table with PRIMARY KEY and Non-Unique PRIMARY INDEX.

Input: CREATE TABLE with INDEX

```
CREATE SET TABLE DP_TEDW.B0381_ACCOUNT_OBTAINED_MAP,
    NO FALLBACK, NO BEFORE JOURNAL,
    NO AFTER JOURNAL, CHECKSUM = DEFAULT
( Ranked_Id          INTEGER NOT NULL
, Source_System_Code SMALLINT NOT NULL
, Operational_Acc_Obtained_Id VARCHAR(100)
  CHARACTER SET LATIN NOT CASESPECIFIC FORMAT 'X(50)'
, Mapped_Id          INTEGER NOT NULL
)
PRIMARY INDEX B0381_ACCOUNT_OBTAINED_idx_PR ( Ranked_Id )
UNIQUE INDEX B0381_ACCT_OBT_MAP_idx_SCD ( Source_System_Code )
INDEX B0381_ACCT_OBT_MAP_idx_OPID ( Operational_Acc_Obtained_Id );
```

Output

```
CREATE TABLE DP_TEDW.B0381_ACCOUNT_OBTAINED_MAP
( Ranked_Id INTEGER NOT NULL
, Source_System_Code SMALLINT NOT NULL
, Operational_Acc_Obtained_Id VARCHAR( 100 )
, Mapped_Id INTEGER NOT NULL
)
DISTRIBUTE BY HASH ( Ranked_Id );

CREATE INDEX B0381_ACCT_OBT_MAP_idx_SCD ON DP_TEDW.B0381_ACCOUNT_OBTAINED_MAP
( Source_System_Code );
CREATE INDEX B0381_ACCT_OBT_MAP_idx_OPID ON DP_TEDW.B0381_ACCOUNT_OBTAINED_MAP
( Operational_Acc_Obtained_Id );
```

NOTE

UNIQUE is removed in the index since index column list (organic_name) is not a super set of DISTRIBUTE BY column list (serial_no, organic_name).

Input - CREATE TABLE with Primary Key and Non-Unique Primary Index (DISTRIBUTE BY HASH is not added)

```
CREATE TABLE employee
(
  EMP_NO INTEGER
, DEPT_NO INTEGER
```

```
, FIRST_NAME VARCHAR(20)
, LAST_NAME CHAR(20)
, SALARY DECIMAL(10,2)
, ADDRESS VARCHAR(100)
, CONSTRAINT pk_emp PRIMARY KEY ( EMP_NO )
) PRIMARY INDEX ( DEPT_NO );
```

Output

```
CREATE TABLE employee
(
  EMP_NO INTEGER
, DEPT_NO INTEGER
, FIRST_NAME VARCHAR(20)
, LAST_NAME CHAR(20)
, SALARY DECIMAL(10,2)
, ADDRESS VARCHAR(100)
, CONSTRAINT pk_emp PRIMARY KEY ( EMP_NO )
)
;
```

CONSTRAINT

A table CONSTRAINT is applied to multiple columns. Migration tool supports the following constraints:

- REFERENCES constraint / FOREIGN KEY: migration currently NOT supported by tool.
- PRIMARY KEY constraint: migration supported by tool.
- UNIQUE constraint: migration supported by tool.

Input: CREATE TABLE with CONSTRAINT

```
CREATE SET TABLE DP_SEDW.T_170UT_HOLDER_ACCT, NO FALLBACK,
NO BEFORE JOURNAL, NO AFTER JOURNAL
( BUSINESSDATE VARCHAR(10)
, SOURCESYSTEM VARCHAR(5)
, UPLOADCODE VARCHAR(1)
, HOLDER_NO VARCHAR(7) NOT NULL
, POSTAL_ADD_4 VARCHAR(40)
, EPF_IND CHAR(1)
, CONSTRAINT uq_t_170ut_hldr UNIQUE ( SOURCESYSTEM, UPLOADCODE,
HOLDER_NO )
) PRIMARY INDEX ( HOLDER_NO, SOURCESYSTEM );
```

Output

```
CREATE TABLE DP_SEDW.T_170UT_HOLDER_ACCT
( BUSINESSDATE VARCHAR( 10 )
, SOURCESYSTEM VARCHAR( 5 )
, UPLOADCODE VARCHAR( 1 )
, HOLDER_NO VARCHAR( 7 ) NOT NULL
, POSTAL_ADD_4 VARCHAR( 40 )
, EPF_IND CHAR( 1 )
, CONSTRAINT uq_t_170ut_hldr UNIQUE ( SOURCESYSTEM, UPLOADCODE, HOLDER_NO )
)
DISTRIBUTE BY HASH ( HOLDER_NO, SOURCESYSTEM );
```

Input

After table creation, CONSTRAINT can be added to a table column to put some restriction at column level by using ALTER statement.

```
CREATE TABLE GCC_PLAN.T1033 ( ROLLOUT_PLAN_LINE_ID NUMBER NOT NULL,
UDF_FIELD_VALUE_ID NUMBER NOT NULL );
ALTER TABLE GCC_PLAN.T1033
ADD CONSTRAINT UDF_FIELD_VALUE_ID_PK UNIQUE (UDF_FIELD_VALUE_ID);
```

Output

```
CREATE TABLE GCC_PLAN.T1033 ( ROLLOUT_PLAN_LINE_ID NUMBER NOT NULL,  
                             UDF_FIELD_VALUE_ID NUMBER NOT NULL,  
                             CONSTRAINT UDF_FIELD_VALUE_ID_PK  
                             UNIQUE (UDF_FIELD_VALUE_ID) ;
```

NOTE

Need to put CONSTRAINT creation syntax inside table creation script after all column declaration.

COLUMN STORE

The table orientation can be converted from ROW-STORE to COLUMN store using the WITH (ORIENTATION=COLUMN) in the CREATE TABLE statement. This feature can be enabled/disabled using the [rowstoreToColumnstore](#) configuration parameter.

Input: CREATE TABLE with change orientation to COLUMN STORE

```
CREATE MULTISET VOLATILE TABLE tab1  
  ( c1 VARCHAR(30) CHARACTER SET UNICODE  
    , c2 DATE  
    , ...  
  )  
PRIMARY INDEX (c1, c2)  
ON COMMIT PRESERVE ROWS;
```

Output

```
CREATE LOCAL TEMPORARY TABLE tab1  
  ( c1 VARCHAR(30)  
    , c2 DATE  
    , ...  
  ) WITH (ORIENTATION = COLUMN)  
ON COMMIT PRESERVE ROWS  
DISTRIBUTE BY HASH (c1, c2);
```

PARTITION

The tool does not support migration of partitions/subpartitions and the partition/subpartition keywords are commented in the migrated scripts:

- Range partition/subpartition
- List partition/subpartition
- Hash partition/subpartition

Scenario 1: Assume that the configuration parameters ([tdMigrateCASE_N](#) and [tdMigrateRANGE_N](#)) are set to **comment** or **range** respectively.

The following is a Teradata CREATE TABLE script with nested partitions.

Input - PARTITION BY RANGE_N

```
CREATE TABLE tab1  
  ( entry_id      integer  not null  
    , oper_id     integer  not null  
    , source_system_cd varchar(5)  
    , entry_dt    date  
    , file_id     integer  
    , load_id     integer  
    , contract_id varchar(50)
```

```

        , contract_type_cd varchar(50)
    )
PRIMARY INDEX (entry_id, oper_id, source_system_cd)
PARTITION BY ( CASE_N( source_system_cd = '00000'
                        , source_system_cd = '00002'
                        , source_system_cd = '00006'
                        , source_system_cd = '00018'
                        , NO CASE )
              , RANGE_N( entry_dt BETWEEN DATE '2012-01-01' AND DATE '2025-12-31' EACH
INTERVAL '1' DAY, NO RANGE )
);

```

Output

```

CREATE TABLE tab1
( entry_id      integer not null
  , oper_id     integer not null
  , source_system_cd varchar(5)
  , entry_dt    date
  , file_id     integer
  , load_id     integer
  , contract_id varchar(50)
  , contract_type_cd varchar(50)
)
DISTRIBUTE BY HASH (entry_id, oper_id, source_system_cd)
PARTITION BY RANGE (entry_dt) ( PARTITION tab1_p1 START (CAST('2012-01-01' AS DATE))
                                END (CAST('2025-12-31' AS DATE))
                                EVERY (INTERVAL '1' DAY) );

```

Scenario 2: Assume that the configuration parameters (**tdMigrateCASE_N** and **tdMigrateRANGE_N**) are set to **comment** or **range** respectively.

The following is another Teradata CREATE TABLE script with nested partitions.

Input

```

CREATE TABLE tab2
( entry_id      integer not null
  , oper_id     integer not null
  , source_system_cd varchar(5)
  , entry_dt    date
  , file_id     integer
  , load_id     integer
  , contract_id varchar(50)
  , contract_type_cd varchar(50)
)
PRIMARY INDEX (entry_id, oper_id, source_system_cd)
PARTITION BY ( RANGE_N( entry_dt BETWEEN DATE '2012-01-01' AND DATE '2025-12-31' EACH
INTERVAL '1' DAY, NO RANGE )
              , CASE_N( source_system_cd = '00000'
                        , source_system_cd = '00002'
                        , source_system_cd = '00006'
                        , source_system_cd = '00018'
                        , NO CASE )
);

```

Output

```

CREATE TABLE tab2
( entry_id      integer not null
  , oper_id     integer not null
  , source_system_cd varchar(5)
  , entry_dt    date
  , file_id     integer
  , load_id     integer
  , contract_id varchar(50)
  , contract_type_cd varchar(50)
)
DISTRIBUTE BY HASH (entry_id, oper_id, source_system_cd)

```

```
PARTITION BY RANGE (entry_dt) ( PARTITION tab2_p1 START (CAST('2012-01-01' AS DATE))
                                END (CAST('2025-12-31' AS DATE))
                                EVERY (INTERVAL '1' DAY) );
```

Scenario 3: Assume that the configuration parameters (**tdMigrateCASE_N** and **tdMigrateRANGE_N**) are set to values other than **comment** or **range** respectively.

Partition syntax will not be commented and the remaining syntax will be migrated.

Input

```
CREATE TABLE tab1
( entry_id      integer not null
  , oper_id     integer not null
  , source_system_cd varchar(5)
  , entry_dt    date
  , file_id     integer
  , load_id     integer
  , contract_id varchar(50)
  , contract_type_cd varchar(50)
)
PRIMARY INDEX (entry_id, oper_id, source_system_cd)
PARTITION BY ( CASE_N( source_system_cd = '00000'
                       , source_system_cd = '00002'
                       , source_system_cd = '00006'
                       , source_system_cd = '00018'
                       , NO CASE )
              , RANGE_N( entry_dt BETWEEN DATE '2012-01-01' AND DATE '2025-12-31' EACH
                          INTERVAL '1' DAY, NO RANGE )
              );
```

Output

```
CREATE TABLE tab2
( entry_id      integer not null
  , oper_id     integer not null
  , source_system_cd varchar(5)
  , entry_dt    date
  , file_id     integer
  , load_id     integer
  , contract_id varchar(50)
  , contract_type_cd varchar(50)
)
DISTRIBUTE BY HASH (entry_id, oper_id, source_system_cd)
/* PARTITION BY ( CASE_N( source_system_cd = '00000'
                          , source_system_cd = '00002'
                          , source_system_cd = '00006'
                          , source_system_cd = '00018'
                          , NO CASE )
                 , RANGE_N( entry_dt BETWEEN DATE '2012-01-01' AND DATE '2025-12-31' EACH
                             INTERVAL '1' DAY, NO RANGE )
                 ) */
;
```

Scenario 4: Assume that the configuration parameters (**tdMigrateCASE_N** and **tdMigrateRANGE_N**) are set to any value.

The following is another TD create table script with RANGE_N partition (without nested partitions).

Input

```
CREATE TABLE tab4
( entry_id      integer not null
  , oper_id     integer not null
  , source_system_cd varchar(5)
  , entry_dt    date
```



```
, file_id      integer
, load_id      integer
, contract_id   varchar(50)
, contract_type_cd varchar(50)
)
PRIMARY INDEX (entry_id, oper_id, source_system_cd)
PARTITION BY (RANGE_N( entry_dt BETWEEN DATE '2012-01-01' AND DATE '2025-12-31' EACH INTERVAL
'1' DAY, NO RANGE )
);
```

Output

```
CREATE TABLE tab4
( entry_id      integer not null
, oper_id      integer not null
, source_system_cd varchar(5)
, entry_dt     date
, file_id      integer
, load_id      integer
, contract_id   varchar(50)
, contract_type_cd varchar(50)
)
DISTRIBUTE BY HASH (entry_id, oper_id, source_system_cd)
PARTITION BY RANGE (entry_dt) ( PARTITION tab4_p1 START (CAST('2012-01-01' AS DATE))
                                END (CAST('2025-12-31' AS DATE))
                                EVERY (INTERVAL '1' DAY) );
```

Scenario 5: Assume that the configuration parameters ([tdMigrateCASE_N](#) and [tdMigrateRANGE_N](#)) are set to **comment** or **range** respectively.

The following is another teradata create table script with CASE_N partition (without nested partitions).

Input

```
CREATE TABLE tab5
( entry_id      integer not null
, oper_id      integer not null
, source_system_cd varchar(5)
, entry_dt     date
, file_id      integer
, load_id      integer
, contract_id   varchar(50)
, contract_type_cd varchar(50)
)
PRIMARY INDEX (entry_id, oper_id, source_system_cd)
PARTITION BY ( CASE_N( source_system_cd = '00000'
                        , source_system_cd = '00002'
                        , source_system_cd = '00006'
                        , source_system_cd = '00018'
                        , NO CASE )
);
```

Output

```
CREATE TABLE tab5
( entry_id      integer not null
, oper_id      integer not null
, source_system_cd varchar(5)
, entry_dt     date
, file_id      integer
, load_id      integer
, contract_id   varchar(50)
, contract_type_cd varchar(50)
)
DISTRIBUTE BY HASH (entry_id, oper_id, source_system_cd)
/* PARTITION BY ( CASE_N( source_system_cd = '00000'
                        , source_system_cd = '00002'
                        , source_system_cd = '00006'
```

```

, source_system_cd = '00018'
, NO CASE )
) */
;

```

ANALYZE

Input - CREATE TABLE with INDEX

```

CREATE TABLE EMP27 AS emp21 WITH DATA
PRIMARY INDEX (EMPNO) ON COMMIT PRESERVE ROWS;

```

Output

```

Begin
CREATE TABLE EMP27
( LIKE emp21 INCLUDING ALL EXCLUDING PARTITION EXCLUDING REOPTIONS EXCLUDING
DISTRIBUTION )
DISTRIBUTE BY HASH ( EMPNO ) ;
INSERT INTO EMP27
select * from emp21 ;
end ;
/
ANALYZE Emp27 (EmpNo);

```

Data Types

The following data type mappings are supported by the DSC.

Input	Output
Numeric	Numeric
BIGINT	BIGINT
BYTEINT	SMALLINT
DECIMAL [(n[,m])]	DECIMAL [(n[,m])]
DOUBLE PRECISION	DOUBLE PRECISION
FLOAT	DOUBLE PRECISION
INT / INTEGER	INTEGER
NUMBER / NUMERIC	NUMERIC
NUMBER(n[,m])	NUMERIC (n[,m])
REAL	REAL
SMALLINT	SMALLINT
Character	Character
CHAR[(n)] / CHARACTER [(n)]	CHAR(n)
CLOB	CLOB
LONG VARCHAR	TEXT

Input	Output
VARCHAR(n) / CHAR VARYING(n) / CHARACTER VARYING(n)	VARCHAR(n)
<u>DateTime</u>	<u>DateTime</u>
DATE	DATE
TIME [(n)]	TIME [(n)]
TIME [(n)] WITH TIME ZONE	TIME [(n)] WITH TIME ZONE
TIMESTAMP [(n)]	TIMESTAMP [(n)]
TIMESTAMP [(n)] WITH TIME ZONE	TIMESTAMP [(n)] WITH TIME ZONE
<u>Period</u>	<u>Period</u>
PERIOD(DATE)	daterange
PERIOD(TIME [(n)])	tsrange [(n)]
PERIOD(TIME WITH TIME ZONE)	tstzrange
PERIOD(TIMESTAMP [(n)])	tsrange [(n)]
PERIOD(TIMESTAMP WITH TIME ZONE)	tstzrange
<u>Binary</u>	<u>Binary</u>
BLOB[(n)]	blob
BYTE[(n)]	bytea
VARBYTE[(n)]	bytea

For example: BYTEINT

Input

```
select cast(col as byteint) from tab;
```

Output

```
SELECT CAST( col AS SMALLINT ) FROM tab ;
```

Support for Specified Columns

Migration tool supports queries that specify number of columns (not all columns specified) during INSERT. This can happen when the input INSERT statement does not contain all the columns mentioned in the input CREATE statement. During migration, the columns are added with any default values specified.

 NOTE

This feature is supported if [session_mode](#) is **Teradata**.

- The SELECT statement for the INSERT-INTO-SELECT must not include the following:
 - Set operators
 - MERGE, TOP with PERCENT, TOP PERCENT with TIES

Input - TABLE with all columns of CREATE are not specified in the INSERT statement

```
CREATE
VOLATILE TABLE
Convert_Data3
,NO LOG (
  zoneno CHAR( 6 )
  ,brno CHAR( 6 )
  ,currtype CHAR( 4 )
  ,Commuteno CHAR( 4 )
  ,Subcode CHAR( 12 )
  ,accddate DATE format 'YYYY-MM-DD' NOT NULL
  ,acctime INTEGER
  ,quoteno CHAR( 1 )
  ,quotedate DATE FORMAT 'YYYY-MM-DD'
  ,lddrbaL DECIMAL( 18 ,0 ) DEFAULT 0
  ,ldcrbal DECIMAL( 18 ,0 )
  ,tddramt DECIMAL( 18 ,0 ) DEFAULT 25
  ,tdcramt DECIMAL( 18 ,0 )
  ,tddrbal DECIMAL( 18 ,2 )
  ,tdcrbal DECIMAL( 18 ,2 )
) PRIMARY INDEX (
  BRNO
  ,CURRTYPE
  ,SUBCODE
)
ON COMMIT PRESERVE ROWS
;

INSERT
INTO
Convert_Data3 (
  zoneno
  ,brno
  ,currtype
  ,commuteno
  ,subcode
  ,accddate
  ,acctime
  ,quoteno
  ,quotedate
  ,tddrbal
  ,tdcrbal
) SELECT
  A.zoneno
  ,A.brno
  ,'014' currtype
  ,'2' commuteno
  ,A.subcode
  ,A.Accdate
  ,A.Acctime
  ,'2' quoteno
  ,B.workdate quoteDate
  ,CAST( ( CAST( SUM ( CAST( A.tddrbal AS FLOAT ) * CAST( B.USCVRATE AS FLOAT ) ) AS
FLOAT ) ) AS DEC ( 18 ,2 ) ) AS tddrbal
  ,CAST( ( CAST( SUM ( CAST( A.tdcrbal AS FLOAT ) * CAST( B.USCVRATE AS FLOAT ) ) AS
FLOAT ) ) AS DEC ( 18 ,2 ) ) AS tdcrbal
FROM
  table2 A
;
```

Output

```
CREATE
LOCAL TEMPORARY TABLE
Convert_Data3 (
  zoneno CHAR( 6 )
  ,brno CHAR( 6 )
  ,currtype CHAR( 4 )
  ,Commuteno CHAR( 4 )
  ,Subcode CHAR( 12 )
  ,accddate DATE NOT NULL
  ,acctime INTEGER
  ,quoteno CHAR( 1 )
  ,quotedate DATE
  ,lddrbaL DECIMAL( 18 ,0 ) DEFAULT 0
  ,ldcrbal DECIMAL( 18 ,0 )
  ,tddramt DECIMAL( 18 ,0 ) DEFAULT 25
  ,tdcramt DECIMAL( 18 ,0 )
  ,tddrbal DECIMAL( 18 ,2 )
  ,tdcrbal DECIMAL( 18 ,2 )
)
ON COMMIT PRESERVE ROWS DISTRIBUTE BY HASH (
BRNO
,CURRTYPE
,SUBCODE
)
;
INSERT
INTO
Convert_Data3 (
  lddrbaL
  ,ldcrbal
  ,tddramt
  ,tdcramt
  ,zoneno
  ,brno
  ,currtype
  ,commuteno
  ,subcode
  ,accddate
  ,acctime
  ,quoteno
  ,quotedate
  ,tddrbal
  ,tdcrbal
) SELECT
  0
  ,NULL
  ,25
  ,NULL
  ,A.zoneno
  ,A.brno
  ,'014' currtype
  ,'2' commuteno
  ,A.subcode
  ,A.Accdate
  ,A.Acctime
  ,'2' quoteno
  ,B.workdate quoteDate
  ,CAST( ( CAST( SUM ( CAST( A.tddrbal AS FLOAT ) * CAST( B.USCVRATE AS FLOAT ) ) AS
FLOAT ) ) AS DECIMAL( 18 ,2 ) ) AS tddrbal
  ,CAST( ( CAST( SUM ( CAST( A.tdcrbal AS FLOAT ) * CAST( B.USCVRATE AS FLOAT ) ) AS
FLOAT ) ) AS DECIMAL( 18 ,2 ) ) AS tdcrbal
FROM
  table2 A MINUS SELECT
    lddrbaL
    ,ldcrbal
    ,tddramt
    ,tdcramt
```

```
        ,zoneno
        ,brno
        ,currtype
        ,commuteno
        ,subcode
        ,accddate
        ,acctime
        ,quoteno
        ,quotedate
        ,tddrbal
        ,tdcrbal
FROM
  CONVERT_DATA3
;
```

6.8.2.2 Index Migration

The sequence of **CREATE INDEX** columns and table names in Teradata is different from that in GaussDB(DWS). Use the configuration parameter [distributeByHash](#) to configure how the data is distributed across the cluster nodes. The tool will not add **DISTRIBUTE BY HASH** which is used to create a table with Primary Key and Non-Unique Primary Index.

Input - Primary key is not superset of primary index and only one column is matched

```
CREATE TABLE good_5 (
  column_1 INTEGER NOT NULL PRIMARY KEY
  ,column_2 INTEGER
  ,column_3 INTEGER NOT NULL
  ,column_4 INTEGER
) PRIMARY INDEX (column_1,column_2);
```

Output

```
CREATE TABLE good_5 (
  column_1 INTEGER NOT NULL PRIMARY KEY
  ,column_2 INTEGER
  ,column_3 INTEGER NOT NULL
  ,column_4 INTEGER
)
;
```

Input - Primary key is not superset of primary index and no column is matched

```
CREATE SET TABLE DP_SEDW.T_170UT_HOLDER_ACCT
  ,NO FALLBACK
  ,NO BEFORE JOURNAL
  ,NO AFTER JOURNAL (
    BUSINESSDATE VARCHAR( 10 )
    ,SOURCESYSTEM VARCHAR( 5 )
    ,UPLOADCODE VARCHAR( 1 )
    ,HOLDER_NO VARCHAR( 7 ) NOT NULL
    ,POSTAL_ADD_4 VARCHAR( 40 )
    ,EPF_IND CHAR( 1 )
    ,PRIMARY KEY ( UPLOADCODE ,HOLDER_NO )
) PRIMARY INDEX ( SOURCESYSTEM,EPF_IND );
```

Output

```
CREATE TABLE DP_SEDW.T_170UT_HOLDER_ACCT (
  BUSINESSDATE VARCHAR( 10 )
  ,SOURCESYSTEM VARCHAR( 5 )
  ,UPLOADCODE VARCHAR( 1 )
  ,HOLDER_NO VARCHAR( 7 ) NOT NULL
  ,POSTAL_ADD_4 VARCHAR( 40 )
```

```
,EPF_IND CHAR( 1 )
,PRIMARY KEY (UPLOADCODE ,HOLDER_NO  ) );
```

Input - No primary key and unique index has index name

```
CREATE SET TABLE "DP_TEDW"."T0409_INTERNAL_ORG_GRP_FUNCT",
NO FALLBACK, NO BEFORE JOURNAL,
NO AFTER JOURNAL
( Organization_Party_Id    INTEGER           NOT NULL
, Function_Code           SMALLINT        NOT NULL
, Intern_Funct_Strt_Date  DATE FORMAT 'YYYY-MM-DD' NOT NULL
, Intern_Funct_End_Date   DATE FORMAT 'YYYY-MM-DD'
)
PRIMARY INDEX ( Organization_Party_Id )
UNIQUE INDEX ux_t0409_intr_fn_1 ( Function_Code, Intern_Funct_Strt_Date )
UNIQUE INDEX ( Organization_Party_Id, Intern_Funct_Strt_Date );
```

Output

```
CREATE TABLE "DP_TEDW"."T0409_INTERNAL_ORG_GRP_FUNCT"
( Organization_Party_Id    INTEGER           NOT NULL
, Function_Code           SMALLINT        NOT NULL
, Intern_Funct_Strt_Date  DATE             NOT NULL
, Intern_Funct_End_Date   DATE
)
DISTRIBUTE BY HASH ( Organization_Party_Id );
CREATE INDEX ux_t0409_intr_fn_1 ON "DP_TEDW"."T0409_INTERNAL_ORG_GRP_FUNCT" ( Function_Code,
Intern_Funct_Strt_Date );
CREATE UNIQUE INDEX ON "DP_TEDW"."T0409_INTERNAL_ORG_GRP_FUNCT" ( Organization_Party_Id,
Intern_Funct_Strt_Date );
```

Input - CREATE TABLE with Primary Key and Non-Unique Primary Index (DISTRIBUTE BY HASH is not added)

```
CREATE TABLE employee
(
EMP_NO INTEGER
, DEPT_NO INTEGER
, FIRST_NAME VARCHAR(20)
, LAST_NAME CHAR(20)
, SALARY DECIMAL(10,2)
, ADDRESS VARCHAR(100)
, CONSTRAINT pk_emp PRIMARY KEY ( EMP_NO )
) PRIMARY INDEX ( DEPT_NO );
```

Output

```
CREATE TABLE employee
(
EMP_NO INTEGER
, DEPT_NO INTEGER
, FIRST_NAME VARCHAR(20)
, LAST_NAME CHAR(20)
, SALARY DECIMAL(10,2)
, ADDRESS VARCHAR(100)
, CONSTRAINT pk_emp PRIMARY KEY ( EMP_NO )
)
;
```

6.8.2.3 View Migration

CREATE VIEW ([short key](#) CV) is used together with **SELECT** to create a view.

The keyword **VIEW** is supported by both Teradata and GaussDB(DWS), but the **SELECT** statements are enclosed in double quotation marks during the migration. For details, see the following figures.

Use the **tdMigrateVIEWCHECKOPTION** configuration parameter to configure migration of views containing the WITH CHECK OPTION keyword. If **tdmigrateVIEWCHECKOPTION** is set to **false**, the tool will skip migration of the query and will log a message.

If the CREATE VIEW includes the LOCK keyword, then the VIEW query will be migrated based on the value of **tdMigrateLOCKoption**.

Input - CREATE VIEW

```
CREATE VIEW DP_STEDW.MY_PARAM
AS
SELECT RUNDATE FROM DP_STEDW.DATE_TBL WHERE dummy = 1;
```

Output

```
CREATE OR REPLACE VIEW DP_STEDW.MY_PARAM
AS
SELECT RUNDATE
FROM DP_STEDW.DATE_TBL
WHERE dummy = 1;
```

Input :CREATE VIEW WITH FORCE KEYWORD

```
CREATE
OR REPLACE FORCE VIEW IS2010_APP_INFO (
APP_ID, APP_SHORTNAME, APP_CHNAME,
APP_ENNAME
) AS
select
t.app_id,
t.app_shortname,
t.app_chname,
t.app_enname
from
newdrms.seas_app_info t
WHERE
t.app_status <> '2';
```

Output

```
CREATE
OR REPLACE
/*FORCE*/
VIEW IS2010_APP_INFO (
APP_ID,
APP_SHORTNAME,
APP_CHNAME,
APP_ENNAME ) AS
SELECT
t.app_id,
t.app_shortname,
t.app_chname,
t.app_enname
FROM
newdrms.seas_app_info t
WHERE
t.app_status <> '2';
```

REPLACE VIEW

In Teradata, the **REPLACE VIEW** statement is used to create a view or rebuild the existing view. DSC converts the **REPLACE VIEW** statement to the **CREATE OR REPLACE VIEW** statement that is compatible with GaussDB(DWS).

Input - REPLACE VIEW


```
REPLACE VIEW DP_STEDW.MY_PARAM AS SELECT
    RUNDATE
FROM
    DP_STEDW.DATE_TBL
WHERE
    dummy = 1
;
```

Output

```
CREATE
OR REPLACE VIEW DP_STEDW.MY_PARAM AS (
    SELECT
        RUNDATE
    FROM
        DP_STEDW.DATE_TBL
    WHERE
        dummy = 1
)
;
```

Input - REPLACE RECURSIVE VIEW

```
Replace RECURSIVE VIEW reachable_from (
emp_id,emp_name,DEPTH)
AS (
SELECT root.emp_id,root.emp_name,0 AS DEPTH
FROM emp AS root
WHERE root.mgr_id IS NULL);
```

Output

```
CREATE OR REPLACE VIEW reachable_from AS (
WITH RECURSIVE reachable_from (
emp_id,emp_name,DEPTH)
AS (
SELECT root.emp_id,root.emp_name,0 AS DEPTH
FROM emp AS root
WHERE root.mgr_id IS NULL
) SELECT * FROM reachable_from);
```

REPLACE FUNCTION

Input

```
REPLACE FUNCTION up_load1.RPT_016_BUS_DATE()
RETURNS DATE
LANGUAGE SQL
CONTAINS SQL
DETERMINISTIC
SQL SECURITY DEFINER
COLLATION INVOKER
INLINE TYPE 1
RETURN DATE'2017-08-22';
```

Output

```
CREATE OR REPLACE FUNCTION up_load1.RPT_016_BUS_DATE()
RETURNS DATE
LANGUAGE SQL
IMMUTABLE
SECURITY DEFINER
AS
$$
SELECT CAST('2017-08-20' AS DATE)
$$
;
```

CHECK OPTION

Use the **tdMigrateVIEWCHECKOPTION** configuration parameter to configure migration of views containing the **CHECK OPTION** keyword

If a view with **CHECK OPTION** is present in the source, then the **CHECK OPTION** is commented from the target database.

Input - VIEW with CHECK OPTION

```
CV mgr15 AS SEL *
FROM
  employee
WHERE
  manager_id = 15 WITH CHECK OPTION
;
```

Output (tdMigrateVIEWCHECKOPTION=True)

```
CREATE
  OR REPLACE VIEW mgr15 AS (
    SELECT
      *
    FROM
      employee
    WHERE
      manager_id = 15 /*WITH CHECK OPTION */
  )
;
```

Output (tdMigrateVIEWCHECKOPTION=False)

```
CV mgr15 AS SEL *
FROM
  employee
WHERE
  manager_id = 15 WITH CHECK OPTION
;
```

VIEW WITH RECURSIVE

GaussDB(DWS) does not support the Teradata keyword **RECURSIVE VIEW**. Therefore the keyword is replaced with **VIEW WITH RECURSIVE** keyword as shown in the following figures.

Figure 6-4 Input view-CREATE RECURSIVE VIEW

```
CREATE
  RECURSIVE VIEW emp_hier (
    emp_id
    ,mgr_id
    ,LEVEL
  ) AS (
    SELECT
      a.emp_id
      ,a.mgr_id
      ,0
    FROM
      employee a
    WHERE
      a.emp_id = 123
```

Figure 6-5 Output view

```
CREATE
VIEW emp_hier AS (
  WITH RECURSIVE emp_hier (
    emp_id
    ,mgr_id
    ,LEVEL
  ) AS (
    SELECT
      a.emp_id
      ,a.mgr_id
      ,0
    FROM
      employee a
    WHERE
      a.emp_id = 123
```

VIEW WITH ACCESS LOCK

Use the **tdMigrateLOCKOption** configuration parameter to configure migration of query containing the LOCK keyword. If **tdMigrateLOCKOption** is set to **false**, the tool will skip migration of the query and will log a message.

Input - VIEW with ACCESS LOCK

```
CREATE OR REPLACE VIEW DP_SVMEDW.S_LCR_909_001_LCRLOAN
AS
LOCK TABLE DP_STEDW.S_LCR_909_001_LCRLOAN FOR ACCESS FOR ACCESS
( SELECT RUN_ID, PRODUCT_ID, CURRENCY
  , CASHFLOW, ENTITY, LCR
  , TIME_BUCKET, MT, Ctl_Id
  , File_Id, Business_Date
  FROM DP_STEDW.S_LCR_909_001_LCRLOAN );
```

Output

```
CREATE OR REPLACE VIEW DP_SVMEDW.S_LCR_909_001_LCRLOAN
AS
/* LOCK TABLE DP_STEDW.S_LCR_909_001_LCRLOAN FOR ACCESS */
( SELECT RUN_ID, PRODUCT_ID, CURRENCY
  , CASHFLOW, ENTITY, LCR
  , TIME_BUCKET, MT, Ctl_Id
  , File_Id, Business_Date
  FROM DP_STEDW.S_LCR_909_001_LCRLOAN );
```

6.8.2.4 COLLECT STATISTICS

COLLECT STAT is used in Teradata for collecting optimizer statistics, which will be used for query performance. GaussDB(DWS) uses the **ANALYZE** statement to replace the **COLLECT STAT** statement.

For details, see [1](#).

Input - COLLECT STATISTICS

```
COLLECT STAT tab1 COLUMN (c1, c2);
```

Output

```
ANALYZE tab1 (c1, c2);
```

Input - COLLECT STATISTICS

```
COLLECT STATISTICS  
  COLUMN (customer_id,customer_name)  
  , COLUMN (postal_code)  
  , COLUMN (customer_address)  
ON customer_t;
```

Output

```
ANALYZE customer_t (  
  customer_id  
  ,customer_name  
  ,postal_code  
  ,customer_address  
)  
;
```

Input - COLLECT STATISTICS with COLUMN

```
COLLECT STATISTICS  
  COLUMN (  
    Order_Date  
    -- ,o_orderID  
/*COLLECT  
STATISTICS*/  
    ,Order_ID  
  )  
ON order_t;
```

Output

```
ANALYZE order_t (  
  Order_Date  
  ,Order_ID  
)  
;
```

Input - COLLECT STATISTICS with Schema Name

```
COLLECT STATS COLUMN (  
  empno  
  ,ename  
)  
  ON ${schemaname}."usrTab1"  
;
```

Output

```
ANALYZE ${schemaname}."usrTab1"  
(  
  empno  
  ,ename  
)  
;
```

COLLECT STATISTICS

Collect statistics based on sampling percentage.

Input

```
COLLECT STATISTICS  
USING SAMPLE 5.00 PERCENT  
COLUMN ( CDR_TYPE_KEY ) ,  
COLUMN ( PARTITION ) ,  
COLUMN ( SRC ) ,  
COLUMN ( PARTITION,SBSCRPN_KEY )  
ON DT_SDM.FCT_OTGO_NTWK_ACTVY_DAILY ;
```

Output

```
SET
default_statistics_target = 5.00 ;
ANALYZE DT_SDM.FCT_OTGO_NTWK_ACTVY_DAILY (CDR_TYPE_KEY) ;
ANALYZE DT_SDM.FCT_OTGO_NTWK_ACTVY_DAILY (PARTITION) ;
ANALYZE DT_SDM.FCT_OTGO_NTWK_ACTVY_DAILY (SRC) ;
ANALYZE DT_SDM.FCT_OTGO_NTWK_ACTVY_DAILY (PARTITION,SBSCRPN_KEY) ;
RESET default_statistics_target ;
```

6.8.2.5 ACCESS LOCK

ACCESS LOCK allows you to read the data from a table that may have been locked for the READ or WRITE.

Use the [tdMigrateLOCKOption](#) configuration parameter to configure migration of query containing the LOCK keyword. If [tdMigrateLOCKOption](#) is set to **false**, the tool will skip migration of the query and will log a message.

Input - ACCESS LOCK (tdMigrateLOCKOption=True)

```
LOCKING TABLE tab1 FOR ACCESS
INSERT INTO tab2
SELECT ...
FROM ...
WHERE ...;
```

Output

```
/* LOCKING TABLE tab1 FOR ACCESS */
INSERT INTO tab2
SELECT ...
FROM ...
WHERE ...;
```

6.8.2.6 DBC.COLUMNS

DBC.COLUMNS view is a table containing information about table and view columns, stored procedures, or macro parameters. The view includes the following column names: **DatabaseName**, **TableName**, **ColumnName**, **ColumnFormat**, **ColumnTitle**, **ColumnType**, and **DefaultValue**. In GaussDB(DWS), this table is equivalent to the **information_schema.columns** table.

NOTE

This feature requires one time execution of the custom script file *DSC/scripts/teradata/db_scripts/mig_fn_get_datatype_short_name.sql*.

For more information about the steps to execute the file, refer [System Requirements](#) and [Prerequisites](#) sections respectively.

The DSC migrates the following dbc.columns to their corresponding information_schema columns.

Table 6-17 Migration of dbc.columns to information_schema columns

dbc.columns	information_schema.columns
ColumnName	Column_Name

dbc.columns	information_schema.columns
ColumnType	mig_fn_get_datatype_short_name (data_Type)
ColumnLength	character_maximum_length
DecimalTotalDigits	numeric_precision
DecimalFractionalDigits	numeric_scale
databasename	table_schema
tablename	table_name
ColumnId	ordinal_position

The following assumptions are made when migrating dbc.columns:

- The FROM clause will contain only the dbc.columns TABLE NAME
- COLUMN NAME can be in the form of *column_name* or *schema_name.table_name.column_name*.

Migration of dbc.columns is not supported for the following cases:

- If the FROM clause has an ALIAS for dbc.columns table name (dbc.columns alias).
- If dbc.columns is combined with other tables (FROM dbc.columns alias1, table1 alias2 OR dbc.columns alias1 join table1 alias2).

 NOTE

- If the input SELECT statement includes dbc.column COLUMN NAMES directly, then the tool will migrate the input column names as an ALIAS. For example, the input column name **DecimalFractionalDigits** is migrated to *numeric_scale* with an ALIAS **DecimalFractionalDigits**.

Example:

Input:

```
SEL
  columnid
  ,DecimalFractionalDigits
FROM
  dbc.columns
;
```

Output:

```
SELECT
  ordinal_position columnid
  ,numeric_scale DecimalFractionalDigits
FROM
  information_schema.columns
;
```

- For table names and schema names, the DSC will convert all string values to lowercase. To maintain case-sensitivity, the table/schema names should be within double quotes. In the following input example, "Test" will not be converted to lower case.

```
SELECT
  TableName
FROM
  dbc . columns
WHERE
  dbc.columns.databasename = ""Test";
```

Input: dbc.columns table with all supported columns

```
SELECT
'$AUTO_DB_IP'
,objectdatabasename
,objecttablename
,'$TX_DATE_10'
,
'0'
,FirstStepTime
,FirstRespTime
,RowCount
,cast(RowCount*sum(case when T2.ColumnType ='CV' then T2.ColumnLength/3 else T2.ColumnLength end)
as decimal(38,0))
,'3'
,
,'BAK_CLR_DATA'
,'2'
,
FROM TMP_clr_information T1
inner join dbc.columns T2
on T1.objectdatabasename =T2.DatabaseName
and T1.objecttablename =T2.TableName
where T2.DatabaseName not in (
sel child from dbc.children
where parent='$FCRM_DB'
)
group by 1,2,3,4,5,6,7,8,9,11,12,13,14,15;
```

Output

```
SELECT
'$AUTO_DB_IP'
,objectdatabasename
,objecttablename
```

```

,$TX_DATE_10'
,
,'0'
,FirstStepTime
,FirstRespTime
,RowCount
,CAST( RowCount * SUM ( CASE WHEN mig_fn_get_datatype_short_name ( T2.data_Type ) = 'CV'
THEN T2.character_maximum_length / 3 ELSE T2.character_maximum_length END ) AS DECIMAL( 38 ,
0 ) )
,'3'
,
,'BAK_CLR_DATA'
,'2'
,
FROM
TMP_clr_information T1 INNER JOIN information_schema.columns T2
ON T1.objectdatabasename = T2.table_schema
AND T1.objecttablename = T2.table_name
WHERE
NOT EXISTS (
SELECT
child
FROM
dbc.children
WHERE
child = T2.table_schema
AND( parent = '$FCRM_DB' )
)
GROUP BY
1 ,2 ,3 ,4 ,5 ,6 ,7 ,8 ,9 ,11 ,12 ,13 ,14 ,15
;

```

Input: dbc.columns table with TABLE NAME

```

SELECT
TRIM( ColumnName )
,UPPER( dbc.columns.ColumnType )
FROM
dbc . columns
WHERE
dbc.columns.databasename = ""Test""
ORDER BY
dbc.columns.ColumnId
;

```

Output

```

SELECT
TRIM( Column_Name )
,UPPER( mig_fn_get_datatype_short_name ( information_schema.columns.data_Type ) )
FROM
information_schema.columns
WHERE
information_schema.columns.table_schema = CASE
WHEN TRIM( ""Test"" ) LIKE ""%''
THEN REPLACE( SUBSTR( ""Test"" ,2 ,LENGTH( ""Test"" ) - 2 ) ,'''' ,"" )
ELSE LOWER( ""Test"" )
END
ORDER BY
information_schema.columns.ordinal_position
;

```

6.8.2.7 DBC.TABLES

The DSC migrates dbc.tables to their corresponding mig_td_ext.vw_td_dbc_tables.
Example: databasename is migrated as mig_td_ext.vw_td_dbc_tables.schemaname.

Input


```
sel databasename,tablename FROM dbc.tables
WHERE tablekind='T' and trim(databasename) = '<dbname>'
AND
( NOT(TRIM(tablename) LIKE ANY (<excludelist>))
);
```

Output

```
SELECT
    mig_td_ext.vw_td_dbc_tables.schemaname
    , mig_td_ext.vw_td_dbc_tables.tablename

FROM
    mig_td_ext.vw_td_dbc_tables
WHERE
    mig_td_ext.vw_td_dbc_tables.tablekind = 'T'
    AND TRIM(mig_td_ext.vw_td_dbc_tables.schemaname) = '<dbname>'
    AND( NOT( TRIM(mig_td_ext.vw_td_dbc_tables.tablename) LIKE ANY ( ARRAY[ < excludelist > ] ) ) )
;
```

6.8.2.8 DBC.INDICES

DSC migrates dbc.indices to the corresponding mig_td_ext.vw_td_dbc_indices.

Example: databasename is migrated as mig_td_ext.vw_td_dbc_tables.schemaname.

Input

```
sel databasename,tablename FROM dbc.indices
WHERE tablekind='T' and trim(databasename) = '<dbname>'
AND
( NOT(TRIM(tablename) LIKE ANY (<excludelist>))
) AND indextype IN ( 'Q','P');
```

Output

```
SELECT
    mig_td_ext.vw_td_dbc_indices.schemaname
, mig_td_ext.vw_td_dbc_indices.tablename

FROM
    mig_td_ext.vw_td_dbc_indices
WHERE

mig_td_ext.vw_td_dbc_indices.tablekind = 'T'

AND TRIM(mig_td_ext.vw_td_dbc_indices.schemaname) =
'<dbname>'

AND( NOT( TRIM(mig_td_ext.vw_td_dbc_indices.tablename) LIKE ANY (
ARRAY[ < excludelist > ] ) ) )
;
```

NOTE

In dbc.indices implementation, the query should contain "AND indextype IN ('Q','P')". If the query does not contain "AND indextype IN ('Q','P')", then the query is not migrated and DSC logs the following error message:

"Query/statement is not supported as indextype should be mentioned with values 'P' and 'Q:'."

dbc.sessioninfoV

Input

```
select username,clientsystemuserid,clientipaddress,clientprogramname
from dbc.sessioninfoV
where sessionno = 140167641814784;
```

Output

```
select username AS username, NULL::TEXT AS clientsystemuserid
, client_addr AS clientipaddress, application_name AS clientprogramname
from pg_catalog.pg_stat_activity
WHERE pid = 140167641814784;
```

dbc.sessioninfo

Input

```
SELECT username
,clientsystemuserid
,clientipaddress
,clientprogramname
FROM
dbc.sessioninfo
WHERE
sessionno = lv_mig_session ;
```

Output

```
select username AS username, NULL::TEXT AS clientsystemuserid
, client_addr AS clientipaddress, application_name AS clientprogramname
from pg_catalog.pg_stat_activity
WHERE pid = lv_mig_session;
```

Teradata "SET QUERY_BAND" with "FOR SESSION"

Input

```
set query_band = 'AppName=${AUTO_SYS};JobName=${AUTO_JOB};TxDate=${TX_DATE};ScriptName=${script_name};' for session ;
```

Output

```
set query_band = 'AppName=${AUTO_SYS};JobName=${AUTO_JOB};TxDate=${TX_DATE};ScriptName=${script_name};' /* for session */;
```

SESSION

Input

```
select Session ;
should be migrated as below:
SELECT pg_backend_pid();
```

Output

```
SELECT pg_backend_pid();
```

6.8.3 SHOW STATS VALUES SEQUENCED

This command displays the COLLECT STATISTICS statement with statistics. Gauss does not have an equivalent for this. Since it does not affect the functionality, this command can be commented.

Input

```
SHOW STATS VALUES SEQUENCED on "temp"."table"
```

Output

```
/*SHOW STATS VALUES SEQUENCED on "temp"."table"*/
```

6.8.4 DML

This section describes the syntax for migrating Teradata DML. The migration syntax determines how the keywords and features are migrated.

In Teradata, SQL queries in a file that contains the **SELECT**, **INSERT**, **UPDATE**, **DELETE**, or **MERGE** statement can be migrated to GaussDB(DWS).

For details, see the following topics:

INSERT

SELECT

UPDATE

DELETE

MERGE

NAMED

ACTIVITYCOUNT

TIMESTAMP

INSERT

The Teradata **INSERT** (**short key** INS) statement is used to insert records into a table. DSC supports the **INSERT** statement.

The **INSERT INTO TABLE table_name** syntax exists in Teradata SQL, but is not supported by GaussDB(DWS). GaussDB(DWS) supports only the **INSERT INTO table_name** syntax. Therefore, remove the keyword **TABLE** when using DSC.

Input

```
INSERT TABLE tab1  
SELECT col1, col2  
FROM tab2  
WHERE col3 > 0;
```

Output

```
INSERT INTO tab1  
SELECT col1, col2  
FROM tab2  
WHERE col3 > 0;
```

SELECT

1. ANALYZE

The Teradata **SELECT** command (**short key** SEL) is used to specify the table columns from which data is to be retrieved.

ANALYZE is used in GaussDB(DWS) for collecting optimizer statistics, which is used for improving query performance.

Input: ANALYZE with INSERT

```
INSERT INTO employee(empno,ename) Values (1,'John');  
COLLECT STAT on employee;
```

Output

```
INSERT INTO employee( empno, ename)  
SELECT 1 ,'John';  
ANALYZE employee;
```

Input: ANALYZE with UPDATE

```
UPD employee SET ename = 'Jane'  
WHERE ename = 'John';  
COLLECT STAT on employee;
```

Output

```
UPDATE employee SET ename = 'Jane'  
WHERE ename = 'John';  
ANALYZE employee;
```

Input: ANALYZE with DELETE

```
DEL FROM employee WHERE ID > 10;  
COLLECT STAT on employee;
```

Output

```
DELETE FROM employee WHERE ID > 10;  
ANALYZE employee;
```

2. Order of Clauses

For Teradata migration of **SELECT** statements, all the clauses (**FROM**, **WHERE**, **HAVING** and **GROUP BY**) can be listed in any order. The tool will not migrate the statement if it contains a **QUALIFY** as an **ALIAS** before the **FROM** clause.

Use the [tdMigrateALIAS](#) configuration parameter to configure migration of ALIAS.

Input: Order of Clauses

```
SELECT expr1 AS alias1  
  , expr2 AS alias2  
  , expr3 AS alias3  
  , MAX( expr4 ), ...  
FROM tab1 T1 INNER JOIN tab2 T2  
  ON T1.c1 = T2.c2 ...  
  AND T3.c5 = '010'  
  AND ...  
WHERE T1.c7 = '000'  
  AND ...  
HAVING alias1 <> 'IC'  
  AND alias2 <> 'IC'  
  AND alias3 <> ''  
GROUP BY 1, 2, 3 ;
```

Output

```
SELECT expr1 AS alias1  
  , expr2 AS alias2  
  , expr3 AS alias3  
  , MAX( expr4 ), ...  
FROM tab1 T1 INNER JOIN tab2 T2  
  ON T1.c1 = T2.c2 ...  
  AND T3.c5 = '010'  
  AND ...  
WHERE T1.c7 = '000'  
  AND ...  
GROUP BY 1 ,2 ,3  
HAVING expr1 <> 'IC'  
  AND expr2 <> 'IC'  
  AND expr3 <> '';
```

Input: Order of Clauses

```
SELECT
  TOP 10 *
GROUP BY
  DeptNo
WHERE
  empID < 100
FROM
  tbl_employee;
```

Output

```
SELECT
  *
FROM
  tbl_employee
WHERE
  empID < 100
GROUP BY
  DeptNo LIMIT 10
;
```

NOTE

If the input script contains QUALIFY as an ALIAS before the FROM clause, the DSC will not migrate the statement and copy the input statement verbatim.

Input: Order of Clauses with QUALIFY as an ALIAS before the FROM clause

```
SELECT
  *
FROM
  table1
WHERE
  abc = (
    SELECT
      col1 AS qualify
    FROM
      TABLE
      WHERE
        col1 = 5
  )
;
```

Output

```
SELECT
  *
FROM
  table1
WHERE
  abc = (
    SELECT
      col1 AS qualify
    FROM
      TABLE
      WHERE
        col1 = 5
  )
;
```

3. Extended Group by Clause

The **GROUP BY** clause can be specified if you want the database to group the selected rows based on the value of expr(s). If this clause contains **CUBE**, **ROLLUP** or **GROUPING SETS** extensions, then the database produces super-aggregate groupings in addition to the regular groupings. These features are not available in GaussDB(DWS), but similar functions can be enabled using the **UNION ALL** operator.

Use the [extendedGroupByClause](#) configuration parameter to configure migration of the extended GROUP BY clause.

Input: Extended Group By Clause - CUBE

```
SELECT expr1 AS alias1
      , expr2 AS alias2
      , expr3 AS alias3
      , MAX( expr4 ), ...
FROM tab1 T1 INNER JOIN tab2 T2
  ON T1.c1 = T2.c2 ...
  AND T3.c5 = '010'
  AND ...
WHERE T1.c7 = '000'
  AND ...
HAVING alias1 <> 'IC'
      AND alias2 <> 'IC'
      AND alias3 <> ''
GROUP BY 1, 2, 3 ;
```

Output

```
SELECT expr1 AS alias1
      , expr2 AS alias2
      , expr3 AS alias3
      , MAX( expr4 ), ...
FROM tab1 T1 INNER JOIN tab2 T2
  ON T1.c1 = T2.c2 ...
  AND T3.c5 = '010'
  AND ...
WHERE T1.c7 = '000'
  AND ...
GROUP BY 1 ,2 ,3
HAVING expr1 <> 'IC'
      AND expr2 <> 'IC'
      AND expr3 <> '';
```

Input: Extended Group By Clause - ROLLUP

```
SELECT d.dname, e.job, MAX(e.sal)
FROM emp e RIGHT OUTER JOIN dept d
  ON e.deptno=d.deptno
WHERE e.job IS NOT NULL
GROUP BY ROLLUP (d.dname, e.job);
```

Output

```
SELECT dname, job, ColumnAlias1
FROM ( SELECT MAX(e.sal) AS ColumnAlias1, d.dname, e.job
FROM emp e RIGHT OUTER JOIN dept d
  ON e.deptno = d.deptno
WHERE e.job IS NOT NULL
GROUP BY d.dname ,e.job
UNION ALL
SELECT MAX(e.sal) AS ColumnAlias1, d.dname, NULL AS
job
FROM emp e RIGHT OUTER JOIN dept d
  ON e.deptno = d.deptno
WHERE e.job IS NOT NULL
GROUP BY d.dname
UNION ALL
SELECT MAX( e.sal ) AS ColumnAlias1, NULL AS dname,
NULL AS job
FROM emp e RIGHT OUTER JOIN dept d
  ON e.deptno = d.deptno
WHERE e.job IS NOT NULL
);
```

Input: Extended Group By Clause - GROUPING SETS

```
SELECT d.dname, e.job, MAX(e.sal)
FROM emp e RIGHT OUTER JOIN dept d
ON e.deptno=d.deptno
```

```
WHERE e.job IS NOT NULL  
GROUP BY GROUPING SETS(d.dname, e.job);
```

Output

```
SELECT dname, job, ColumnAlias1  
FROM ( SELECT MAX(e.sal) AS ColumnAlias1  
      , d.dname, NULL AS job  
      FROM emp e RIGHT OUTER JOIN dept d  
      ON e.deptno = d.deptno  
      WHERE e.job IS NOT NULL  
      GROUP BY d.dname  
      UNION ALL  
      SELECT MAX(e.sal) AS ColumnAlias1  
      , NULL AS dname, e.job  
      FROM emp e RIGHT OUTER JOIN dept d  
      ON e.deptno = d.deptno  
      WHERE e.job IS NOT NULL  
      GROUP BY e.job  
      );
```

4. TOP and SAMPLE

The **TOP** and **SAMPLE** clauses of Teradata are migrated to **LIMIT** in GaussDB(DWS).

a. TOP

The DSC also supports migration of **TOP** statements with dynamic parameters.

NOTE

- For **TOP** clauses containing **WITH TIES**, the ORDER BY clause is also required. Otherwise, the tool will not migrate the statement and copy it as it is.
 - When using TOP with dynamic parameters:
 - The input dynamic parameters should be in the following form:
TOP :<parameter_name>
- The following characters are valid for dynamic parameters: a-z, A-Z, 0-9 and "_".

Input: SELECT .. TOP

```
SELECT TOP 1 c1, COUNT (*) cnt  
FROM tab1  
GROUP BY c1  
ORDER BY cnt;
```

Output

```
SELECT c1, COUNT(*) cnt  
FROM tab1  
GROUP BY c1  
ORDER BY cnt  
LIMIT 1;
```

Input: SELECT .. TOP PERCENT

```
SELECT TOP 10 PERCENT c1, c2  
FROM employee  
WHERE ...  
ORDER BY c2 DESC;
```

Output

```
WITH top_percent AS (  
  SELECT c1, c2  
  FROM employee  
  WHERE ...  
  ORDER BY c2 DESC  
)  
SELECT *
```

```
FROM top_percent
LIMIT (SELECT CEIL(COUNT( * ) * 10 / 100)
      FROM top_percent);
```

Input: SELECT .. TOP with dynamic parameters

```
SELECT
    TOP :Limit WITH TIES c1
    ,SUM (c2) sc2
FROM
    tab1
WHERE
    c3 > 10
GROUP BY
    c1
ORDER BY
    c1
;
```

Output

```
WITH top_ties AS (
    SELECT
        c1
        ,SUM (c2) sc2
        ,rank (
            ) OVER( ORDER BY c1 ) AS TOP_RNK
    FROM
        tab1
    WHERE
        c3 > 10
    GROUP BY
        c1
) SELECT
    c1
    ,sc2
FROM
    top_ties
WHERE
    TOP_RNK <= :Limit
ORDER BY
    TOP_RNK
;
```

Input: SELECT .. TOP with dynamic parameters and with TIES

```
SELECT
    TOP :Limit WITH TIES Customer_ID
FROM
    Customer_t
ORDER BY
    Customer_ID
;
```

Output

```
WITH top_ties AS (
    SELECT
        Customer_ID
        ,rank (
            ) OVER( order by Customer_id) AS TOP_RNK
    FROM
        Customer_t
) SELECT
    Customer_ID
FROM
    top_ties
WHERE
    TOP_RNK <= :Limit
ORDER BY
    TOP_RNK
;
```

Input: SELECT .. TOP PERCENT with dynamic parameters


```

SELECT
    TOP :Input_Limit PERCENT WITH TIES c1
    ,SUM (c2) sc2
FROM
    tab1
GROUP BY
    c1
ORDER BY
    c1
;

```

Output

```

WITH top_percent_ties AS (
    SELECT
        c1
        ,SUM (c2) sc2
        ,rank (
            ) OVER( ORDER BY c1 ) AS TOP_RNK
    FROM
        tab1
    GROUP BY
        c1
) SELECT
    c1
    ,sc2
FROM
    top_percent_ties
WHERE
    TOP_RNK <= (
        SELECT
            CEIL(COUNT( * ) * :Input_Limit / 100)
        FROM
            top_percent_ties
    )
ORDER BY
    TOP_RNK
;

```

b. **SAMPLE** **NOTE**

The tool only supports single positive integers in the SAMPLE clause.

Input: SELECT .. SAMPLE

```

SELECT c1, c2, c3
FROM tab1
WHERE c1 > 1000
SAMPLE 1;

```

Output

```

SELECT c1, c2, c3
FROM tab1
WHERE c1 > 1000
LIMIT 1;

```

UPDATE

The tool supports and migrates the **UPDATE** (**short key** UPD) statements.

Input: UPDATE with TABLE ALIAS

```

UPDATE T1
FROM tab1 T1, tab2 T2
SET c1 = T2.c1
, c2 = T2.c2
WHERE T1.c3 = T2.c3;

```

Output

```
UPDATE tab1 T1
  SET c1 = T2.c1
    , c2 = T2.c2
  FROM tab2 T2
 WHERE T1.c3 = T2.c3;
```

Input: UPDATE with TABLE ALIAS using a sub query

```
UPDATE t1
  FROM tab1 t1, ( SELECT c1, c2 FROM tab2
                 WHERE c2 > 100 ) t2
  SET c1 = t2.c1
 WHERE t1.c2 = t2.c2;
```

Output

```
UPDATE tab1 t1
  SET c1 = t2.c1
  FROM ( SELECT c1, c2 FROM tab2
        WHERE c2 > 100 ) t2
 WHERE t1.c2 = t2.c2;
```

Input: UPDATE with ANALYZE

```
UPD employee SET ename = 'Jane'
  WHERE ename = 'John';
COLLECT STAT on employee;
```

Output

```
UPDATE employee SET ename = 'Jane'
  WHERE ename = 'John';
ANALYZE employee;
```

DELETE

DELETE ([short key](#) abbreviated as **DEL**) is an ANSI-compliant SQL syntax operator used to delete existing records from a table. DSC supports the Teradata **DELETE** statement and its short key **DEL**. The **DELETE** statement that does not contain the **WHERE** clause is migrated to **TRUNCATE** in GaussDB(DWS). Use the [deleteToTruncate](#) parameter to enable or disable this behavior.

Input: DELETE

```
DEL FROM tab1
  WHERE a =10;
```

Output

```
DELETE FROM tab1
  WHERE a =10;
```

Input: DELETE without WHERE - Migrated to TRUNCATE if deletetoTruncate=TRUE

```
DELETE FROM ${schemaname} . "tablename" ALL;
```

Output

```
TRUNCATE
  TABLE
    ${schemaname} . "tablename";
```

In DELETE, the same table is used in DELETE and FROM clauses with / without WHERE clause

Input

```
DELETE DP_TMP.M_P_TX_SCV_REMAINING_PARTY
FROM DP_TMP.M_P_TX_SCV_REMAINING_PARTY ALL ;
---
DELETE DP_VMCTLFW.CTLFW_Process_Id
FROM DP_VMCTLFW.CTLFW_Process_Id
WHERE (Process_Name = :_spVV2 )
AND (Process_Id NOT IN (SELECT MAX(Process_Id )(NAMED Process_Id )
                        FROM DP_VMCTLFW.CTLFW_Process_Id
                        WHERE Process_Name = :_spVV2 )
);
---
DELETE CPID
FROM DP_VMCTLFW.CTLFW_Process_Id AS CPID
WHERE (Process_Name = :_spVV2 )
AND (Process_Id NOT IN (SELECT MAX(Process_Id )(NAMED Process_Id )
                        FROM DP_VMCTLFW.CTLFW_Process_Id
                        WHERE Process_Name = :_spVV2 )
);
```

Output

```
DELETE FROM DP_TMP.M_P_TX_SCV_REMAINING_PARTY;
---
DELETE FROM DP_VMCTLFW.CTLFW_Process_Id
WHERE (Process_Name = :_spVV2 )
AND (Process_Id NOT IN (SELECT MAX(Process_Id )(NAMED Process_Id )
                        FROM DP_VMCTLFW.CTLFW_Process_Id
                        WHERE Process_Name = :_spVV2 )
);
---
DELETE FROM DP_VMCTLFW.CTLFW_Process_Id AS CPID
WHERE (Process_Name = :_spVV2 )
AND (Process_Id NOT IN (SELECT MAX(Process_Id )(NAMED Process_Id )
                        FROM DP_VMCTLFW.CTLFW_Process_Id
                        WHERE Process_Name = :_spVV2 )
);
```

DELETE table_alias FROM table

Input

```
SQL_Detail10124.sql
delete a
  from ${BRTL_DCOR}.BRTL_CS_POT_CUST_UMPAY_INF_S as a
 where a.DW_Snsh_Dt = cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd')
 and a.DW_Job_Seq = 1 ;
was migrated as below:
  DELETE FROM
    BRTL_DCOR.BRTL_CS_POT_CUST_UMPAY_INF_S AS a
  USING
    WHERE a.DW_Snsh_Dt = CAST( lv_mig_v_Trx_Dt AS DATE )
    AND a.DW_Job_Seq = 1 ;
SQL_Detail10449.sql
delete a
  from ${BRTL_DCOR}.BRTL_EM_YISHITONG_USR_INF as a
 where a.DW_Job_Seq = 1 ;
was migrated as below:
  DELETE FROM
    BRTL_DCOR.BRTL_EM_YISHITONG_USR_INF AS a
  USING
    WHERE a.DW_Job_Seq = 1 ;
SQL_Detail5742.sql
delete a
  from ${BRTL_DCOR}.BRTL_PD_FP_NAV_ADT_INF as a;
was migrated as
  DELETE a
  FROM
    BRTL_DCOR.BRTL_PD_FP_NAV_ADT_INF AS a ;
```

Output

```
SQL_Detail10124.sql
delete from ${BRTL_DCOR}.BRTL_CS_POT_CUST_UMPAY_INF_S as a
  where a.DW_Snsh_Dt = cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd')
  and a.DW_Job_Seq = 1 ;
SQL_Detail10449.sql
delete from ${BRTL_DCOR}.BRTL_EM_YISHITONG_USR_INF as a
  where a.DW_Job_Seq = 1 ;
SQL_Detail5742.sql
delete from ${BRTL_DCOR}.BRTL_PD_FP_NAV_ADT_INF as a;
```

MERGE

NOTE

Gauss database in 6.5.0 or later versions support the MERGE function.

MERGE is an ANSI-standard SQL syntax operator used to select rows from one or more sources for updating or inserting into a table or view. The conditions to update or insert to the target table or view can be specified.

Input: MERGE

```
MERGE INTO tab1 A
using ( SELECT c1, c2, ... FROM tab2 WHERE ...) AS B
ON A.c1 = B.c1
  WHEN MATCHED THEN
    UPDATE SET c2 = c2
      , c3 = c3
  WHEN NOT MATCHED THEN
    INSERT VALUES (B.c1, B.c2, B.c3);
```

Output

```
WITH B AS (
  SELECT
    c1
    ,c2
    ,...
  FROM
    tab2
  WHERE
    ...
)
,UPD_REC AS (
  UPDATE
    tab1 A
  SET
    c2 = c2
    ,c3 = c3
  FROM
    B
  WHERE
    A.c1 = B.c1 returning A. *
)
INSERT
  INTO
    tab1 SELECT
      B.c1
      ,B.c2
      ,B.c3
    FROM
      B
    WHERE
      NOT EXISTS (
        SELECT
          1
        FROM
```

```
        UPD_REC A
    WHERE
        A.c1 = B.c1
    )
;
```

NAMED

NAMED is used in Teradata to assign a temporary name to an expression or column. The **NAMED** statements for expression names are migrated to **AS** in GaussDB(DWS). The **NAMED** statements for column names are retained in the same syntax.

Input: NAMED Expression migrated to AS

```
SELECT Name, ((Salary + (YrsExp * 200))/12) (NAMED Projection)
FROM Employee
WHERE DeptNo = 600 AND Projection < 2500;
```

Output

```
SELECT Name, ((Salary + (YrsExp * 200))/12) AS Projection
FROM Employee
WHERE DeptNo = 600 AND ((Salary + (YrsExp * 200))/12) < 2500;
```

Input: NAMED AS for Column Name

```
SELECT product_id AS id
FROM emp where pid=2 or id=2;
```

Output

```
SELECT product_id (NAMED "pid") AS id
FROM emp where product_id=2 or product_id=2;
```

Input: NAMED() for Column Name

```
INSERT INTO Neg100 (NAMED,ID,Dept) VALUES ('TEST',1,'IT');
```

Output

```
INSERT INTO Neg100 (NAMED,ID,Dept) SELECT 'TEST',1, 'IT';
```

Input: NAMED alias with TITLE alias without AS

```
SELECT dept_name (NAMED alias1) (TITLE alias2 )
FROM employee
WHERE dept_name like 'Quality';
```

Output

```
SELECT dept_name
AS alias1
FROM employee
WHERE dept_name like 'Quality';
```

Input: NAMED alias with TITLE alias with AS

The DSC will skip the NAMED alias and TITLE alias and use only the AS alias.

```
SELECT sale_name (Named alias1 ) (Title alias2)
AS alias3
FROM employee
WHERE sname = 'Stock' OR sname ='Sales';
```

Output

```
SELECT sale_name
AS alias3
```

```
FROM employee
WHERE sname = 'Stock' OR sname ='Sales';
```

Input: NAMED with TITLE

NAMED and TITLE used together, separated by comma(,) within brackets().

```
SELECT customer_id (NAMED cust_id, TITLE 'Customer Id')
FROM Customer_T
WHERE cust_id > 10;
```

Output

```
SELECT cust_id AS "Customer Id"
FROM (SELECT customer_id AS cust_id
      FROM customer_t
      WHERE cust_id > 10);
```

ACTIVITYCOUNT

Input

It is a status variable that returns the number of rows affected by a DML statement in an embedded SQL statement.

```
SEL tablename
FROM dbc.tables
WHERE databasename ='tera_db'
  AND tablename='tab1';

.IF ACTIVITYCOUNT > 0 THEN .GOTO NXTREPORT;
CREATE MULTISET TABLE tera_db.tab1
, NO FALLBACK
, NO BEFORE JOURNAL
, NO AFTER JOURNAL
, CHECKSUM = DEFAULT
(
  Tx_Zone_Num CHAR( 4 )
  , Tx_Org_Num VARCHAR( 30 )
)
PRIMARY INDEX
(
  Tx_Org_Num
)
INDEX
(
  Tx_Teller_Id
)
;

.LABEL NXTREPORT
DEL FROM tera_db.tab1;
```

Output

```
DECLARE v_verify TEXT ;
v_no_data_found NUMBER ( 1 ) ;

BEGIN
  BEGIN
    v_no_data_found := 0 ;

    SELECT
      mig_td_ext.vw_td_dbc_tables.tablename INTO v_verify
    FROM
      mig_td_ext.vw_td_dbc_tables
    WHERE
      mig_td_ext.vw_td_dbc_tables.schemaname = 'tera_db'
```

```
        AND mig_td_ext.vw_td_dbc_tables.tablename = 'tab1' ;

    EXCEPTION
    WHEN NO_DATA_FOUND THEN
        v_no_data_found := 1 ;

END ;

IF
    v_no_data_found = 1 THEN
        CREATE TABLE tera_db.tab1 (
            Tx_Zone_Num CHAR( 4 )
            ,Tx_Org_Num VARCHAR( 30 )
        ) DISTRIBUTE BY HASH ( Tx_Org_Num ) ;

    CREATE
    INDEX
        ON tera_db.tab1 ( Tx_Teller_Id ) ;

END IF ;

DELETE FROM
    tera_db.tab1 ;

END ;
/
```

TIMESTAMP

Input - TIMESTAMP with FORMAT

The FORMAT phrase sets the format for a specific TIME or TIMESTAMP column or value. A FORMAT phrase overrides the system format.

```
SELECT 'StartDTTM' as a
    ,CURRENT_TIMESTAMP (FORMAT 'HH:MI:SSBMMBDD,BYYYY');
```

Output

```
SELECT 'StartDTTM' AS a
    ,TO_CHAR( CURRENT_TIMESTAMP , 'HH:MI:SS MON DD, YYYY' ) ;
```

TIMESTAMP Types Casting

Input

```
COALESCE( a.Snd_Tm ,TIMESTAMP '0001-01-01 00:00:00' )
should be migrated as below:
COALESCE( a.Snd_Tm , CAST('0001-01-01 00:00:00' AS TIMESTAMP) )
```

Output

```
COALESCE( a.Snd_Tm , CAST('0001-01-01 00:00:00' AS TIMESTAMP) )
```

6.8.5 Query Migration Operators

This section describes the syntax for migrating Teradata query migration operators. The migration syntax determines how the keywords and features are migrated.

For details, see the following topics:

[QUALIFY](#)

[ALIAS](#)

FORMAT and CAST

Short Keys Migration

Object Names Starting with \$

QUALIFY

In general, the **QUALIFY** clause is accompanied by analytic functions (window functions) such as CSUM(), MDIFF(), ROW_NUMBER() and RANK(). This is addressed using sub-query that contains the window functions specified in the **QUALIFY** clause. Migration tools support **QUALIFY** with **MDIFF()**, **RANK()** and **ROW_NUMBER()**. **QUALIFY** is a Teradata extension and not an ANSI standard syntax. It is executed after the WHERE and GROUP BY clauses. **QUALIFY** must start in new line.

NOTE

Migration tools support column name and/or expressions in the ORDER BY clause only if the column name and/or expression is explicitly included in the SELECT statement as well.

Input: QUALIFY

```
SELECT
  CUSTOMER_ID
  ,CUSTOMER_NAME
FROM
  CUSTOMER_T QUALIFY row_number( ) Over( partition BY CUSTOMER_ID ORDER BY POSTAL_CODE
DESC ) = 1
;
```

Output

```
SELECT
  CUSTOMER_ID
  ,CUSTOMER_NAME
FROM
  (
    SELECT
      CUSTOMER_ID
      ,CUSTOMER_NAME
      ,row_number( ) Over( partition BY CUSTOMER_ID ORDER BY POSTAL_CODE DESC ) AS
ROW_NUM1
    FROM
      CUSTOMER_T
  ) Q1
WHERE
  Q1.ROW_NUM1 = 1
;
```

Input: QUALIFY with MDIFF and RANK

```
SELECT
  material_name
  ,unit_of_measure * standard_cost AS tot_cost
FROM
  raw_material_t m LEFT JOIN supplies_t s
  ON s.material_id = m.material_id
  QUALIFY rank ( ) over( ORDER BY tot_cost DESC ) IN '5'
  OR mdiff( tot_cost ,3 ,material_name ) IS NULL
;
```

Output

```
SELECT
  material_name
```



```

,tot_cost
FROM
(
  SELECT
    material_name
    ,unit_of_measure * standard_cost AS tot_cost
    ,rank ( ) over( ORDER BY unit_of_measure * standard_cost DESC ) AS ROW_NUM1
    ,unit_of_measure * standard_cost - (LAG( unit_of_measure * standard_cost ,3 ,NULL )
over( ORDER BY material_name )) AS ROW_NUM2
  FROM
    raw_material_t m LEFT JOIN supplies_t s
    ON s.material_id = m.material_id
) Q1
WHERE
  Q1.ROW_NUM1 = '5'
  OR Q1.ROW_NUM2 IS NULL
;

```

Input: QUALIFY with ORDER BY having columns that do not exist in the SELECT list

```

SELECT Postal_Code
  FROM db_pvfc9_std.Customer_t t1
  GROUP BY Customer_Name ,Postal_Code
  QUALIFY ---comments
  ( Rank ( CHAR(Customer_Address) DESC ) ) = 1
  ORDER BY t1.Customer_Name;

```

Output

```

SELECT Postal_Code FROM
  ( SELECT Customer_Name, Postal_Code
    , Rank ( ) over( PARTITION BY Customer_Name, Postal_Code ORDER BY LENGTH(Customer_Address)
DESC ) AS Rank_col
  FROM db_pvfc9_std.Customer_t t1
) Q1
  WHERE /*comments*/
  Q1.Rank_col = 1
  ORDER BY Q1.Customer_Name;

```

Input: QUALIFY with COLUMN ALIAS - the corresponding column expression should not be added again in SELECT list.

```

SELECT material_name, unit_of_measure * standard_cost as tot_cost,
  RANK() over(order by tot_cost desc) vendor_cnt
  FROM raw_material_t m left join supplies_t s
  ON s.material_id = m.material_id
  QUALIFY vendor_cnt < 5 or MDIFF(tot_cost, 3, material_name) IS NULL;

```

Output

```

SELECT material_name, tot_cost, vendor_cnt
  FROM ( SELECT material_name
    , unit_of_measure * standard_cost AS tot_cost
    , rank ( ) over (ORDER BY tot_cost DESC) vendor_cnt
    , tot_cost - ( LAG(tot_cost ,3 ,NULL) over (ORDER BY material_name) ) AS anltn
  FROM raw_material_t m LEFT JOIN supplies_t s
  ON s.material_id = m.material_id
) Q1
  WHERE Q1.vendor_cnt < 5 OR Q1.anltn IS NULL
;

```

TITLE with QUALIFY

Input

```

REPLACE VIEW ${STG_VIEW}.LP06_BMCLINFP${v_Table_Suffix_Inc}
(

```

```

CLICLINBR
, CLICHNNAM
, CLICHNSHO
, CLICLIMNE
, CLIBNKCOD
)
AS
LOCKING ${STG_DATA}.LP06_BMCLIIFP${v_Table_Suffix_Inc} FOR ACCESS
SELECT
  CLICLINBR (title '  VARCHAR(20)')
, CLICHNNAM (title '  VARCHAR(200)')
, CLICHNSHO (title '  VARCHAR(20)')
, CLICLIMNE (title '  VARCHAR(10)')
, CLIBNKCOD (title '  VARCHAR(11)')
FROM
  ${STG_DATA}.LP06_BMCLIIFP${v_Table_Suffix_Inc} s1
QUALIFY
  ROW_NUMBER() OVER(PARTITION BY CLICLINBR ORDER BY CLICLINBR ) = 1
;

```

Output

```

CREATE OR REPLACE VIEW ${STG_VIEW}.LP06_BMCLIIFP${v_Table_Suffix_Inc}
(
  CLICLINBR
, CLICHNNAM
, CLICHNSHO
, CLICLIMNE
, CLIBNKCOD
)
AS
/* LOCKING ${STG_DATA}.LP06_BMCLIIFP${v_Table_Suffix_Inc} FOR ACCESS */
SELECT CLICLINBR
      , CLICHNNAM
      , CLICHNSHO
      , CLICLIMNE
      , CLIBNKCOD
FROM (
  SELECT
    CLICLINBR /* (title '  VARCHAR(20)') */
    , CLICHNNAM /* (title '  VARCHAR(200)') */
    , CLICHNSHO /* (title '  VARCHAR(20)') */
    , CLICLIMNE /* (title '  VARCHAR(10)') */
    , CLIBNKCOD /* (title '  VARCHAR(11)') */
    , ROW_NUMBER() OVER(PARTITION BY CLICLINBR ORDER BY CLICLINBR ) AS ROWNUM1
FROM
  ${STG_DATA}.LP06_BMCLIIFP${v_Table_Suffix_Inc} s1 ) Q1
WHERE Q1.ROWNUM1 = 1
;

```

ALIAS

ALIAS is supported by all databases. In Teradata, an **ALIAS** can be referred in **SELECT** and **WHERE** clauses of the same statement where the alias is defined. Since **ALIAS** is not supported in **SELECT** and **WHERE** clauses in the target, it is replaced by the defined value/expression.

NOTE

The comparison operators LT, LE, GT, GE, EQ, and NE must not be used as TABLE alias or COLUMN alias.

Tools support ALIAS names for columns. If the ALIAS name is same as the column name, then it should be specified for that column only and not for other columns in that table. In the following example, there is a conflict between DATA_DT column name and the DATA_DT alias. This is not supported by the tool.

```
SELECT DATA_DT, DATA_INT AS DATA_DT FROM KK WHERE DATA_DT=DATE;
```

Input: ALIAS

```
SELECT
  expression1 (
    TITLE 'Expression 1'
  ) AS alias1
  ,CASE
    WHEN alias1 + Cx >= z
    THEN 1
    ELSE 0
  END AS alias2
FROM
  tab1
WHERE
  alias1 = y
;
```

Output: tdMigrateALIAS = FALSE

```
SELECT
  expression1 AS alias1
  ,CASE
    WHEN alias1 + Cx >= z
    THEN 1
    ELSE 0
  END AS alias2
FROM
  tab1
WHERE
  alias1 = y
;
```

Output: tdMigrateALIAS = TRUE

```
SELECT
  expression1 AS alias1
  ,CASE
    WHEN expression1 + Cx >= z
    THEN 1
    ELSE 0
  END AS alias2
FROM
  tab1
WHERE
  expression1 = y
;
```

FORMAT and CAST

In Teradata, the **FORMAT** keyword is used for formatting a column/expression. For example, FORMAT '9(n)' and 'z(n)' are addressed using LPAD with 0 and space (' ') respectively.

Data typing is done using **CAST** or direct data type [like (expression1)(CHAR(n))]. This feature is addressed using **CAST**. For details, see [Type Casting and Formatting](#).

Input: FORMAT with CAST

```
SELECT
  CAST(TRIM( Agt_Num ) AS DECIMAL( 5 ,0 ) FORMAT '9(5)' )
FROM
  C03_AGENT_BOND
;

SELECT
  CAST(CAST( Agt_Num AS INT FORMAT 'Z(17)' ) AS CHAR( 5 ) )
FROM
```

```

C03_AGENT_BOND
;
SELECT
  CHAR(CAST( CAST( CND_VLU AS DECIMAL( 17,0 ) FORMAT 'Z(17)' ) AS VARCHAR( 17 ) ) )
FROM
  C03_AGENT_BOND
;

```

Output

```

SELECT
  LPAD( CAST( TRIM( Agt_Num ) AS DECIMAL( 5,0 ) ) ,5,'0' ) AS Agt_Num
FROM
  C03_AGENT_BOND
;
SELECT
  CAST(CAST( Agt_Num AS INT FORMAT 'Z(17)' ) AS CHAR( 5 ) )
FROM
  C03_AGENT_BOND
;
SELECT
  LENGTH( CAST( LPAD( CAST( CND_VLU AS DECIMAL( 17,0 ) ) ,17,' ' ) AS VARCHAR( 17 ) ) ) AS
CND_VLU
FROM
  C03_AGENT_BOND
;

```

Input - FORMAT 'Z(n)9'

```

SELECT
  standard_price (FORMAT 'Z(5)9') (CHAR( 6 ))
,max_price (FORMAT 'ZZZZ9') (CHAR( 6 ))
FROM
  product_t
;

```

Output

```

SELECT
  CAST( TO_CHAR( standard_price , '999990' ) AS CHAR( 6 ) ) AS standard_price
,CAST( TO_CHAR( max_price , '999990' ) AS CHAR( 6 ) ) AS max_price
FROM
  product_t
;

```

Input - FORMAT 'z(m)9.9(n)'

```

SELECT
  standard_price (FORMAT 'Z(6)9.9(2)') (CHAR( 6 ))
FROM
  product_t
;

```

Output

```

SELECT
  CAST( TO_CHAR( standard_price , '9999990.00' ) AS CHAR( 6 ) ) AS standard_price
FROM
  product_t
;

```

Input - CAST AS INTEGER

```

SELECT
  CAST( standard_price AS INTEGER )
FROM
  product_t
;

```

Output

```
SELECT
  (standard_price)
FROM
  product_t
;
```

Input - CAST AS INTEGER FORMAT

```
SELECT
  CAST( price11 AS INTEGER FORMAT 'Z(4)9' ) (
    CHAR( 10 )
  )
FROM
  product_t
;
```

Output

```
SELECT
  CAST( TO_CHAR( ( price11 ) , '99990' ) AS CHAR( 10 ) ) AS price11
FROM
  product_t
;
```

NOTE

The following Gauss function is added to convert to integer:

```
CREATE OR REPLACE FUNCTION
/* This function is used to support "CAST AS INTEGER" of Teradata.
   It should be created in the "mig_td_ext" schema.
*/
( i_param          TEXT )
RETURN INTEGER
AS
v_castasint  INTEGER;
BEGIN

  v_castasint := CASE WHEN i_param IS NULL
                    THEN NULL          -- if NULL value is provided as input
                    WHEN TRIM(i_param) IS NULL
                    THEN 0             -- if empty string with one
or more spaces is provided
                    ELSE TRUNC(CAST(i_param AS NUMBER))      -- if any
numeric value is provided
                    END;

RETURN v_castasint;
END;
```

Short Keys Migration

Table 6-18 lists the Teradata short keys supported by GaussDB(DWS) and their equivalent syntax in GaussDB(DWS).

Table 6-18 List of short keys

Teradata Short Key	Equivalent Syntax in GaussDB(DWS)
SEL	SELECT
INS	INSERT
UPD	UPDATE

Teradata Short Key	Equivalent Syntax in GaussDB(DWS)
DEL	DELETE
CT	CREATE TABLE
CV	CREATE VIEW
BT	START TRANSACTION
ET	COMMIT

Input - BT

```
BT;
--
delete from ${BRTL_DCOR}.BRTL_CS_CUST_CID_UID_REL
where DW_Job_Seq = ${v_Group_No};

.if ERRORCODE <> 0 then .quit 12;

--
insert into ${BRTL_DCOR}.BRTL_CS_CUST_CID_UID_REL
(
    Cust_Id
    ,Cust_UID
    ,DW_Upd_Dt
    ,DW_Upd_Tm
    ,DW_Job_Seq
    ,DW_Etl_Dt
)
select
    a.Cust_Id
    ,a.Cust_UID
    ,current_date as Dw_Upd_Dt
    ,current_time(0) as DW_Upd_Tm
    ,cast(${v_Group_No} as byteint) as DW_Job_Seq
    ,cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd') as DW_Etl_Dt
from ${BRTL_VCOR}.BRTL_CS_CUST_CID_UID_REL_S a
where a.DW_Snsh_Dt = cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd');

.if ERRORCODE <> 0 then .quit 12;

ET;cd ..
```

Output

```
BEGIN
--
BEGIN
    delete from ${BRTL_DCOR}.BRTL_CS_CUST_CID_UID_REL
    where DW_Job_Seq = ${v_Group_No};
    lv_mig_errorcode = 0;
EXCEPTION
    WHEN OTHERS THEN
        lv_mig_errorcode = -1;
END;

IF lv_mig_errorcode <> 0 THEN
    RAISE EXCEPTION '12';
END IF;

--
BEGIN
    insert into ${BRTL_DCOR}.BRTL_CS_CUST_CID_UID_REL
```

```

(
  Cust_Id
  ,Cust_UID
  ,DW_Upd_Dt
  ,DW_Upd_Tm
  ,DW_Job_Seq
  ,DW_Etl_Dt
)
select
  a.Cust_Id
  ,a.Cust_UID
  ,current_date as Dw_Upd_Dt
  ,current_time(0) as DW_Upd_Tm
  ,cast(${v_Group_No} as byteint) as DW_Job_Seq
  ,cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd') as DW_Etl_Dt
from ${BRTL_VCOR}.BRTL_CS_CUST_CID_UID_REL_S a
where a.DW_Snsh_Dt = cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd');
EXCEPTION
  WHEN OTHERS THEN
    lv_mig_errorcode = -1;
END;

IF lv_mig_errorcode <> 0 THEN
  RAISE EXCEPTION '12';
END IF;

END;

```

Object Names Starting with \$

This section describes the migration of object names starting with \$.

The migration behavior for object names starting with \$ is explained in the following table. Use the [tdMigrateDollar](#) configuration parameter to configure the behavior.

For details, see: [IN / NOT IN conversion](#)

Table 6-19 Migration of object names starting with \$

tdMigrateDollar Setting	Object Name	Migrated to
true	\$V_SQL Static object name starting with \$	"\$V_SQL"
true	\${V_SQL} Dynamic object name starting with \$	\${V_SQL} No change: Dynamic object names not supported
false	\$V_SQL Static object name starting with \$	\$V_SQL No change: Configuration parameter is set to false .
false	\${V_SQL} Dynamic object name starting with \$	\${V_SQL} No change: Configuration parameter is set to false .

 **NOTE**

Any variable starting with \$ is considered as a Value. The tool will migrate this by adding ARRAY.

Input - OBJECT STARTING WITH \$

```
SELECT $C1 from p11 where $C1 NOT LIKE ANY ($sql1);
```

Output (tdMigrateDollar to TRUE)

```
SELECT
  "$C1"
FROM
  p11
WHERE
  "$C1" NOT LIKE ANY (
    ARRAY[ "$sql1" ]
  )
;
```

Output (tdMigrateDollar to FALSE)

```
SELECT
  $C1
FROM
  p11
WHERE
  $C1 NOT LIKE ANY (
    ARRAY[ $sql1 ]
  )
;
```

Input - Value starting with \$ in LIKEALL/LIKE ANY

```
SELECT * FROM T1
WHERE T1.Event_Dt >= ADD_MONTHS(CAST('${OUT_DATE}' AS DATE FORMAT 'YYYYMMDD')+1,
(-1)*CAST(T7.Tm_Range_Month AS INTEGER))
  AND T1.Event_Dt <= CAST('${OUT_DATE}' AS DATE FORMAT 'YYYYMMDD')
  AND T1.Cntpty_Acct_Name NOT LIKE ALL ( SELECT Tx_Cntpty_Name_Key FROM TEMP_NAME )
  AND T1.Cntpty_Acct_Name NOT LIKE ANY ( SELECT Tx_Cntpty_Name_Key FROM TEMP_NAME )
  AND T1.Cntpty_Acct_Name LIKE ALL ( SELECT Tx_Cntpty_Name_Key FROM TEMP_NAME )
  AND T1.Cntpty_Acct_Name LIKE ANY ( SELECT Tx_Cntpty_Name_Key FROM TEMP_NAME )
  AND T1.Col1 NOT LIKE ANY ($sql1)
  AND T1.Col1 NOT LIKE ALL ($sql1)
  AND T1.Col1 LIKE ANY ($sql1)
  AND T1.Col1 LIKE ALL ($sql1);
```

Output

```
SELECT
  *
FROM
  T1
WHERE
  T1.Event_Dt >= ADD_MONTHS (CAST( '${OUT_DATE}' AS DATE ) + 1 ,(- 1 ) *
CAST( T7.Tm_Range_Month AS INTEGER ))
  AND T1.Event_Dt <= CAST( '${OUT_DATE}' AS DATE )
  AND T1.Cntpty_Acct_Name NOT LIKE ALL (
    SELECT
      Tx_Cntpty_Name_Key
    FROM
      TEMP_NAME
  )
  AND T1.Cntpty_Acct_Name NOT LIKE ANY (
    SELECT
      Tx_Cntpty_Name_Key
    FROM
```



```

        TEMP_NAME
    )
    AND T1.Cntpty_Acct_Name LIKE ALL (
        SELECT
            Tx_Cntpty_Name_Key
        FROM
            TEMP_NAME
    )
    AND T1.Cntpty_Acct_Name LIKE ANY (
        SELECT
            Tx_Cntpty_Name_Key
        FROM
            TEMP_NAME
    )
    AND T1.Col1 NOT LIKE ANY (
        ARRAY[ "$sql1" ]
    )
    AND T1.Col1 NOT LIKE ALL (
        ARRAY[ "$sql1" ]
    )
    AND T1.Col1 LIKE ANY (
        ARRAY[ "$sql1" ]
    )
    AND T1.Col1 LIKE ALL (
        ARRAY[ "$sql1" ]
    )
;

```

QUALIFY, CASE, and ORDER BY

Input

```

select
    a.Cust_UID as Cust_UID      /* UID */
    ,a.Rtl_Usr_Id as Ini_CM     /* */
    ,a.Cntr_Aprv_Dt as Aprv_Pass_Tm /* */
    ,a.Blg_Org_Id as CM_BRN_Nbr /* */
    ,a.Mng_Chg_Typ_Cd as MNG_CHG_TYP_CD /* */
    ,case when a.Blg_Org_Id = b.BRN_Org_Id and a.Mng_Chg_Typ_Cd= 'PMD' and a.Pst_Id in
('PB0101','PB0104') then 'Y' ----
        when a.Blg_Org_Id = b.BRN_Org_Id and a.Mng_Chg_Typ_Cd= 'DEVPMO' and a.Pst_Id='PB0106' then
'Y' ----
        when a.Blg_Org_Id = b.BRN_Org_Id and a.Mng_Chg_Typ_Cd= 'DMD' and a.Pst_Id in ('PB0201','PB0204')
then 'Y' ----
        when a.Blg_Org_Id = b.BRN_Org_Id and a.Mng_Chg_Typ_Cd= 'DEVDMO' and a.Pst_Id='PB0109' then 'Y'
----
        else ''
    end as Pst_Flg /* */
    ,a.Pst_Id as Pst_Id /* */
    ,a.BBK_Org_Id as BBK_Org_Id /* */
from VT_CUID_MND_NMN_CHG_INF as a /* VT_ */
LEFT OUTER JOIN ${BRTL_VCOR}.BRTL_EM_USR_PST_REL_INF_S as b /* EM_ */
on a.Rtl_Usr_Id = b.Rtl_Usr_Id
AND a.Blg_Org_Id = b.BRN_Org_Id
AND a.Pst_Id = b.Pst_Id
AND b.Sys_Id = 'privatebanking'
AND b.pst_sts IN ('1','0','-2') /* 1 -2 0 */
AND b.DW_Snsh_Dt = cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd')
qualify row_number() over(partition by a.Cust_UID,a.bbk_org_id order by
case when ( a.Mng_Chg_Typ_Cd= 'PMD' and a.Pst_Id in ('PB0101','PB0104')) or ( a.Mng_Chg_Typ_Cd=
'DEVPMO' and a.Pst_Id='PB0106')
then 0 when ( a.Mng_Chg_Typ_Cd= 'DMD' and a.Pst_Id in ('PB0201','PB0204')) or ( a.Mng_Chg_Typ_Cd=
'DEVDMO' and a.Pst_Id='PB0109' ) then 0 else 1 end asc ) = 1
;

```

Output

```

SELECT
    Cust_UID AS Cust_UID /* UID */

```

```

,Ini_CM /* */
,Aprv_Pass_Tm /* */
,CM_BRN_Nbr /* */
,MNG_CHG_TYP_CD /* */
,Pst_Flg /* */
,Pst_Id AS Pst_Id /* */
,BBK_Org_Id AS BBK_Org_Id /* */
FROM
( SELECT
a.Cust_UID AS Cust_UID /* UID */
,a.Rtl_Usr_Id AS Ini_CM /* */
,a.Cntr_Aprv_Dt AS Aprv_Pass_Tm /* */
,a.Blg_Org_Id AS CM_BRN_Nbr /* */
,a.Mng_Chg_Typ_Cd AS MNG_CHG_TYP_CD /* */
,CASE WHEN a.Blg_Org_Id = b.BRN_Org_Id AND a.Mng_Chg_Typ_Cd = 'PMD' AND a.Pst_Id
IN ( 'PB0101', 'PB0104' )
THEN 'Y' /* */
WHEN a.Blg_Org_Id = b.BRN_Org_Id AND a.Mng_Chg_Typ_Cd = 'DEVPMD' AND
a.Pst_Id = 'PB0106'
THEN 'Y' /* */
WHEN a.Blg_Org_Id = b.BRN_Org_Id AND a.Mng_Chg_Typ_Cd = 'DMD' AND a.Pst_Id
IN ( 'PB0201', 'PB0204' )
THEN 'Y' /* */
WHEN a.Blg_Org_Id = b.BRN_Org_Id AND a.Mng_Chg_Typ_Cd = 'DEVDMMD' AND
a.Pst_Id = 'PB0109'
THEN 'Y' /* */
ELSE
''
END AS Pst_Flg /* */
,a.Pst_Id AS Pst_Id /* */
,a.BBK_Org_Id AS BBK_Org_Id /* */
,row_number() over( partition BY a.Cust_UID
,a.bbk_org_id
ORDER BY
CASE WHEN( a.Mng_Chg_Typ_Cd = 'PMD' AND Q1.Pst_Id IN ( 'PB0101', 'PB0104' ) )
OR( Q1.Mng_Chg_Typ_Cd = 'DEVPMD' AND a.Pst_Id = 'PB0106' )
THEN 0
WHEN( a.Mng_Chg_Typ_Cd = 'DMD' AND Q1.Pst_Id IN ( 'PB0201', 'PB0204' ) )
OR( Q1.Mng_Chg_Typ_Cd = 'DEVDMMD' AND a.Pst_Id = 'PB0109' )
THEN 0
ELSE
1
END ASC ) AS ROW_NUM1
FROM
VT_CUID_MND_NMN_CHG_INF AS a /* VT_ */
LEFT OUTER JOIN BRTL_VCOR.BRTL_EM_USR_PST_REL_INF_S AS b /* EM_ */
ON a.Rtl_Usr_Id = b.Rtl_Usr_Id
AND a.Blg_Org_Id = b.BRN_Org_Id
AND a.Pst_Id = b.Pst_Id
AND b.Sys_Id = 'privatebanking'
AND b.pst_sts IN ( '1', '0', '-2' ) /* 1 -2 0 */
AND b.DW_Snsh_Dt = CAST( lv_mig_v_Trx_Dt AS DATE ) ) Q1
WHERE
Q1.ROW_NUM1 = 1 ;

```

6.8.6 Query Optimization Operators

This section describes the syntax for migrating Teradata query optimization operators. The migration syntax determines how the keywords and features are migrated.

Use the [inToExists](#) parameter to configure the migration from **IN** or **NOT IN** to **EXISTS** or **NOT EXISTS**.

This parameter defaults to **FALSE**. To enable the query optimization feature, this parameter must be set to **TRUE**.

IN and NOT IN Conversion

When being converted to GaussDB(DWS) SQL queries, Teradata queries containing the **IN** and **NOT IN** operators have been optimized, and **IN** and **NOT IN** have been converted to **EXISTS** and **NOT EXISTS**, respectively. The **IN** and **NOT IN** operators support single or multiple columns. DSC will migrate the **IN** or **NOT IN** statement only when it exists in the **WHERE** or **ON** clause. The following example shows the conversion from **IN** to **EXISTS**, which is also applicable to the conversion from **NOT IN** to **NOT EXISTS**.

Simple conversion from IN to EXISTS

In the following example, the keyword **IN** is provided in the input file. During the migration, DSC replaces **IN** with **EXISTS** to optimize query performance.

NOTE

- The **IN** and **NOT IN** statements with nested **IN** and **NOT IN** keywords cannot be migrated. In this case, the scripts will be invalid after migration.

```
UPDATE tab1
  SET b = 123
  WHERE b IN ('abc')
  AND b IN ( SELECT i
             FROM tab2
             WHERE j NOT IN (SELECT m
                             FROM tab3
                             )
           )
;
```

When an **IN** or **NOT IN** statement containing subqueries is being migrated, comments between the **IN** or **NOT IN** operator and the subqueries (see the example) cannot be migrated.

Example:

```
SELECT *
  FROM categories
  WHERE category_name
  IN --comment
     ( SELECT category_name
       FROM categories1 )
  ORDER BY category_name;
```

- **Migrating IN or NOT IN statements whose object names contain \$ and #**
 - DSC will not migrate the query if the **TABLE** name or **TABLE ALIAS** starts with **\$**.
SELECT Customer_Name
 FROM Customer_t \$A
 WHERE Customer_ID IN(SELECT Customer_ID FROM Customer_t);
 - If the **COLUMN** name starts with **#**, DSC may fail to migrate the query.
SELECT Customer_Name
 FROM Customer_t
 WHERE #Customer_ID IN(SELECT #Customer_ID FROM Customer_t);

Input: IN

```
SELECT ...
  FROM tab1 t
  WHERE t.col1 IN (SELECT icol1 FROM tab2 e)
  ORDER BY col1
```

Output

```
SELECT ...
  FROM tab1 t
  WHERE EXISTS (SELECT icol1
```

```

        FROM tab2 e
        WHERE icol1 = t.col1
    )
ORDER BY col1;

```

Input: IN with multiple columns and Aggregate functions

```

SELECT deptno, job_id, empno, salary, bonus
FROM emp_t
WHERE ( deptno, job_id, CAST(salary AS NUMBER(10,2))+CAST(bonus AS NUMBER(10,2)) )
      IN ( SELECT deptno, job_id,
            MAX(CAST(salary AS NUMBER(10,2))+CAST(bonus AS NUMBER(10,2)))
          FROM emp_t
          WHERE hire_dt >= CAST( '20170101' AS DATE FORMAT 'YYYYMMDD' )
          GROUP BY deptno, job_id )
AND hire_dt IS NOT NULL;

```

Output

```

SELECT deptno, job_id, empno, salary, bonus
FROM emp_t MAlias1
WHERE EXISTS ( SELECT deptno, job_id,
                   MAX(CAST(salary AS NUMBER(10,2))+CAST(bonus AS NUMBER(10,2)))
               FROM emp_t
               WHERE hire_dt >= CAST( '20170101' AS DATE)
               AND deptno = MAlias1.deptno
               AND job_id = MAlias1.job_id
               GROUP BY deptno, job_id
               HAVING MAX(CAST(salary AS NUMBER(10,2))+CAST(bonus AS NUMBER(10,2)))
                    = CAST(MAlias1.salary AS NUMBER(10,2))+CAST(MAlias1.bonus AS NUMBER(10,2)) )
AND hire_dt IS NOT NULL;

```

6.8.7 System Functions and Operators

This section describes the syntax for migrating Teradata system functions and operators. The migration syntax determines how the keywords and features are migrated.

Schema

The database with the schema name should be changed to **SET SESSION CURRENT_SCHEMA**.

Oracle Syntax	Syntax After Migration
DATABASE SCHTERA	SET SESSION CURRENT_SCHEMA TO SCHTERA

Analytical Functions

Analytical functions are collectively called ordered analytical functions in Teradata, and they provide powerful analytical abilities for data mining, analysis and business intelligence.

1. Analytical Functions in ORDER BY

Input: Analytic function in ORDER BY clause

```

SELECT customer_id, customer_name, RANK(customer_id, customer_address DESC)
FROM customer_t
WHERE customer_state = 'CA'
ORDER BY RANK(customer_id, customer_address DESC);

```

Output

```
SELECT customer_id, customer_name, RANK() over(order by customer_id, customer_address DESC)
FROM customer_t
WHERE customer_state = 'CA'
ORDER BY RANK() over(order by customer_id DESC, customer_address DESC) ;
```

Input: Analytic function in GROUP BY clause

```
SELECT customer_city, customer_state, postal_code
, rank(postal_code)
, rank() over(partition by customer_state order by postal_code)
, rank() over(order by postal_code)
FROM Customer_T
GROUP BY customer_state
ORDER BY customer_state;
```

Output

```
SELECT customer_city, customer_state, postal_code
, rank() over(PARTITION BY customer_state ORDER BY postal_code DESC)
, rank() over(partition by customer_state order by postal_code)
, rank() over(order by postal_code)
FROM Customer_T
ORDER BY customer_state;
```

2. Analytical Functions in PARTITION BY

When the input script contains a numeric value in the PARTITION BY clause, the migrated script retains the numeric value as it is.

Input: Analytic function in PARTITION BY clause (with numeric value)

```
SELECT
Customer_id
,customer_name
,rank (
) over( partition BY 1 ORDER BY Customer_id )
,rank (customer_name)
FROM
Customer_t
GROUP BY
1
;
```

Output

```
SELECT
Customer_id
,customer_name
,rank (
) over( partition BY 1 ORDER BY Customer_id )
,rank (
) over( PARTITION BY Customer_id ORDER BY customer_name DESC )
FROM
Customer_t
;
```

3. Window Functions

Window functions perform calculations across rows of the query result. DSC supports the following Teradata window functions:

NOTE

The DSC supports only single occurrence of window function in QUALIFY clause. Multiple window functions in a QUALIFY may result in invalid migration.

4. CSUM

The Cumulative Sum (CSUM) function provides a running or cumulative total for a column's numeric value. It is recommended that ALIAS be used in the QUALIFY statements.

Input - CSUM with GROUP_ID

```

INSERT INTO GISIS_SUM.DW_DAT71 (
  col1
  ,PROD_GROUP
)
SELECT
  CSUM(1, T1.col1)
  ,T1.PROD_GROUP
FROM tab1 T1
WHERE T1.col1 = 'ABC'
;

```

Output

```

INSERT
  INTO
    GISIS_SUM.DW_DAT71 (
      col1
      ,PROD_GROUP
    ) SELECT
      SUM (1) over( ORDER BY T1.col1 ROWS UNBOUNDED PRECEDING )
      ,T1.PROD_GROUP
    FROM
      tab1 T1
    WHERE
      T1.col1 = 'ABC'
;

```

Input - CSUM with GROUP_ID

```

SELECT top 10
  CSUM(1, T1.Test_GROUP)
  ,T1.col1
FROM ${schema}. T1
WHERE T1.Test_GROUP = 'Test_group' group by Test_group order by Test_Group;

```

Output

```

SELECT
  SUM (1) over( partition BY Test_group ORDER BY T1.Test_GROUP ROWS UNBOUNDED
PRECEDING )
  ,T1.col1
FROM
  ${schema}. T1
WHERE
  T1.Test_GROUP = 'Test_group'
ORDER BY
  Test_Group LIMIT 10
;

```

Input - CSUM with GROUP BY + QUALIFY

```

SELECT c1, c2, c3, CSUM(c4, c3)
FROM tab1
QUALIFY ROW_NUMBER(c4) = 1
GROUP BY 1, 2;

```

Output

```

SELECT c1, c2, c3, ColumnAlias1
FROM ( SELECT c1, c2, c3
  , SUM (c4) OVER(PARTITION BY 1 ,2 ORDER BY c3 ROWS UNBOUNDED PRECEDING) AS
ColumnAlias1
  , ROW_NUMBER( ) OVER(PARTITION BY 1, 2 ORDER BY c4) AS ROW_NUM1
FROM tab1
) Q1
WHERE Q1.ROW_NUM1 = 1;

```

5. MDIFF

The MDIFF function calculates the moving difference for a column based on the preset query width. The query width is the specified number of rows. It is recommended that ALIAS be used in the QUALIFY statements.

Input: MDIFF with QUALIFY

```

SELECT DT_A.Acct_ID, DT_A.Trade_Date, DT_A.Stat_PBU_ID
  , CAST( MDIFF( Stat_PBU_ID_3, 1, DT_A.Trade_No ASC ) AS DECIMAL(20,0) ) AS

```

```
MDIFF_Stat_PBU_ID
FROM Trade_His DT_A
WHERE Trade_Date >= CAST( '20170101' AS DATE FORMAT 'YYYYMMDD' )
GROUP BY DT_A.Acct_ID, DT_A.Trade_Date
QUALIFY MDIFF_Stat_PBU_ID <> 0 OR MDIFF_Stat_PBU_ID IS NULL;
```

Output

```
SELECT Acct_ID, Trade_Date, Stat_PBU_ID, MDIFF_Stat_PBU_ID
FROM (SELECT DT_A.Acct_ID, DT_A.Trade_Date, DT_A.Stat_PBU_ID
, CAST( (Stat_PBU_ID_3 - (LAG(Stat_PBU_ID_3, 1, NULL) OVER (PARTITION BY DT_A.Acct_ID,
DT_A.Trade_Date ORDER BY DT_A.Trade_No ASC))) AS MDIFF_Stat_PBU_ID
FROM Trade_His DT_A
WHERE Trade_Date >= CAST( '20170101' AS DATE)
)
WHERE MDIFF_Stat_PBU_ID <> 0 OR MDIFF_Stat_PBU_ID IS NULL;
```

6. RANK

RANK(col1, col2...)

Input: RANK with GROUP BY

```
SELECT c1, c2, c3, RANK(c4, c1 DESC, c3) AS Rank1
FROM tab1
WHERE ...
GROUP BY c1;
```

Output

```
SELECT c1, c2, c3, RANK() OVER (PARTITION BY c1 ORDER BY c4, c1 DESC ,c3) AS Rank1
FROM tab1
WHERE ...;
```

7. ROW_NUMBER

ROW_NUMBER(col1, col2...)

Input: ROW NUMBER with GROUP BY + QUALIFY

```
SELECT c1, c2, c3, ROW_NUMBER(c4, c3)
FROM tab1
QUALIFY RANK(c4) = 1
GROUP BY 1, 2;
```

Output

```
SELECT
c1
,c2
,c3
,ColumnAlias1
FROM
(
SELECT
c1
,c2
,c3
,ROW_NUMBER() over( PARTITION BY 1 ,2 ORDER BY c4 ,c3 ) AS ColumnAlias1
,RANK (
) over( PARTITION BY 1 ,2 ORDER BY c4 ) AS ROW_NUM1
FROM
tab1
) Q1
WHERE
Q1.ROW_NUM1 = 1
;
```

8. COMPRESS specified with *****

Input

```
ORCADBRN VARCHAR(6) CHARACTER SET LATIN CASESPECIFIC TITLE ' ' COMPRESS '*****'
```

Output

```
ORCADBRN VARCHAR( 6 ) /* CHARACTER SET LATIN*/ /* CASESPECIFIC*/ /*TITLE ' ' /* /*
COMPRESS '*****' */
```

Comparison and List Operators

NOTE

The comparison operators LT, LE, GT, GE, EQ, and NE must not be used as TABLE alias or COLUMN alias.

The following comparison and list operators are supported:

1. ^= and GT

Input: Comparison operations (^= and GT)

```
SELECT t1.c1, t2.c2
FROM tab1 t1, tab2 t2
WHERE t1.c3 ^= t1.c3
AND t2.c4 GT 100;
```

Output

```
SELECT t1.c1, t2.c2
FROM tab1 t1, tab2 t2
WHERE t1.c3 <> t1.c3
AND t2.c4 > 100;
```

2. EQ and NE

Input: Comparison operations (EQ and NE)

```
SELECT t1.c1, t2.c2
FROM tab1 t1 INNER JOIN tab2 t2
ON t1.c2 EQ t2.c2
WHERE t1.c6 NE 1000;
```

Output

```
SELECT t1.c1, t2.c2
FROM tab1 t1 INNER JOIN tab2 t2
ON t1.c2 = t2.c2
WHERE
t1.c6 <> 1000;
```

3. LE and GE

Input: Comparison operations (LE and GE)

```
SELECT t1.c1, t2.c2
FROM tab1 t1, tab2 t2
WHERE t1.c3 LE 200
AND t2.c4 GE 100;
```

Output

```
SELECT t1.c1, t2.c2
FROM tab1 t1, tab2 t2
WHERE t1.c3 <= 200
AND t2.c4 >= 100;
```

4. NOT= and LT

Input: Comparison operations (NOT= and LT)

```
SELECT t1.c1, t2.c2
FROM tab1 t1, tab2 t2
WHERE t1.c3 NOT= t1.c3
AND t2.c4 LT 100;
```

Output

```
SELECT t1.c1, t2.c2
FROM tab1 t1, tab2 t2
WHERE t1.c3 <> t1.c3
AND t2.c4 < 100;
```

5. IN and NOT IN

For details, see [IN and NOT IN Conversion](#).

Input: IN and NOT IN


```
SELECT c1, c2
FROM tab1
WHERE c1 IN 'XY';
```

Output

```
SELECT c1, c2
FROM tab1
WHERE c1 = 'XY';
```

NOTE

GaussDB(DWS) does not support **IN** and **NOT IN** operators in some specific scenarios.

6. IS NOT IN

Input: IS NOT IN

```
SELECT c1, c2
FROM tab1
WHERE c1 IS NOT IN (subquery);
```

Output

```
SELECT c1, c2
FROM tab1
WHERE c1 NOT IN (subquery);
```

7. LIKE ALL / NOT LIKE ALL

Input: LIKE ALL / NOT LIKE ALL

```
SELECT c1, c2
FROM tab1
WHERE c3 NOT LIKE ALL ('%STR1%', '%STR2%', '%STR3%');
```

Output

```
SELECT c1, c2
FROM tab1
WHERE c3 NOT LIKE ALL (ARRAY[ '%STR1%', '%STR2%', '%STR3%' ]);
```

8. LIKE ANY / NOT LIKE ANY

Input: LIKE ANY / NOT LIKE ANY

```
SELECT c1, c2
FROM tab1
WHERE c3 LIKE ANY ('STR1%', 'STR2%', 'STR3%');
```

Output

```
SELECT c1, c2
FROM tab1
WHERE c3 LIKE ANY (ARRAY[ 'STR1%', 'STR2%', 'STR3%' ]);
```

Table Operators

The functions that can be called in the FROM clause of a query are from the table operator.

Input: Table operator with RETURNS

```
SELECT *
FROM TABLE( sales_retrieve (9005) RETURNS ( store INTEGER, item CLOB, quantity BYTEINT ) AS ret;
```

Output

```
SELECT *
FROM sales_retrieve(9005) AS ret (store, item, quantity);
```

6.8.8 Math Functions

********Input: ****

```
expr1 ** expr2
```

Output

```
expr1 ^ expr2
```

MOD

Input: MOD

```
expr1 MOD expr2
```

Output

```
expr1 % expr2
```

NULLIFZERO

Use the [tdMigrateNULLIFZERO](#) configuration parameter to configure migration of NULLIFZERO.

Input: NULLIFZERO

```
SELECT NULLIFZERO(expr1) FROM tab1  
WHERE ... ;
```

Output

```
SELECT NULLIF(expr1, 0) FROM tab1  
WHERE ... ;
```

ZEROIFNULL

Use the [tdMigrateZEROIFNULL](#) configuration parameter to configure migration of ZEROIFNULL.

Input: ZEROIFNULL

```
SELECT ZEROIFNULL(expr1) FROM tab1  
WHERE ... ;
```

Output

```
SELECT COALESCE(expr1, 0) FROM tab1  
WHERE ... ;
```

Declaring a Hexadecimal Character Literal Value

Input

```
SELECT  
(COALESCE(TRIM(BOTH FROM VTX_D_RPT_0017_WMSE12_01_01.ID), ''))  
||'7E'xc||(COALESCE(TRIM(BOTH FROM VTX_D_RPT_0017_WMSE12_01_01.Code), ''))  
||'7E'xc||(COALESCE(TRIM(BOTH FROM VTX_D_RPT_0017_WMSE12_01_01.Description), ''))  
||'7E'xc||(COALESCE(TRIM(BOTH FROM VTX_D_RPT_0017_WMSE12_01_01.Name), ''))  
||'7E'xc||(COALESCE(TRIM(BOTH FROM VTX_D_RPT_0017_WMSE12_01_01.Host_Product_Id), ''))  
FROM DP_VTXEDW.VTX_D_RPT_0017_WMSE12_01_01 VTX_D_RPT_0017_WMSE12_01_01
```

```
WHERE 1=1  
;
```

Output

```
SELECT  
(COALESCE(TRIM(BOTH FROM VTX_D_RPT_0017_WMSE12_01_01.ID),''))  
||E'\x7E'||(COALESCE(TRIM(BOTH FROM VTX_D_RPT_0017_WMSE12_01_01.Code),''))  
||E'\x7E'||(COALESCE(TRIM(BOTH FROM VTX_D_RPT_0017_WMSE12_01_01.Description),''))  
||E'\x7E'||(COALESCE(TRIM(BOTH FROM VTX_D_RPT_0017_WMSE12_01_01.Name),''))  
||E'\x7E'||(COALESCE(TRIM(BOTH FROM VTX_D_RPT_0017_WMSE12_01_01.Host_Product_Id),''))  
FROM DP_VTXEDW.VTX_D_RPT_0017_WMSE12_01_01 VTX_D_RPT_0017_WMSE12_01_01  
WHERE 1=1  
;
```

Declaring a Hexadecimal Binary Literal Value

Input

```
CREATE MULTISET TABLE bvalues (IDVal INTEGER, CodeVal BYTE(2));  
INSERT INTO bvalues VALUES (112193, '7879'XB) ;  
SELECT IDVal, CodeVal FROM bvalues WHERE CodeVal = '7879'XB ;
```

Output

```
CREATE TABLE bvalues (IDVal INTEGER, CodeVal BYTEA);  
INSERT INTO bvalues VALUES (112193, BYTEA '\x7879') ;  
SELECT IDVal, CodeVal FROM bvalues WHERE CodeVal = BYTEA '\x7879' ;
```

6.8.9 String Functions

CHAR Function

Input: CHAR

```
CHAR( expression1 )
```

Output

```
LENGTH( expression1 )
```

CHARACTERS Function

Input: CHARACTERS

```
CHARACTERS( expression1 )
```

Output

```
LENGTH( expression1 )
```

INDEX

Input: INDEX

```
SELECT INDEX(expr1/string, substring)  
FROM tab1  
WHERE ... ;
```

Output

```
SELECT INSTR(expr1/string, substring)  
FROM tab1  
WHERE ... ;
```

STRREPLACE

Input: STRREPLACE

```
SELECT STRREPLACE(c2, '!', '')
FROM tab1
WHERE ...;
```

Output

```
SELECT REPLACE(c2, '!', '')
FROM tab1
WHERE ...;
```

OREPLACE

Input: OREPLACE

```
SELECT OREPLACE (c2, '!', '')
FROM tab1
WHERE ... ;
```

Output

```
SELECT REPLACE(c2, '!', '')
FROM tab1
WHERE ... ;
```

6.8.10 Date and Time Functions

DATE

Migration tools support the migration of Teradata DATE FORMAT in SELECT statements, using TO_CHAR to display the date in the source format. This conversion is not done if the date format is an expression (example: Start_Dt + 30) or if the WHERE statement contains an expression (Example: WHERE Start_Dt > End_Dt).

For details, see: [Type Casting to DATE without DATE Keyword](#)

NOTE

- Migration is supported for SELECT statements with and without column alias.
- Date formatting is not supported in the sub levels and in inner queries. It is supported only at the outer query level.
- For date formatting, if a table is created with SCHEMA name, subsequent SELECT statements must also include the schema name. In the following example, the table TEMP_TBL in the SELECT statement will not be migrated and the table retained as it was.

```
CREATE TABLE ${SCH}.TEMP_TBL
(C1 INTEGER
,C2 DATE FORMAT 'YYYY-MM-DD')
PRIMARY INDEX(C1,C2);

SELECT ${SCH}.TEMP_TBL.C2 FROM TEMP_TBL where ${SCH}.TEMP_TBL.C2 is not null;
```

Input: DATE FORMAT

```
SELECT
CASE
WHEN SUBSTR( CAST( CAST( SUBSTR( '20180631' ,1 ,6 ) || '01' AS DATE FORMAT 'YYYYMMDD' )
+ abc_day - 1 AS FORMAT 'YYYYMMDD' ) ,1 ,6 ) = SUBSTR( '20180631' ,1 ,6 )
THEN 1
ELSE 0
```

```
END  
FROM  
tab1  
;
```

Output

```
SELECT  
CASE  
WHEN SUBSTR( TO_CHAR( CAST( SUBSTR( '20180631' ,1 ,6 ) || '01' AS DATE ) + abc_day -  
1 , 'YYYYMMDD' ) ,1 ,6 ) = SUBSTR( '20180631' ,1 ,6 )  
THEN 1  
ELSE 0  
END  
FROM  
tab1  
;
```

Migration tools support migration of the date value. If the input DATE is followed by "YYYY-MM-DD", then the date is not changed in the output. The following examples show conversion of DATE to CURRENT_DATE.

Input: DATE

```
SELECT  
t1.c1  
,t2.c2  
FROM  
$schema.tab1 t1  
, $schema.tab2 t2  
WHERE  
t1.c3 ^= t1.c3  
AND t2.c4 GT DATE  
;
```

Output

```
SELECT  
t1.c1  
,t2.c2  
FROM  
"$schema".tab1 t1  
,"$schema".tab2 t2  
WHERE  
t1.c3 <> t1.c3  
AND t2.c4 > CURRENT_DATE  
;
```

Input: DATE with "YYYY-MM-DD"

```
ALTER TABLE  
$abc . tab1 ADD (  
col_date DATE DEFAULT DATE '2000-01-01'  
)  
;
```

Output

```
ALTER TABLE  
"$abc" . tab1 ADD (  
col_date DATE DEFAULT DATE '2000-01-01'  
)  
;
```

Input: DATE subtraction

```
SELECT  
CAST( T1.Buyback_Mature_Dt - CAST( '${gsTXDate}' AS DATE FORMAT 'YYYYMMDD' ) AS  
CHAR( 5 ) )  
FROM
```

```
tab1 T1
WHERE
  T1.col1 > 10
;
```

Output:

```
SELECT
  CAST( EXTRACT( 'DAY' FROM ( T1.Buyback_Mature_Dt - CAST( '${gsTXDate}' AS DATE ) ) ) AS
CHAR( 5 ) )
FROM
  tab1 T1
WHERE
  T1.col1 > 10
;
```

ADD_MONTHS

Input

```
ADD_MONTHS(CAST(substr(T1.GRANT_DATE,1,8)||'01'AS DATE FORMAT 'YYYY-MM-DD'),1)-1
```

Output

```
ADD_MONTHS(CAST(SUBSTR( T1.GRANT_DATE ,1 ,8 ) || '01' AS DATE ),1) - 1
```

TIMESTAMP

Input: TIMESTAMP

```
select CAST('20190811' || ' ||'01:00:00'
AS TIMESTAMP(0)
FORMAT 'YYYYMMDDDBHH:MI:SS'
);
```

Output

```
SELECT TO_TIMESTAMP( '20190811' || ' ' || '01:00:00' , 'YYYYMMDD HH24:MI:SS' );
```

TIME FORMAT

Input

```
COALESCE(t3.Crt_Tm , CAST('00:00:00' AS TIME FORMAT 'HH:MI:SS'))
COALESCE(LI07_F3EABCTL.PCTLREGTIM,CAST('${NULL_TIME}' AS TIME FORMAT 'HH:MI:sS'))
trim(cast(cast(a.Ases_Orig_Tm as time format'hhmiss') as varchar(10)))
```

Output

```
CAST('00:00:00' AS TIME FORMAT 'HH:MI:SS')
should be migrated as
SELECT CAST(TO_TIMESTAMP('00:00:00', 'HH24:MI:SS') AS TIME)
---
CAST(abc AS TIME FORMAT 'HH:MI:sS')
=>
CAST(TO_TIMESTAMP(abc, 'HH24:MI:SS') AS TIME)
---
CAST(abc AS TIME FORMAT 'HH:MI:sS')
=>
CAST(TO_TIMESTAMP(abc, 'HH24:MI:SS') AS TIME)
```

TIMESTAMP FORMAT

Input

```

select
  a.Org_Id as Brn_Org_Id      /* */
  ,a.Evt_Id as Vst_Srl_Nbr   /* */
  ,a.EAC_Id as EAC_Id       /* */
  ,cast(cast(cast(Prt_Tm as timestamp format 'YYYY-MM-DDBHH:MI:SS') as varchar(19) )as timestamp(0))
as Tsk_Start_Tm            /* */
from ${BRTL_VCOR}.BRTL_BC_SLF_TMN_RTL_PRT_JNL as a /* BC_ */
where a.DW_Dat_Dt = CAST('${v_Trx_Dt}' AS DATE FORMAT 'YYYY-MM-DD') ;

```

Output

```

SELECT
  a.Org_Id AS Brn_Org_Id /* */
  ,a.Evt_Id AS Vst_Srl_Nbr /* */
  ,a.EAC_Id AS EAC_Id /* */
  ,CAST( CAST( TO_TIMESTAMP( Prt_Tm , 'YYYY-MM-DD HH24:MI:SS' ) AS VARCHAR( 19 ) ) AS
TIMESTAMP ( 0 ) ) AS Tsk_Start_Tm /* */
FROM ${BRTL_VCOR}.BRTL_BC_SLF_TMN_RTL_PRT_JNL AS a /* BC_ */
WHERE
  a.DW_Dat_Dt = CAST( '${v_Trx_Dt}' AS DATE ) ;

```

TIMESTAMP(n) FORMAT

Input

```

select
  cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd') as DW_Snsh_Dt /* */
  ,coalesce(a.CRE_DAT,cast('0001-01-01 00:00:01' as timestamp(6) format 'yyyy-mm-ddbhh:mi:ssds(6)')) as
Crt_Tm /* */
  ,cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd') as DW_ETL_Dt /* */
  ,cast(current_date as date format 'yyyy-mm-dd') as DW_Upd_Dt /* */
  ,current_time(0) as DW_Upd_Tm /* */
  ,1 as DW_Job_Seq /* */
from ${NDS_VIEW}.NLV65_MGM_GLDCUS_INF_NEW as a /* MGM */
;
-----
cast('0001-01-01 00:00:00' as timestamp(6) format 'yyyy-mm-ddbhh:mi:ssds(6)')
TO_TIMESTAMP('0001-01-01 00:00:00', 'yyyy-mm-dd HH24:MI:SS.US')
-----
cast('0001-01-01 00:00:00.000000' as timestamp(6))
cast('0001-01-01 00:00:00.000000' as timestamp(6))
-----
CAST('0001-01-01 00:00:00.000000' AS TIMESTAMP(6) FORMAT 'YYYY-MM-DDBHH:MI:SS.S(6)')
TO_TIMESTAMP('0001-01-01 00:00:00.000000', 'yyyy-mm-dd HH24:MI:SS.US')
-----
cast(LA02_USERLOG_M.LOGTIME as TIMESTAMP(6) FORMAT 'YYYY-MM-DD HH:MI:SS.S(0)')
TO_TIMESTAMP(LA02_USERLOG_M.LOGTIME, 'YYYY-MM-DD HH24:MI:SS')
-----
cast('0001-01-01 00:00:00' as timestamp(3) format 'yyyy-mm-ddbhh:mi:ssds(3)')
TO_TIMESTAMP('0001-01-01 00:00:00', 'yyyy-mm-dd HH24:MI:SS.MS')
-----
CAST('0001-01-01 00:00:01.000000' AS TIMESTAMP( 6 ) format 'yyyy-mm-ddbhh:mi:ssds(6)')
TO_TIMESTAMP('0001-01-01 00:00:01.000000', 'yyyy-mm-dd HH24:MI:SS.US')

```

Output

```

cast('0001-01-01 00:00:00' as timestamp(6) format 'yyyy-mm-ddbhh:mi:ssds(6)')
TO_TIMESTAMP('0001-01-01 00:00:00', 'yyyy-mm-dd HH24:MI:SS.US')
-----
cast('0001-01-01 00:00:00.000000' as timestamp(6))
cast('0001-01-01 00:00:00.000000' as timestamp(6))
-----
CAST('0001-01-01 00:00:00.000000' AS TIMESTAMP(6) FORMAT 'YYYY-MM-DDBHH:MI:SS.S(6)')
TO_TIMESTAMP('0001-01-01 00:00:00.000000', 'yyyy-mm-dd HH24:MI:SS.US')
-----
cast(LA02_USERLOG_M.LOGTIME as TIMESTAMP(6) FORMAT 'YYYY-MM-DD HH:MI:SS.S(0)')
TO_TIMESTAMP(LA02_USERLOG_M.LOGTIME, 'YYYY-MM-DD HH24:MI:SS')
-----
cast('0001-01-01 00:00:00' as timestamp(3) format 'yyyy-mm-ddbhh:mi:ssds(3)')

```

```
TO_TIMESTAMP('0001-01-01 00:00:00', 'yyyy-mm-dd HH24:MI:SS.MS' )
-----
CAST('0001-01-01 00:00:01.000000' AS TIMESTAMP ( 6 ) format 'yyyy-mm-ddbhh:mi:ssds(6)' )
TO_TIMESTAMP('0001-01-01 00:00:01.000000', 'yyyy-mm-dd HH24:MI:SS.US' )
```

trunc(<date>, 'MM') trunc(<date>, 'YY')

Input

```
select
  cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd') as DW_Stat_Dt      /* */
,coalesce(d.IAC_Id,'') as IAC_Id      /* */
,coalesce(d.IAC_Mdf,'') as IAC_Mdf      /* */
,coalesce(c.Rtl_Wlth_Prod_Id,'') as Rtl_Wlth_Prod_Id      /* */
,coalesce(c.Ccy_Cd,'') as Ccy_Cd      /* */
,0 as Lot_Bal      /* */
,cast(sum(case when s2.Nvld_Dt > cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd') then s2.Pos_Amt else 0
end) as decimal(18,2)) as NP_Occy_TMKV      /* */
,cast(
  sum(s2.Pos_Amt *
    ((case when s2.Nvld_Dt > cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd')
      then cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd') else s2.Nvld_Dt - 1 end)
    -
    (case when s2.Eft_Dt > trunc(cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd'),'MM')
      then s2.Eft_Dt else trunc(cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd'),'MM')
    end)
  + 1
  )
)
/
```

Output

```
date_trunc('month', cast('${v_Trx_Dt}' as date))
date_trunc('year', cast('${v_Trx_Dt}' as date))
```

NEXT

Input: NEXT

```
SELECT c1, c2
FROM tab1
WHERE NEXT(c3) = CAST('2004-01-04' AS DATE FORMAT 'YYYY-MM-DD');
```

Output

```
SELECT c1, c2
FROM tab1
WHERE c3 + 1 = CAST('2004-01-04' AS DATE);
```

6.8.11 Type Casting and Formatting

This section describes the syntax for migrating Teradata type casting and formatting. The migration syntax determines how the keywords and features are migrated.

In Teradata, the FORMAT keyword is used for formatting a column/expression. FORMAT '9(n)' and 'z(n)' are addressed using LPAD with 0 and space (' ') respectively. Data typing can be done using CAST or direct data type [(expression1)(CHAR(n))]. This feature is addressed using CAST.

The following type casting and formatting statements are supported by the DSC:

- **CHAR**

- [COLUMNS and COLUMN ALIAS](#)
- [Expressions](#)
- [INT](#)
- [DATE](#)
- [DAY to SECOND](#)
- [DECIMAL](#)
- [Time Interval](#)
- [NULL](#)
- [Implicit Type Casting Issues](#)

CHAR

Input - Data type casting for CHAR

```
(expression1)(CHAR(n))
```

Output

```
CAST( (expression1) AS CHAR(n) )
```

COLUMNS and COLUMN ALIAS

Input - Type casting and formatting of a column should ensure the column name is the same as the column alias

```
SELECT Product_Line_ID, MAX(Standard_Price)
FROM ( SELECT A.Product_Description, A.Product_Line_ID
, A.Standard_Price(DECIMAL(18),FORMAT '9(18)')(CHAR(18))
FROM product_t A
WHERE Product_Line_ID in (1, 2)
) AS tabAls
GROUP BY Product_Line_ID;
```

Output

```
SELECT Product_Line_ID, MAX( Standard_Price )
FROM ( SELECT A.Product_Description, A.Product_Line_ID
, CAST( LPAD( CAST(A.Standard_Price AS DECIMAL( 18 ,0 ) ), 18, '0' ) AS CHAR( 18 ) ) AS
Standard_Price
FROM product_t A
WHERE Product_Line_ID IN( 1 ,2 )
) AS tabAls
GROUP BY Product_Line_ID;
```

Expressions

Input - Type casting and formatting of an expression

```
SELECT product_id, standard_price*100.00(DECIMAL (17),FORMAT '9(17)')(CHAR(17) ) AS order_amt
FROM db_pvfc9_std.Product_t
WHERE product_line_id is not null ;
```

Output

```
SELECT product_id, CAST(LPAD(CAST(standard_price*100.00 AS DECIMAL(17)), 17, '0') AS CHAR(17)) AS
order_amt
FROM db_pvfc9_std.Product_t
WHERE product_line_id is not null ;
```

INT

Input - Data type casting for INT

```
SELECT
  CAST( col1 AS INT ) (
    FORMAT '9(5)'
  )
FROM
  table1
;
```

Output

```
SELECT
  LPAD( CAST( col1 AS INT ) ,5 ,'0' )
FROM
  table1
;
```

Input - Data type casting for INT

```
SELECT
  CAST( col1 AS INT ) (
    FORMAT '999999'
  )
FROM
  table1
;
```

Output

```
SELECT
  LPAD( CAST( col1 AS INT ) ,6 ,'0' )
FROM
  table1
;
```

Input - Data type casting for INT

```
SELECT
  CAST( expression1 AS INT FORMAT '9(10)' )
FROM
  table1
;
```

Output

```
SELECT
  LPAD( CAST( expression1 AS INT ) ,10 ,'0' )
FROM
  table1
;
```

Input - Data type casting for INT

```
SELECT
  CAST( expression1 AS INT FORMAT '9999' )
FROM
  table1
;
```

Output

```
SELECT
  LPAD( CAST( expression1 AS INT ) ,4 ,'0' )
FROM
  table1
;
```

DATE

In Teradata, when casting DATE from one format to another format, AS FORMAT is used. Migration tools will add TO_CHAR function to retain the specified input format.

For details, see [Date and Time Functions](#).

Input - Data type casting without DATE keyword

```
SELECT
  CAST( CAST( '2013-02-12' AS DATE FORMAT 'YYYY/MM/DD' ) AS FORMAT 'DD/MM/YY' )
;
```

Output

```
SELECT
  TO_CHAR( CAST( '2013-02-12' AS DATE ) , 'DD/MM/YY' )
;
```

DAY to SECOND

Input - Data type casting DAY to SECOND

```
SELECT CAST(T1.Draw_Gold_Dt || ' ' || T1.Draw_Gold_Tm as Timestamp)
- CAST(T1.Tx_Dt || ' ' || T1.Tx_Tm as Timestamp) DAY(4) To SECOND from db_pvfc9_std.draw_tab T1;
```

Output

```
SELECT
  CAST(( CAST( T1.Draw_Gold_Dt || ' ' || T1.Draw_Gold_Tm AS TIMESTAMP ) - CAST(T1.Tx_Dt || ' ' ||
T1.Tx_Tm AS TIMESTAMP ) ) AS INTERVAL DAY ( 4 ) TO SECOND )
FROM
  db_pvfc9_std.draw_tab T1
;
```

DECIMAL

Input - Data type casting for DECIMAL

```
SELECT
  standard_price (
    DECIMAL( 17 )
    ,FORMAT '9(17)'
  ) (
    CHAR( 17 )
  )
FROM
  db_pvfc9_std.Product_t
;
```

Output

```
SELECT
  CAST( LPAD( CAST( standard_price AS DECIMAL( 17 ,0 ) ) ,17 ,'0' ) AS CHAR( 17 ) )
FROM
  db_pvfc9_std.Product_t
;
```

Input - Data type casting for DECIMAL

```
SELECT
  standard_price (
    DECIMAL( 17 ,0 )
    ,FORMAT '9(17)'
  ) (
```

```
        VARCHAR( 17 )
    )
FROM
    db_pvfc9_std.Product_t
;
```

Output

```
SELECT
    CAST( LPAD( CAST( standard_price AS DECIMAL( 17 ,0 ) ) ,17 ,'0' ) AS VARCHAR( 17 ) )
FROM
    db_pvfc9_std.Product_t
;
```

Input - Data type casting for DECIMAL

```
SELECT
    customer_id (
        DECIMAL( 17 )
    ) (
        FORMAT '9(17)'
    ) (
        VARCHAR( 17 )
    )
FROM
    db_pvfc9_std.Customer_t
;
```

Output

```
SELECT
    CAST( LPAD( CAST( customer_id AS DECIMAL( 17 ,0 ) ) ,17 ,'0' ) AS VARCHAR( 17 ) )
FROM
    db_pvfc9_std.Customer_t
;
```

Time Interval

Type casting to time intervals is supported in DDL and DML. It is supported within SELECT and can be used in subqueries of VIEW, MERGE, and INSERT.

Input - Data type casting to time intervals

```
SELECT TIME '06:00:00.00' HOUR TO SECOND;
```

Output

```
SELECT TIME '06:00:00.00';
```

Input - Data type casting to time intervals with TOP

```
SELECT TOP 3 * FROM dwQErrDtL_mc.C03_CORP_AGENT_INSURE
WHERE Data_Dt > (SELECT TIME '06:00:00.00' HOUR TO SECOND);
```

Output

```
SELECT * FROM dwQErrDtL_mc.C03_CORP_AGENT_INSURE WHERE Data_Dt > (SELECT TIME
'06:00:00.00') limit 3;
```

NULL

DSC will migrate an expression in the form NULL(data_type) to CAST(NULL AS replacement_data_type).

Input - Data type casting for NULL

```
NULL(VARCHAR(n))
```

Output

```
CAST(NULL AS VARCHAR(n))
```

Implicit Type Casting Issues

Input - Implicit TYPE CASTING ISSUES

```
SELECT Data_Type,Start_Dt,End_Dt
FROM (
  SELECT Data_Type,Start_Dt,End_Dt
  FROM (
    SELECT '101' AS Data_Type,CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD')-1 AS Start_Dt,CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD') AS End_Dt
  ) TT
  UNION ALL
  SELECT '201' AS Data_Type,CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD')-7 AS Start_Dt,CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD') AS End_Dt
  FROM Sys_Calendar.CALENDAR
  WHERE calendar_date = CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD')
  AND Day_Of_Week = 1
  UNION ALL
  SELECT Data_Type,Start_Dt,End_Dt
  FROM (
    SELECT '401' AS Data_Type,CAST('${TX_PRIMONTH_END}' AS DATE FORMAT 'YYYYMMDD') AS Start_Dt,CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD') AS End_Dt
  ) TT
  WHERE CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD')=CAST('${TX_MONTH_END}' AS DATE FORMAT 'YYYYMMDD')
  UNION ALL
  SELECT Data_Type,Start_Dt,End_Dt
  FROM (
    SELECT '501' AS Data_Type,CAST('${TX_PRIQUARTER_END}' AS DATE FORMAT 'YYYYMMDD') AS Start_Dt,CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD') AS End_Dt
  ) TT
  WHERE CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD')=CAST('${TX_QUARTER_END}' AS DATE FORMAT 'YYYYMMDD')
  UNION ALL
  SELECT Data_Type,Start_Dt,End_Dt
  FROM (
    SELECT '701' AS Data_Type,CAST('${TX_PRIYEAR_END}' AS DATE FORMAT 'YYYYMMDD') AS Start_Dt,CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD') AS End_Dt
  ) TT
  WHERE CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD')=CAST('${TX_YEAR_END}' AS DATE FORMAT 'YYYYMMDD')
) T1
;
```

Output

```
SELECT Data_Type,Start_Dt,End_Dt
FROM (
  SELECT Data_Type,Start_Dt,End_Dt
  FROM (
    SELECT CAST('101' AS TEXT) AS Data_Type,CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD')-1 AS Start_Dt,CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD') AS End_Dt
  ) TT
  UNION ALL
  SELECT CAST('201' AS TEXT) AS Data_Type,CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD')-7 AS Start_Dt,CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD') AS End_Dt
  FROM Sys_Calendar.CALENDAR
  WHERE calendar_date = CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD')
  AND Day_Of_Week = 1
  UNION ALL
  SELECT Data_Type,Start_Dt,End_Dt
  FROM (
    SELECT CAST('401' AS TEXT) AS Data_Type,CAST('${TX_PRIMONTH_END}' AS DATE FORMAT 'YYYYMMDD') AS Start_Dt,CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD') AS End_Dt
  ) TT
```

```
WHERE CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD')=CAST('${TX_MONTH_END}' AS DATE
FORMAT 'YYYYMMDD')
UNION ALL
SELECT Data_Type,Start_Dt,End_Dt
FROM (
  SELECT CAST('501' AS TEXT) AS Data_Type,CAST('${TX_PRIQUARTER_END}' AS DATE FORMAT
'YYYYMMDD') AS Start_Dt,CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD') AS End_Dt
) TT
WHERE CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD')=CAST('${TX_QUARTER_END}' AS DATE
FORMAT 'YYYYMMDD')
UNION ALL
SELECT Data_Type,Start_Dt,End_Dt
FROM (
  SELECT CAST('701' AS TEXT) AS Data_Type,CAST('${TX_PRIYEAR_END}' AS DATE FORMAT 'YYYYMMDD')
AS Start_Dt,CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD') AS End_Dt
) TT
WHERE CAST('${TX_DATE}' AS DATE FORMAT 'YYYYMMDD')=CAST('${TX_YEAR_END}' AS DATE FORMAT
'YYYYMMDD')
) T1
;
```

6.8.12 BTEQ Utility Command

The BTEQ utility commands are as follows:

LOGOFF QUIT

LOGOFF ends the current RDBMS sessions without exiting BTEQ.

QUIT command ends the current Teradata database sessions and exits BTEQ.

Input

```
SELECT 'StartDTTM' as a
,CURRENT_TIMESTAMP (FORMAT 'HH:MI:SSBMMMBDD,BYYYY') ;
.LOGOFF;
.QUIT;
```

Output

```
SELECT 'StartDTTM' as a
,CURRENT_TIMESTAMP (FORMAT 'HH:MI:SSBMMMBDD,BYYYY') ;
.LOGOFF;
.QUIT;
```

NOTE

Gauss does not support, so it is required to comment.

.IF ERRORCODE and .QUIT

BTEQ statements specified with .IF and .QUIT.

Input

```
COLLECT STATISTICS
USING SAMPLE 5.00 PERCENT
COLUMN ( CDR_TYPE_KEY ) ,
COLUMN ( PARTITION ) ,
COLUMN ( SRC ) ,
COLUMN ( PARTITION,SBSCRPN_KEY )
ON DT_SDM.FCT_OTGO_NTWK_ACTVY_DAILY ;
```

Output

```
SET
default_statistics_target = 5.00 ;
ANALYZE DT_SDM.FCT_OTGO_NTWK_ACTVY_DAILY (CDR_TYPE_KEY) ;
ANALYZE DT_SDM.FCT_OTGO_NTWK_ACTVY_DAILY (PARTITION) ;
ANALYZE DT_SDM.FCT_OTGO_NTWK_ACTVY_DAILY (SRC) ;
ANALYZE DT_SDM.FCT_OTGO_NTWK_ACTVY_DAILY (PARTITION,SBSCRPN_KEY) ;
RESET default_statistics_target ;
```

.IF

Input:

```
.IF END_MONTH_FLAG <> 'Y' THEN .GOTO LABEL_1;
```

Output:

```
IF END_MONTH_FLAG <> 'Y' THEN
    GOTO LABEL_1 ;
END IF ;
```

.QUIT

Input:

```
.IF ERRORCODE <> 0 THEN .QUIT 12;
```

Output:

```
IF ERRORCODE <> 0 THEN
    RAISE EXCEPTION '12' ;
END IF;
```

.IF & .QUIT

.IF and .QUIT should be moved inside the block.

Oracle Syntax	Syntax After Migration
<pre>INSERT INTO EMP SELECT * FROM EMP; .IF ERRORCODE <> 0 THEN .QUIT 12;</pre>	<pre>DECLARE lv_mig_errorcode NUMBER (4) ; BEGIN BEGIN INSERT INTO EMP SELECT * FROM EMP; lv_mig_errorcode := 0 ; EXCEPTION WHEN OTHERS THEN lv_mig_errorcode := - 1 ; END ; IF lv_mig_errorcode <> 0 THEN RAISE EXCEPTION '12' ; END IF ; END ; /</pre>

.RETURN

Input:

```
.if ERRORCODE = 0 then .RETURN;
```

Output:

```
IF ERRORCODE = 0 THEN
    RETURN;
END IF;
```

.GOTO

Input:

```
.IF END_MONTH_FLAG <> 'Y' THEN .GOTO LABEL_1;
```

Output:

```
IF END_MONTH_FLAG <> 'Y' THEN
    GOTO LABEL_1;
END IF ;
```

Label

Input:

```
.LABEL LABEL_1
```

Output:

```
<<LABEL_1>>
```

ERRORCODE 3807

Input:

```
SELECT end_mon AS END_MONTH_FLAG
FROM tab2 ;

.IF END_MONTH_FLAG <> 'Y' THEN
    .GOTO LABEL_1;

.IF ERRORCODE = 3807 THEN
    .QUIT 8888;
```

Output

```
DECLARE lv_mig_errorcode NUMBER (4);
        lv_mig_END_MONTH_FLAG TEXT;
BEGIN
    BEGIN
        SELECT end_mon
            INTO lv_mig_END_MONTH_FLAG
            FROM tab2 ;

        lv_mig_errorcode := 0 ;
    EXCEPTION
        WHEN UNDEFINED_TABLE THEN
            lv_mig_errorcode := 3807 ;

        WHEN OTHERS THEN
            lv_mig_errorcode := - 1 ;
    END ;

    IF lv_mig_END_MONTH_FLAG <> 'Y' THEN
        GOTO LABEL_1 ;
    END IF ;
    IF lv_mig_errorcode = 3807 THEN
        RAISE EXCEPTION '8888' ;
    END IF ;
END;
/
```


BT with BTEQ commands

Input

```
BT;

delete from ${BRTL_DCOR}.BRTL_CS_CUST_CID_UID_REL
where DW_Job_Seq = ${v_Group_No};

.if ERRORCODE <> 0 then .quit 12;

insert into ${BRTL_DCOR}.BRTL_CS_CUST_CID_UID_REL
(
  Cust_Id
 ,Cust_UID
 ,DW_Upd_Dt
 ,DW_Upd_Tm
 ,DW_Job_Seq
 ,DW_Etl_Dt
)
select
  a.Cust_Id
 ,a.Cust_UID
 ,current_date as Dw_Upd_Dt
 ,current_time(0) as DW_Upd_Tm
 ,cast(${v_Group_No} as byteint) as DW_Job_Seq
 ,cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd') as DW_Etl_Dt
from ${BRTL_VCOR}.BRTL_CS_CUST_CID_UID_REL_S a
where a.DW_Snsh_Dt = cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd');

.if ERRORCODE <> 0 then .quit 12;
```

Output

```
BEGIN
--
BEGIN
  delete from ${BRTL_DCOR}.BRTL_CS_CUST_CID_UID_REL
  where DW_Job_Seq = ${v_Group_No};
  lv_mig_errorcode = 0;
EXCEPTION
  WHEN OTHERS THEN
    lv_mig_errorcode = -1;
END;

IF lv_mig_errorcode <> 0 THEN
  RAISE EXCEPTION '12';
END IF;
```

ET with BTEQ Commands

Input

```
ET;
BEGIN

BEGIN
  delete from ${BRTL_DCOR}.BRTL_CS_CUST_CID_UID_REL
  where DW_Job_Seq = ${v_Group_No};
  lv_mig_errorcode = 0;
EXCEPTION
  WHEN OTHERS THEN
    lv_mig_errorcode = -1;
END;

IF lv_mig_errorcode <> 0 THEN
  RAISE EXCEPTION '12';
END IF;
```

```
BEGIN
  insert into ${BRTL_DCOR}.BRTL_CS_CUST_CID_UID_REL
  (
    Cust_Id
    ,Cust_UID
    ,DW_Upd_Dt
    ,DW_Upd_Tm
    ,DW_Job_Seq
    ,DW_Etl_Dt
  )
  select
    a.Cust_Id
    ,a.Cust_UID
    ,current_date as Dw_Upd_Dt
    ,current_time(0) as DW_Upd_Tm
    ,cast(${v_Group_No} as byteint) as DW_Job_Seq
    ,cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd') as DW_Etl_Dt
  from ${BRTL_VCOR}.BRTL_CS_CUST_CID_UID_REL_S a
  where a.DW_Snsh_Dt = cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd');
EXCEPTION
  WHEN OTHERS THEN
    lv_mig_errorcode = -1;
END;

IF lv_mig_errorcode <> 0 THEN
  RAISE EXCEPTION '12';
END IF;

END;
```

Output

```
--
BEGIN
  insert into ${BRTL_DCOR}.BRTL_CS_CUST_CID_UID_REL
  (
    Cust_Id
    ,Cust_UID
    ,DW_Upd_Dt
    ,DW_Upd_Tm
    ,DW_Job_Seq
    ,DW_Etl_Dt
  )
  select
    a.Cust_Id
    ,a.Cust_UID
    ,current_date as Dw_Upd_Dt
    ,current_time(0) as DW_Upd_Tm
    ,cast(${v_Group_No} as byteint) as DW_Job_Seq
    ,cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd') as DW_Etl_Dt
  from ${BRTL_VCOR}.BRTL_CS_CUST_CID_UID_REL_S a
  where a.DW_Snsh_Dt = cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd');
EXCEPTION
  WHEN OTHERS THEN
    lv_mig_errorcode = -1;
END;

IF lv_mig_errorcode <> 0 THEN
  RAISE EXCEPTION '12';
END IF;

END;
```

.Export FILE

.EXPORT FILE should be changed to COPY and teradata utilities is set to **false**.

Oracle Syntax	Syntax After Migration
<pre>.export file = \$FILENAME; select empno, ename from emp where deptno = 1;</pre>	<pre>COPY (select empno, ename from emp where deptno = 1) TO '\$FILENAME' CSV HEADER DELIMITER E'\t';</pre>

.EXPORT FILE should be changed to \$q\$COPY and moved inside the block when teradataUtilities is set to **true**.

Oracle Syntax	Syntax After Migration
<pre>print BTEQ <<ENDOFINPUT; DATABASE HPBUS; .export file = \$FILENAME; select empno, ename from emp where deptno = 1; .IF ERRORCODE <> 0 THEN .QUIT 12; .LOGOFF; .QUIT 0; ENDOFINPUT</pre>	<pre>DECLARE lv_mig_obj_exists_check NUMBER(1); lv_mig_errorcode NUMBER(4); BEGIN SET SESSION CURRENT_SCHEMA TO public ; BEGIN SELECT COUNT(*) INTO lv_mig_obj_exists_check FROM (select empno, ename from emp where deptno = 1); lv_mig_errorcode := 0; EXCEPTION WHEN OTHERS THEN lv_mig_errorcode := -1; END ; EXECUTE \$q\$COPY (select empno, ename from emp where deptno = 1) TO '\$FILENAME' CSV HEADER DELIMITER E'\t'\$q\$; IF lv_mig_errorcode <> 0 THEN RAISE EXCEPTION '12'; END IF ; RAISE EXCEPTION '-99'; RETURN ; END ; /</pre>

SQL_Lang & BTEQ

Multiple tag names should be handled for SQL_Lang.

Oracle Syntax	Syntax After Migration
<pre>#!/usr/bin/perl ##### ##### # BTEQ script in Perl # Date Time : 2013-10-15 # Table : TB_NET_LTE_GPRS_CDR (4G GPRS» °μ¥) # Script Name : XXX00_TB_NET_LTE_GPRS_CDR # Source Table : TB_04024-GPRS # Load strategy: S4 use strict; # Declare using Perl strict syntax my \$HOME = \$ENV{"AUTO_HOME"}; unshift(@INC, "\$HOME/bin"); require etl_pub; # ----- Variable Section ----- # DATABASE NAMES my \$TEMPDB = \$ETL::TEMPDB; my \$SDATADB = \$ETL::SDATADB; my \$PDATADB = \$ETL::PDATADB; my \$PARADB = \$ETL::PARADB; my \$PDDL = \$ETL::PDDL; my \$PCODE = \$ETL::PCODE; if (\$#ARGV < 0) { exit(1); } my \$CONTROL_FILE = \$ARGV[0]; my \$TX_DATE = substr(\${CONTROL_FILE},length(\$ {CONTROL_FILE})-12, 8); open(STDERR, ">&STDOUT"); my \$TRG_COL_LIST =<<TRGCOLLIST; MSISDN ,dat_rcd_dt ,vst_rgn_cd TRGCOLLIST my \$MAP_COL_LIST =<<MAPCOLLIST; TB_04024.msisdn ,CAST(' \$TX_DATE' AS DATE FORMAT 'YYYYMMDD') ,TB_04024.vst_rgn_cd MAPCOLLIST my \$FILTER = "CMCC_Prov_Prvd_Id=\$PCODE"; my \$table_today = "\${TEMPDB}.TB_04024_ {PCODE}"; my \$table_target = "Z" . substr(\$PCODE,1,2) . "NET_LTE_GPRS_CDR"; my \$UNIT_FLAG; sub BTEQ_S4 { my (\$dbh) = @_; my \$BTEQ_CMD_S4 = <<ENDOFINPUT; INSERT INTO \${PDATADB}.\$table_target (\$TRG_COL_LIST) SELECT \$MAP_COL_LIST FROM \$SDATADB.TB_\${PCODE}_04024_ {UNIT_FLAG}_ \${TX_DATE} TB_04024; .IF ERRORCODE <> 0 THEN .QUIT 12;</pre>	<pre>#!/usr/bin/perl ##### ##### # BTEQ script in Perl # Date Time : 2013-10-15 # Table : TB_NET_LTE_GPRS_CDR (4G GPRS) # Script Name : XXX00_TB_NET_LTE_GPRS_CDR # Source Table : TB_04024-GPRS # Load strategy: S4 use strict; # Declare using Perl strict syntax my \$HOME = \$ENV{"AUTO_HOME"}; unshift(@INC, "\$HOME/bin"); require etl_pub; # ----- Variable Section ----- # DATABASE NAMES my \$TEMPDB = \$ETL::TEMPDB; my \$SDATADB = \$ETL::SDATADB; my \$PDATADB = \$ETL::PDATADB; my \$PARADB = \$ETL::PARADB; my \$PDDL = \$ETL::PDDL; my \$PCODE = \$ETL::PCODE; if (\$#ARGV < 0) { exit(1); } my \$CONTROL_FILE = \$ARGV[0]; my \$TX_DATE = substr(\${CONTROL_FILE},length(\$ {CONTROL_FILE})-12, 8); open(STDERR, ">&STDOUT"); my \$TRG_COL_LIST=<<TRGCOLLIST ; MSISDN ,dat_rcd_dt ,vst_rgn_cd TRGCOLLIST my \$MAP_COL_LIST=<<MAPCOLLIST ; TB_04024.msisdn ,CAST(' \$TX_DATE' AS DATE) ,TB_04024.vst_rgn_cd MAPCOLLIST my \$FILTER = "CMCC_Prov_Prvd_Id=\$PCODE"; my \$table_today = "\${TEMPDB}.TB_04024_ {PCODE}"; my \$table_target = "Z" . substr(\$PCODE,1,2) . "NET_LTE_GPRS_CDR"; my \$UNIT_FLAG; sub BTEQ_S4 { my (\$dbh) = @_; my \$BTEQ_CMD_S4=<<ENDOFINPUT ; DECLARE lv_mig_obj_exists_check NUMBER (1) ; lv_mig_errorcode NUMBER (4) ; BEGIN BEGIN</pre>

Oracle Syntax	Syntax After Migration
<pre> ENDOFINPUT return \$BTEQ_CMD_S4; } my \$unit_num = "04024"; sub BTEQ_Z1 { my \$BTEQ_CMD_Z1 = <<ENDOFINPUT; INSERT INTO \${PDATADB}.\${table_target} (\$TRG_COL_LIST) SELECT \$MAP_COL_LIST FROM \$SDATADB.TB_\${PCODE}_\${unit_num}_\${ UNIT_FLAG}_\${TX_DATE} tb_\${unit_num}; .IF ERRORCODE <> 0 THEN .QUIT 12; ENDOFINPUT return \$BTEQ_CMD_Z1; } sub main() { my \$dbh=ETL::DBconnect(); # SDATA \$UNIT_FLAG = ETL::get_UNIT_FLAG(\$dbh, "TB_04024", \$PCODE, \$TX_DATE); my \$BTEQCMD = ""; if (\$UNIT_FLAG eq " ") { print "Ô!\n"; ETL::disconnectETL(\$dbh); return 1; } elsif (\$UNIT_FLAG eq "S") { \$BTEQCMD = BTEQ_S4(\$dbh); } elsif (\$UNIT_FLAG eq "Z") { \$BTEQCMD = BTEQ_Z1(\$dbh); } else { print "\n"; return 1; } ETL::disconnectETL(\$dbh); return ETL::ExecuteBTEQ(\$BTEQCMD, \$TX_DATE); } my \$ret= main(); exit(\$ret); </pre>	<pre> INSERT INTO \${PDATADB}.\${table_target} (\$TRG_COL_LIST) SELECT \$MAP_COL_LIST FROM \$SDATADB.TB_\${PCODE}_04024_\${ UNIT_FLAG}_\${TX_DATE} TB_04024 ; lv_mig_errorcode := 0 ; EXCEPTION WHEN OTHERS THEN lv_mig_errorcode := - 1 ; END ; IF lv_mig_errorcode <> 0 THEN RAISE EXCEPTION '12' ; END IF ; END ; / ENDOFINPUT return \$BTEQ_CMD_S4; } my \$unit_num = "04024"; sub BTEQ_Z1 { my \$BTEQ_CMD_Z1=<<ENDOFINPUT ; DECLARE lv_mig_obj_exists_check NUMBER (1) ; lv_mig_errorcode NUMBER (4) ; BEGIN INSERT INTO \${PDATADB}.\${table_target} (\$TRG_COL_LIST) SELECT \$MAP_COL_LIST FROM \$SDATADB.TB_\${PCODE}_\${ unit_num}_\${UNIT_FLAG}_\${TX_DATE} tb_\${ unit_num}; lv_mig_errorcode := 0 ; EXCEPTION WHEN OTHERS THEN lv_mig_errorcode := - 1 ; END ; IF lv_mig_errorcode <> 0 THEN RAISE EXCEPTION '12' ; END IF ; END ; / ENDOFINPUT return \$BTEQ_CMD_Z1; } sub main() { my \$dbh=ETL::DBconnect(); # SDATA \$UNIT_FLAG = ETL::get_UNIT_FLAG(\$dbh, "TB_04024", \$PCODE, \$TX_DATE); </pre>

Oracle Syntax	Syntax After Migration
	<pre> my \$BTEQCMD = ""; if (\$UNIT_FLAG eq " ") { print "\n"; ETL::disconnectETL(\$dbh); return 1; } elsif (\$UNIT_FLAG eq "S") { \$BTEQCMD = BTEQ_S4(\$dbh); } elsif (\$UNIT_FLAG eq "Z") { \$BTEQCMD = BTEQ_Z1(\$dbh); } else { print ",\n"; return 1; } ETL::disconnectETL(\$dbh); return ETL::ExecuteBTEQ(\$BTEQCMD, \$TX_DATE); } my \$ret= main(); exit(\$ret); </pre>

6.8.13 DSQL

DSQL Variable: With AS

Input

```

/* VARIABLE INPUT */
select cast(cast('${TX_DATE}' as date format 'yyyymmdd') as date format 'yyyy-mm-dd') as v_Trx_Dt;
.IF ERRORCODE <> 0 THEN .QUIT 12 ;

insert into VT_RTL_ACT_ORG_INF      /* VT_      */
(
  Act_Id      /*      */
  ,Act_Mdf      /*      */
  ,Act_Agr_Typ_Cd      /*      */
  ,Opn_BBK      /*      */
  ,Opn_BRN      /*      */
)
select
  a.Agr_Id as Act_Id      /*      */
  ,a.Agr_Mdf as Act_Mdf      /*      */
  ,a.Agr_Typ_Cd as Act_Agr_Typ_Cd      /*      */
  ,a.BBK_Org_Id as Opn_BBK      /*      */
  ,a.Opn_Org_Id as Opn_BRN      /*      */
from ${PDM_VIEW}.T03_AGR_TRSR_BND_ACT as a      /* _      */
where a.DW_Start_Dt <= cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd')
      AND a.DW_End_Dt > cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd')
      AND a.Agr_Typ_Cd IN ('20301')      /*      */
;
.IF ERRORCODE <> 0 THEN .QUIT 12 ;

```

Output

```

DECLARE lv_mig_obj_exists_check  NUMBER ( 1 ) ;
lv_mig_errorcode  NUMBER ( 4 ) ;
lv_mig_v_Trx_Dt  TEXT ;

BEGIN
  /*VARIABLE INPUT */
  BEGIN
    SELECT CAST( CAST( '${TX_DATE}' AS DATE ) AS DATE )
    INTO lv_mig_v_Trx_Dt ;

```

```
lv_mig_errorcode := 0 ;

EXCEPTION
  WHEN OTHERS THEN
    lv_mig_errorcode := -1;

END;
IF lv_mig_errorcode <> 0 THEN
  RAISE EXCEPTION '12' ;
END IF ;

BEGIN
  INSERT INTO VT_RTL_ACT_ORG_INF /* VT_ */
  (
    Act_Id /* */
    ,Act_Mdf /* */
    ,Act_Agr_Typ_Cd /* */
    ,Opn_BBK /* */
    ,Opn_BRN /* */
  )
  SELECT a.Agr_Id AS Act_Id /* */
    ,a.Agr_Mdf AS Act_Mdf /* */
    ,a.Agr_Typ_Cd AS Act_Agr_Typ_Cd /* */
    ,a.BBK_Org_Id AS Opn_BBK /* */
    ,a.Opn_Org_Id AS Opn_BRN /* */
  FROM ${PDM_VIEW}.T03_AGR_TRSR_BND_ACT AS a /* */
  WHERE a.DW_Start_Dt <= CAST( lv_mig_v.Trx_Dt AS DATE )
    AND a.DW_End_Dt > CAST( lv_mig_v.Trx_Dt AS DATE )
    AND a.Agr_Typ_Cd IN ( '20301' ) /* */
  ;
  lv_mig_errorcode := 0 ;

EXCEPTION
  WHEN OTHERS THEN
    lv_mig_errorcode := -1;

END ;
IF lv_mig_errorcode <> 0 THEN
  RAISE EXCEPTION '12' ;
END IF ;

END ;
/
```

DSQL Variable: Without AS

Input

```
/* SESSION INPUT */
select Session ;
.IF ERRORCODE <> 0 THEN .QUIT 12 ;

select username,clientsystemuserid,clientipaddress,clientprogramname
  from dbc.sessioninfoV
  where sessionno = '$Session' ;
.IF ERRORCODE <> 0 THEN .QUIT 12 ;
```

Output

```
DECLARE lv_mig_obj_exists_check  NUMBER ( 1 ) ;
lv_mig_errorcode                 NUMBER ( 4 ) ;
lv_mig_Session                   TEXT ;

BEGIN
  /*SESSION INPUT */
  BEGIN
    SELECT pg_backend_pid ( )
    INTO lv_mig_Session ;
```

```
lv_mig_errorcode := 0 ;

EXCEPTION
  WHEN OTHERS THEN
    lv_mig_errorcode := - 1 ;
END ;

IF lv_mig_errorcode <> 0 THEN
  RAISE EXCEPTION '12' ;
END IF ;

BEGIN
  SELECT COUNT( * ) INTO lv_mig_obj_exists_check
    FROM ( SELECT username
            ,clientsystemuserid
            ,clientipaddress
            ,clientprogramname
            FROM dbc.sessioninfoV
            WHERE sessionno = lv_mig_Session )
  LIMIT 1 ;

  lv_mig_errorcode := 0 ;

EXCEPTION
  WHEN OTHERS THEN
    lv_mig_errorcode := - 1 ;
END ;

IF lv_mig_errorcode <> 0 THEN
  RAISE EXCEPTION '12' ;
END IF ;

END ;
/
```

Specifying Variables in BTEQ Statements

Input

```
select case when cast('${v_Trx_Dt}' as date format'yyyy-mm-dd') = cast('${v_Tx_Mon_End_Date}' as date
format'yyyy-mm-dd') then '0' else '1' end as v_IsLastDay;
.IF ERRORCODE <> 0 THEN .QUIT 12 ;
insert into VT_AS_CUST_WLTH_GRP      /* VT_      */
(
  Cust_UID      /* UID */
, BBK_Org_Id    /*      */
, Wlth_grp_Cd   /*      */
, Card_Grd_Cd   /*      */
)
select
  a.Cust_UID as Cust_UID      /* UID */
, a.BBK_Org_Id as BBK_Org_Id /*      */
, '11' as Wlth_grp_Cd /*      */
, coalesce(b.Card_Grd_Cd, '') as Card_Grd_Cd /*      */
from VT_CUST_WLTH_GRP_LAST as a /* VT_      */
LEFT OUTER JOIN ${BRTL_VEXT}.BRTL_AS_CUST_CARD_GRD_S as b /* AS_      */
on b.Cust_Uid = a.Cust_Uid
AND b.BBK_Org_Id = a.BBK_Org_Id
AND b.Card_Sts_Scp_Cd = '001' /* 001-      */
AND b.Card_Grd_Cd IN ('080','060','040','020','010','000')
AND b.DW_Snsh_Dt = cast('${v_Trx_Dt}' as date format'yyyy-mm-dd')
where b.Cust_UID IS null
;
.IF v_IsLastDay = 1 THEN .GOTO doit
```

Output


```

BEGIN
  select case when cast('${v_Trx_Dt}' as date format'yyyy-mm-dd') = cast('${v_Tx_Mon_End_Date}' as date
format'yyyy-mm-dd') then '0' else '1' end INTO lv_mig_v_IsLastDay;
  lv_mig_ERRORCODE = 0;
EXCEPTION
  WHEN OTHERS THEN
    lv_mig_ERRORCODE = -1;
END;
IF lv_mig_ERRORCODE <> 0 THEN
  RAISE EXCEPTION '12';
END IF;

insert into VT_AS_CUST_WLTH_GRP      /* VT_      */
(
  Cust_UID      /* UID */
, BBK_Org_Id    /*      */
, Wlth_grp_Cd   /*      */
, Card_Grd_Cd   /*      */
)
select
  a.Cust_UID as Cust_UID      /* UID */
, a.BBK_Org_Id as BBK_Org_Id /*      */
, '11' as Wlth_grp_Cd /*      */
, coalesce(b.Card_Grd_Cd, '') as Card_Grd_Cd /*      */
from VT_CUST_WLTH_GRP_LAST as a /* VT_      */
LEFT OUTER JOIN ${BRTL_VEXT}.BRTL_AS_CUST_CARD_GRD_S as b /* AS_      */
on b.Cust_Uid = a.Cust_Uid
AND b.BBK_Org_Id = a.BBK_Org_Id
AND b.Card_Sts_Scp_Cd = '001' /* 001-      */
AND b.Card_Grd_Cd IN ('080','060','040','020','010','000')
AND b.DW_Snsh_Dt = cast('${v_Trx_Dt}' as date format'yyyy-mm-dd')
where b.Cust_UID IS null
;
IF lv_mig_v_IsLastDay = 1 THEN
  GOTO doit;
END IF;

```

Specifying Variables Using SELECT EXTRACT FROM

Input

```

select EXTRACT (MONTH FROM cast('${TX_DATE}' as date format 'YYYYMMDD')) as CURR_MON;
.if ERRORCODE <> 0 then .quit 12;
--
.if CURR_MON <> 1 THEN .goto NON_JAN;
.if ERRORCODE <> 0 then .quit 12;

```

Output

```

BEGIN
  select EXTRACT (MONTH FROM cast('${TX_DATE}' as date format 'YYYYMMDD')) INTO CURR_MON;
  ...
END;
  ...

```

DATE Type Casting: Specifying DSQL Variables

Input

```

select
  case when a.DW_Stat_Dt in
(date'${v_Tx_Pre_1_Mon_End_Date}'
,date'${v_Tx_Pre_2_Mon_End_Date}'
,date'${v_Tx_Pre_3_Mon_End_Date}')
then '1' else '2' end as Quarter_Flg /* PK- 1-- 2-- 3-- */
, a.BBK_Org_Id as BBK_Org_Id /* PK-      */
, a.Cust_UID as Cust_UID /* PK- UID */
, a.Entp_Cust_Id as Entp_Cust_Id /* PK-      */

```

```

,coalesce(b.BBK_Nbr,") as Agn_BBK_Org_Id /* PK- */
from ${BRTL_VEXT}.BRTL_AS_AGN_ENTP_CUID_TRX_SR as a /* AS_ UID */
LEFT OUTER JOIN ${BRTL_VCOR}.BRTL_OR_RTL_ORG_INF_S as b /* OR_ */
on a.Agn_BRN_Org_Id = b.Rtl_Org_Id
and b.DW_Snsh_Dt = cast('${v_Trx_Dt}' as date format 'yyyy-mm-dd')
where a.DW_Stat_Dt IN (date'${v_Tx_Pre_1_Mon_End_Date}'
,date'${v_Tx_Pre_2_Mon_End_Date}'
,date'${v_Tx_Pre_3_Mon_End_Date}'
,date'${v_Tx_Pre_4_Mon_End_Date}'
,date'${v_Tx_Pre_5_Mon_End_Date}'
,date'${v_Tx_Pre_6_Mon_End_Date}')
AND a.Stat_Prd_Cd = 'M001'
group by Quarter_Flg, a.BBK_Org_Id, a.Cust_UID, a.Entp_Cust_Id, coalesce(b.BBK_Nbr,")
;

```

should be migrated as below:

```

SELECT
CASE WHEN a.DW_Stat_Dt IN
( CAST(lv_mig_v_Tx_Pre_1_Mon_End_Date AS DATE)
, CAST(lv_mig_v_Tx_Pre_2_Mon_End_Date AS DATE)
, CAST(lv_mig_v_Tx_Pre_3_Mon_End_Date AS DATE) )
THEN '1'
ELSE '2'
END AS Quarter_Flg /* PK- 1-- 2-- 3-- */
,a.BBK_Org_Id AS BBK_Org_Id /* PK- */
,a.Cust_UID AS Cust_UID /* PK- UID */
,a.Entp_Cust_Id AS Entp_Cust_Id /* PK- */
,COALESCE( b.BBK_Nbr ," ) AS Agn_BBK_Org_Id /* PK- */
FROM
BRTL_VEXT.BRTL_AS_AGN_ENTP_CUID_TRX_SR AS a /* AS_ UID */
LEFT OUTER JOIN BRTL_VCOR.BRTL_OR_RTL_ORG_INF_S AS b /* OR_ */
ON a.Agn_BRN_Org_Id = b.Rtl_Org_Id
AND b.DW_Snsh_Dt = CAST( lv_mig_v_Trx_Dt AS DATE )
WHERE
a.DW_Stat_Dt IN ( CAST(lv_mig_v_Tx_Pre_1_Mon_End_Date AS DATE)
,CAST(lv_mig_v_Tx_Pre_2_Mon_End_Date AS DATE)
,CAST(lv_mig_v_Tx_Pre_3_Mon_End_Date AS DATE)
,CAST(lv_mig_v_Tx_Pre_4_Mon_End_Date AS DATE)
,CAST(lv_mig_v_Tx_Pre_5_Mon_End_Date AS DATE)
,CAST(lv_mig_v_Tx_Pre_6_Mon_End_Date AS DATE) )
AND a.Stat_Prd_Cd = 'M001'
GROUP BY Quarter_Flg, a.BBK_Org_Id, a.Cust_UID, a.Entp_Cust_Id, COALESCE( b.BBK_Nbr ," )
;

```

Output

```

SELECT
CASE WHEN a.DW_Stat_Dt IN
( CAST(lv_mig_v_Tx_Pre_1_Mon_End_Date AS DATE)
, CAST(lv_mig_v_Tx_Pre_2_Mon_End_Date AS DATE)
, CAST(lv_mig_v_Tx_Pre_3_Mon_End_Date AS DATE) )
THEN '1'
ELSE '2'
END AS Quarter_Flg /* PK- 1-- 2-- 3-- */
,a.BBK_Org_Id AS BBK_Org_Id /* PK- */
,a.Cust_UID AS Cust_UID /* PK- UID */
,a.Entp_Cust_Id AS Entp_Cust_Id /* PK- */
,COALESCE( b.BBK_Nbr ," ) AS Agn_BBK_Org_Id /* PK- */
FROM
BRTL_VEXT.BRTL_AS_AGN_ENTP_CUID_TRX_SR AS a /* AS_ UID */
LEFT OUTER JOIN BRTL_VCOR.BRTL_OR_RTL_ORG_INF_S AS b /* OR_ */
ON a.Agn_BRN_Org_Id = b.Rtl_Org_Id
AND b.DW_Snsh_Dt = CAST( lv_mig_v_Trx_Dt AS DATE )
WHERE
a.DW_Stat_Dt IN ( CAST(lv_mig_v_Tx_Pre_1_Mon_End_Date AS DATE)
,CAST(lv_mig_v_Tx_Pre_2_Mon_End_Date AS DATE)
,CAST(lv_mig_v_Tx_Pre_3_Mon_End_Date AS DATE)
,CAST(lv_mig_v_Tx_Pre_4_Mon_End_Date AS DATE)
,CAST(lv_mig_v_Tx_Pre_5_Mon_End_Date AS DATE)
,CAST(lv_mig_v_Tx_Pre_6_Mon_End_Date AS DATE) )
AND a.Stat_Prd_Cd = 'M001'

```

```
GROUP BY Quarter_Flg, a.BBK_Org_Id, a.Cust_UID, a.Entp_Cust_Id, COALESCE( b.BBK_Nbr, " )  
;
```

6.9 Oracle Syntax Migration

6.9.1 Overview

This section lists the Oracle features supported by the syntax migration tool, and provides the Oracle syntax and the equivalent GaussDB(DWS) syntax for each feature. The syntax listed in this section illustrates the internal logic for Oracle script migration.

This section is also a reference for the database migration team and for the on-site verification of Oracle script migration.

6.9.2 Schema Objects

This section describes the syntax for migrating Oracle schema objects. The migration syntax determines how the keywords and features are migrated.

Topics in this section include:

Tables, temporary tables, global temporary tables, indexes, views, sequences, PURGE, and database keywords. For details, see [Tables](#) to [Database Keywords](#).

6.9.2.1 Tables

CREATE TABLE

The Oracle **CREATE TABLE** statement is used to create new tables. The target database supports Oracle CREATE TABLE without any migration.

ALTER TABLE

The Oracle ALTER TABLE statement is used to add, rename, modify, or drop/delete columns in a table. The target database supports Oracle ALTER TABLE without any migration.

PRIMARY KEY

The Oracle ALTER TABLE statement is used to add table names when the primary key appears in a different file other than the CREATE table statement.

Input - PRIMARY KEY

```
CREATE TABLE CTP_ARM_CONFIG  
( HOSTNAME VARCHAR2(50),  
  OPNAME VARCHAR2(50),  
  PARAMTYPE VARCHAR2(2),  
  PARAMVALUE NUMBER(*,0),  
  MODIFYDATE DATE  
  ) SEGMENT CREATION DEFERRED  
  PCTFREE 10 PCTUSED 0 INITRANS 1 MAXTRANS 255  
  NOCOMPRESS LOGGING  
  STORAGE( PCTINCREASE 0
```

```
BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)
TABLESPACE SPMS_DATA ;

ALTER TABLE CTP_ARM_CONFIG ADD CONSTRAINT PKCTP_ARM_CONFIG PRIMARY KEY (HOSTNAME,
OPNAME)
USING INDEX PCTFREE 10 INITRANS 2 MAXTRANS 255 COMPUTE STATISTICS
STORAGE( PCTINCREASE 0
BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)
TABLESPACE SPMS_DATA ENABLE;
```

Output

```
CREATE
TABLE
  CTP_ARM_CONFIG (
    HOSTNAME VARCHAR2 (50)
    ,OPNAME VARCHAR2 (50)
    ,PARAMTYPE VARCHAR2 (2)
    ,PARAMVALUE NUMBER (
      38
      ,0
    )
    ,MODIFYDATE DATE
    ,CONSTRAINT PKCTP_ARM_CONFIG PRIMARY KEY (
      HOSTNAME
      ,OPNAME
    )
  ) /*SEGMENT CREATION DEFERRED*/
  /*PCTFREE 10*/
  /*PCTUSED 0*/
  /*INITRANS 1*/
  /*MAXTRANS 255*/
  /*NOCOMPRESS*/
  /*LOGGING*/
  /*STORAGE( BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)*/
  /*TABLESPACE SPMS_DATA */
;
```

Unique

The **ALTER TABLE** query contains UNIQUE Constraint. If it is directly executed in GaussDB, the following error shows: "Cannot create index whose evaluation cannot be enforced to remote nodes".

Implementation is similar to PRIMARY KEY. If PRIMARY KEY/UNIQUE is already present, there is no need to migrate and leave it as it is.

Input

```
CREATE
TABLE
  GCC_PLAN.T1033 (
    ROLLOUT_PLAN_LINE_ID NUMBER NOT NULL
    ,UDF_FIELD_VALUE_ID NUMBER NOT NULL
  ) ;
ALTER TABLE
  GCC_PLAN.T1033 ADD CONSTRAINT UDF_FIELD_VALUE_ID_PK UNIQUE (UDF_FIELD_VALUE_ID) ;
```

Output

```
CREATE TABLE
  GCC_PLAN.T1033
  (
    ROLLOUT_PLAN_LINE_ID NUMBER NOT NULL
    ,UDF_FIELD_VALUE_ID NUMBER NOT NULL
    ,CONSTRAINT UDF_FIELD_VALUE_ID_PK UNIQUE (UDF_FIELD_VALUE_ID)
  ) ;
```

NULL Constraint

NULL constraint during local variable declaration is not supported in packages - that is L_CONTRACT_DISTRIBUTE_STATUS
SAD_DISTRIBUTION_HEADERS_T.STATUS%TYPE NULL ;

Input

```
CREATE OR REPLACE FUNCTION CONTRACT_DISTRIBUTE_STATUS_S2(PI_CONTRACT_NUMBER IN
VARCHAR2)
RETURN VARCHAR2 IS
L_CONTRACT_DISTRIBUTE_STATUS BAS_SUBTYPE_PKG.STATUS NULL;

BEGIN

FOR CUR_CONTRACT IN (SELECT HT.CONTRACT_STATUS
FROM SAD_CONTRACTS_V HT
WHERE HT.HTH = PI_CONTRACT_NUMBER)
LOOP
IF CUR_CONTRACT.CONTRACT_STATUS = 0 THEN
L_CONTRACT_DISTRIBUTE_STATUS := 'Cancel';
ELSE
L_CONTRACT_DISTRIBUTE_STATUS := BAS_SUBTYPE_PKG.G_HEADER_WAITING_SPLIT_STATUS;
END IF;
END LOOP;

RETURN L_CONTRACT_DISTRIBUTE_STATUS;

END CONTRACT_DISTRIBUTE_STATUS_S2;
/
```

Output

```
CREATE OR REPLACE FUNCTION CONTRACT_DISTRIBUTE_STATUS_S2
( PI_CONTRACT_NUMBER IN VARCHAR2 )
RETURN VARCHAR2
PACKAGE
IS
L_CONTRACT_DISTRIBUTE_STATUS BAS_SUBTYPE_PKG.STATUS /*NULL*/;
BEGIN
FOR CUR_CONTRACT IN ( SELECT HT.CONTRACT_STATUS
FROM SAD_CONTRACTS_V HT
WHERE HT.HTH = PI_CONTRACT_NUMBER )
LOOP
IF CUR_CONTRACT.CONTRACT_STATUS = 0 THEN
L_CONTRACT_DISTRIBUTE_STATUS := 'Cancel' ;

ELSE
L_CONTRACT_DISTRIBUTE_STATUS := BAS_SUBTYPE_PKG.G_HEADER_WAITING_SPLIT_STATUS ;

END IF ;

END LOOP ;

RETURN L_CONTRACT_DISTRIBUTE_STATUS ;
END ;
/
```

NO INDEX CREATED

If the **INDEX** or **STORAGE** parameter is used in **ALTER TABLE**, delete the parameter. Add constraints to **CREATE TABLE**.

Input - PRIMARY KEY

```
CREATE TABLE CTP_ARM_CONFIG
( HOSTNAME VARCHAR2(50),
```

```

OPNAME VARCHAR2(50),
PARAMTYPE VARCHAR2(2),
PARAMVALUE NUMBER(*,0),
MODIFYDATE DATE
) SEGMENT CREATION DEFERRED
PCTFREE 10 PCTUSED 0 INITRANS 1 MAXTRANS 255
NOCOMPRESS LOGGING
STORAGE( PCTINCREASE 0
BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)
TABLESPACE SPMS_DATA ;
ALTER TABLE CTP_ARM_CONFIG ADD CONSTRAINT PKCTP_ARM_CONFIG PRIMARY KEY
(HOSTNAME, OPNAME)
USING INDEX PCTFREE 10 INITRANS 2 MAXTRANS 255 COMPUTE STATISTICS
STORAGE( PCTINCREASE 0
BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)
TABLESPACE SPMS_DATA ENABLE;
    
```

Output

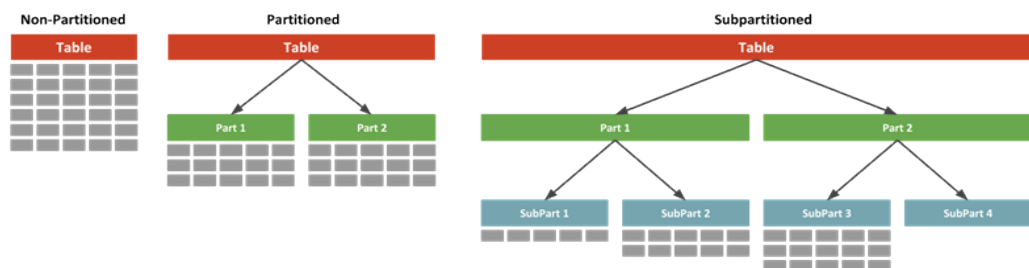
```

CREATE TABLE
CTP_ARM_CONFIG (
HOSTNAME VARCHAR2 (50)
,OPNAME VARCHAR2 (50)
,PARAMTYPE VARCHAR2 (2)
,PARAMVALUE NUMBER (
38
,0
)
,MODIFYDATE DATE
,CONSTRAINT PKCTP_ARM_CONFIG PRIMARY KEY (
HOSTNAME
,OPNAME
)
) /*SEGMENT CREATION DEFERRED*/
/*PCTFREE 10*/
/*PCTUSED 0*/
/*INITRANS 1*/
/*MAXTRANS 255*/
/*NOCOMPRESS*/
/*LOGGING*/
/*STORAGE( BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE
DEFAULT)*/
/*TABLESPACE SPMS_DATA */
;
    
```

PARTITIONS

Maintenance of large tables and indexes can become very time and resource consuming. At the same time, data access performance can reduce drastically for these objects. Partitioning of tables and indexes can benefit the performance and maintenance in several ways.

Figure 6-6 Partitioning and sub-partitioning of tables



DSC supports migration of range partition.

The tool does not support the following partitions/subpartitions and these are commented in the migrated scripts:

- List partition
- Hash partition
- Range subpartition
- List subpartition
- Hash subpartition

The unsupported partitions/subpartitions may be supported in the future. Configuration parameters have been provided to enable/disable commenting of the unsupported statements. For details, see [Configuration Parameters for Oracle Features](#).

- **PARTITION BY HASH**

Hash partitioning is a partitioning technique where a hash algorithm is used to distribute rows evenly across the different partitions (sub-tables). This is typically used where ranges are not appropriate, for example employee ID, product ID, and so on. DSC does not support PARTITION and SUBPARTITION by HASH and will comment these statements.

Input - HASH PARTITION

```
CREATE TABLE dept (deptno NUMBER, deptname VARCHAR(32)) PARTITION BY HASH(deptno)
PARTITIONS 16;
```

Output

```
CREATE TABLE dept ( deptno NUMBER ,deptname VARCHAR( 32 ) ) /* PARTITION BY HASH(deptno)
PARTITIONS 16 */ ;
```

Input - HASH PARTITION without partition names

```
CREATE TABLE dept (deptno NUMBER, deptname VARCHAR(32))
PARTITION BY HASH(deptno) PARTITIONS 16;
```

Output

```
CREATE TABLE dept (deptno NUMBER, deptname VARCHAR(32))
/* PARTITION BY HASH(deptno) PARTITIONS 16 */;
```

Input - HASH SUBPARTITION

```
CREATE TABLE sales
( prod_id NUMBER(6)
, cust_id NUMBER
, time_id DATE
, channel_id CHAR(1)
, promo_id NUMBER(6)
, quantity_sold NUMBER(3)
, amount_sold NUMBER(10,2)
)
PARTITION BY RANGE (time_id) SUBPARTITION BY HASH (cust_id)
SUBPARTITIONS 8STORE IN (ts1, ts2, ts3, ts4)
( PARTITION sales_q1_2006 VALUES LESS THAN (TO_DATE('01-APR-2006','dd-MON-yyyy'))
, PARTITION sales_q2_2006 VALUES LESS THAN (TO_DATE('01-JUL-2006','dd-MON-yyyy'))
, PARTITION sales_q3_2006 VALUES LESS THAN (TO_DATE('01-OCT-2006','dd-MON-yyyy'))
, PARTITION sales_q4_2006 VALUES LESS THAN (TO_DATE('01-JAN-2007','dd-MON-yyyy'))
);
```

Output

```
CREATE TABLE sales
( prod_id NUMBER(6)
, cust_id NUMBER
, time_id DATE
```

```

, channel_id CHAR(1)
, promo_id NUMBER(6)
, quantity_sold NUMBER(3)
, amount_sold NUMBER(10,2)
)
PARTITION BY RANGE (time_id) /*SUBPARTITION BY HASH (cust_id)
SUBPARTITIONS 8 STORE IN (ts1, ts2, ts3, ts4) */
( PARTITION sales_q1_2006 VALUES LESS THAN (TO_DATE('01-APR-2006','dd-MON-yyyy'))
, PARTITION sales_q2_2006 VALUES LESS THAN (TO_DATE('01-JUL-2006','dd-MON-yyyy'))
, PARTITION sales_q3_2006 VALUES LESS THAN (TO_DATE('01-OCT-2006','dd-MON-yyyy'))
, PARTITION sales_q4_2006 VALUES LESS THAN (TO_DATE('01-JAN-2007','dd-MON-yyyy'))
);

```

- **PARTITION BY LIST**

List partitioning is a partitioning technique where you specify a list of discrete values for the partitioning key in the description for each partition. DSC does not support PARTITION and SUBPARTITION by LIST and will comment these statements.

Input - LIST PARTITION

```

CREATE TABLE sales_by_region (item# INTEGER, qty INTEGER, store_name VARCHAR(30), state_code
VARCHAR(2), sale_date DATE) STORAGE(INITIAL 10K NEXT 20K) TABLESPACE tbs5 PARTITION BY
LIST (state_code) ( PARTITION region_east VALUES ('MA','NY','CT','NH','ME','MD','VA','PA','NJ')
STORAGE (INITIAL 8M) TABLESPACE tbs8, PARTITION region_west VALUES
('CA','AZ','NM','OR','WA','UT','NV','CO') NOLOGGING, PARTITION region_south VALUES
('TX','KY','TN','LA','MS','AR','AL','GA'), PARTITION region_central VALUES
('OH','ND','SD','MO','IL','MI','IA'), PARTITION region_null VALUES (NULL), PARTITION region_unknown
VALUES (DEFAULT) );

```

Output

```

CREATE UNLOGGED TABLE sales_by_region ( item# INTEGER ,qty INTEGER ,store_name
VARCHAR( 30 ) ,state_code VARCHAR( 2 ) ,sale_date DATE ) TABLESPACE tbs5 /* PARTITION BY
LIST(state_code)(PARTITION region_east VALUES('MA','NY','CT','NH','ME','MD','VA','PA','NJ')
TABLESPACE tbs8, PARTITION region_west VALUES('CA','AZ','NM','OR','WA','UT','NV','CO') , PARTITION
region_south VALUES('TX','KY','TN','LA','MS','AR','AL','GA'), PARTITION region_central
VALUES('OH','ND','SD','MO','IL','MI','IA'), PARTITION region_null VALUES(NULL), PARTITION
region_unknown VALUES(DEFAULT) ) */ ;

```

Input - LIST PARTITION (With Storage Parameters)

```

CREATE TABLE store_master
( Store_id NUMBER
, Store_address VARCHAR2 (40)
, City VARCHAR2 (30)
, State VARCHAR2 (2)
, zip VARCHAR2 (10)
, manager_id NUMBER
)
/*TABLESPACE users*/
STORAGE ( INITIAL 100 k NEXT 100 k
PCTINCREASE 0 )
PARTITION BY LIST (city)
( PARTITION south_florida
VALUES ( 'MIA', 'ORL' )
/*TABLESPACE users*/
STORAGE ( INITIAL 100 k NEXT 100
k PCTINCREASE 0 )
, PARTITION north_florida
VALUES ( 'JAC', 'TAM', 'PEN' )
/*TABLESPACE users*/
STORAGE ( INITIAL 100 k NEXT 100
k PCTINCREASE 0 )
, PARTITION south_georgia VALUES
( 'BRU', 'WAY', 'VAL' )
/*TABLESPACE users*/
STORAGE ( INITIAL 100 k NEXT 100
k PCTINCREASE 0 )
, PARTITION north_georgia

```



```
VALUES ( 'ATL', 'SAV', NULL )  
);
```

Output

```
CREATE TABLE store_master  
  ( Store_id NUMBER  
  , Store_address VARCHAR2 (40)  
  , City VARCHAR2 (30)  
  , State VARCHAR2 (2)  
  , zip VARCHAR2 (10)  
  , manager_id NUMBER  
  )  
/*TABLESPACE users*/  
STORAGE ( INITIAL 100 k NEXT 100 k );
```

Input - LIST PARTITIONED TABLE from another TABLE

```
CREATE TABLE tab1_list  
  PARTITION BY LIST (col1)  
  ( partition part1 VALUES ( 1 )  
  , partition part2 VALUES ( 2,  
  3, 4 )  
  , partition part3 VALUES  
  (DEFAULT)  
  )  
AS  
SELECT *  
FROM tab1;
```

Output

```
CREATE TABLE tab1_list  
AS  
( SELECT *  
FROM tab1 );
```

Input - LIST PARTITION with SUBPARTITIONS

```
CREATE TABLE big_t_list PARTITION BY LIST(n10) (partition part1 VALUES (1) ,partition part2 VALUES  
(2,3,4) ,partition part3 VALUES (DEFAULT)) AS SELECT * FROM big_t;
```

Output

```
CREATE TABLE big_t_list /* PARTITION BY LIST(n10)(partition part1 VALUES(1) ,partition part2  
VALUES(2,3,4) ,partition part3 VALUES(DEFAULT)) */ AS ( SELECT * FROM big_t );
```

Input - LIST PARTITION with SUBPARTITION TEMPLATE

```
CREATE TABLE q1_sales_by_region  
  ( deptno NUMBER  
  , deptname varchar2 (20)  
  , quarterly_sales NUMBER  
  (10,2)  
  , state varchar2 (2)  
  )  
PARTITION BY LIST (state)  
SUBPARTITION BY RANGE  
(quarterly_sales)  
SUBPARTITION TEMPLATE  
( SUBPARTITION original VALUES  
LESS THAN (1001)  
  , SUBPARTITION acquired VALUES  
LESS THAN (8001)  
  , SUBPARTITION recent VALUES  
LESS THAN (MAXVALUE)  
  )  
( PARTITION q1_northwest VALUES  
( 'OR', 'WA' )  
  , PARTITION q1_southwest VALUES  
( 'AZ', 'UT', 'NM' )  
  , PARTITION q1_northeast VALUES  
( 'NY', 'VM', 'NJ' )  
  , PARTITION q1_southcentral VALUES  
( 'OK', 'TX' )  
  );
```

Output

```
CREATE TABLE q1_sales_by_region
  ( deptno NUMBER
    , deptname varchar2 (20)
    , quarterly_sales NUMBER (10,2)
    , state varchar2 (2)
  );
```

- **PARTITION BY RANGE**

Range partitioning is a partitioning technique where ranges of data is stored separately in different sub-tables. Range partitioning is useful when you have distinct ranges of data you want to store together, for example the date field. DSC supports PARTITION by RANGE. It does not support SUBPARTITION by RANGE and will comment these statements.

Input - RANGE PARTITION (With STORAGE Parameters)

```
CREATE
TABLE
  CCM_TA550002_H (
    STRU_ID VARCHAR2 (10)
    ,ORGAN1_NO VARCHAR2 (10)
    ,ORGAN2_NO VARCHAR2 (10)
  ) partition BY range (ORGAN2_NO) (
    partition CCM_TA550002_01
      VALUES LESS than ('00100') /* TABLESPACE users */
      /*pctfree 10*/
      /*initrans 1*/
      /*storage(initial 256 K NEXT 256 K minextents 1 maxextents unlimited )*/
    ,partition CCM_TA550002_02
      VALUES LESS than ('00200') /* TABLESPACE users */
      /*pctfree 10*/
      /*initrans 1*/
      /* storage ( initial 256 K NEXT
256K minextents 1
maxextents unlimited
pctincrease 0 )*/
```

Output

```
CREATE TABLE CCM_TA550002_H
  ( STRU_ID VARCHAR2 (10)
    , ORGAN1_NO VARCHAR2 (10)
    , ORGAN2_NO VARCHAR2 (10)
  )
  partition BY range (ORGAN2_NO)
    ( partition CCM_TA550002_01 VALUES LESS
      than ('00100')
      /*TABLESPACE users*/
    , partition CCM_TA550002_02 VALUES LESS
      than ('00200')
      /*TABLESPACE users*/
  );
```

Input - RANGE PARTITION with SUBPARTITIONS

```
CREATE TABLE composite_rng_list (
  cust_id NUMBER(10),
  cust_name VARCHAR2(25),
  cust_state VARCHAR2(2),
  time_id DATE)
PARTITION BY RANGE(time_id)
SUBPARTITION BY LIST (cust_state)
SUBPARTITION TEMPLATE(
  SUBPARTITION west VALUES ('OR', 'WA') TABLESPACE part1,
  SUBPARTITION east VALUES ('NY', 'CT') TABLESPACE part2,
  SUBPARTITION cent VALUES ('OK', 'TX') TABLESPACE part3) (
  PARTITION per1 VALUES LESS THAN (TO_DATE('01/01/2000','DD/MM/YYYY')),
  PARTITION per2 VALUES LESS THAN (TO_DATE('01/01/2005','DD/MM/YYYY')),
  PARTITION per3 VALUES LESS THAN (TO_DATE('01/01/2010','DD/MM/YYYY')),
  PARTITION future VALUES LESS THAN(MAXVALUE));
```

Output

```
CREATE TABLE composite_rng_list (  
  cust_id NUMBER(10),  
  cust_name VARCHAR2(25),  
  cust_state VARCHAR2(2),  
  time_id DATE)  
PARTITION BY RANGE(time_id)  
/*SUBPARTITION BY LIST (cust_state)  
SUBPARTITION TEMPLATE(  
  SUBPARTITION west VALUES ('OR', 'WA') TABLESPACE part1,  
  SUBPARTITION east VALUES ('NY', 'CT') TABLESPACE part2,  
  SUBPARTITION cent VALUES ('OK', 'TX') TABLESPACE part3)*/ (  
  PARTITION per1 VALUES LESS THAN (TO_DATE('01/01/2000','DD/MM/YYYY')),  
  PARTITION per2 VALUES LESS THAN (TO_DATE('01/01/2005','DD/MM/YYYY')),  
  PARTITION per3 VALUES LESS THAN (TO_DATE('01/01/2010','DD/MM/YYYY')),  
  PARTITION future VALUES LESS THAN(MAXVALUE));
```

Input - RANGE PARTITION with SUBPARTITION TEMPLATE

```
CREATE TABLE composite_rng_rng (  
  cust_id NUMBER(10),  
  cust_name VARCHAR2(25),  
  cust_state VARCHAR2(2),  
  time_id DATE)  
PARTITION BY RANGE(time_id)  
SUBPARTITION BY RANGE (cust_id)  
SUBPARTITION TEMPLATE(  
  SUBPARTITION original VALUES LESS THAN (1001) TABLESPACE part1,  
  SUBPARTITION acquired VALUES LESS THAN (8001) TABLESPACE part2,  
  SUBPARTITION recent VALUES LESS THAN (MAXVALUE) TABLESPACE part3) (  
  PARTITION per1 VALUES LESS THAN (TO_DATE('01/01/2000','DD/MM/YYYY')),  
  PARTITION per2 VALUES LESS THAN (TO_DATE('01/01/2005','DD/MM/YYYY')),  
  PARTITION per3 VALUES LESS THAN (TO_DATE('01/01/2010','DD/MM/YYYY')),  
  PARTITION future VALUES LESS THAN (MAXVALUE));
```

Output

```
CREATE TABLE composite_rng_rng (  
  cust_id NUMBER(10),  
  cust_name VARCHAR2(25),  
  cust_state VARCHAR2(2),  
  time_id DATE)  
PARTITION BY RANGE(time_id)  
/*SUBPARTITION BY RANGE (cust_id)  
SUBPARTITION TEMPLATE(  
  SUBPARTITION original VALUES LESS THAN (1001) TABLESPACE part1,  
  SUBPARTITION acquired VALUES LESS THAN (8001) TABLESPACE part2,  
  SUBPARTITION recent VALUES LESS THAN (MAXVALUE) TABLESPACE part3)*/ (  
  PARTITION per1 VALUES LESS THAN (TO_DATE('01/01/2000','DD/MM/YYYY')),  
  PARTITION per2 VALUES LESS THAN (TO_DATE('01/01/2005','DD/MM/YYYY')),  
  PARTITION per3 VALUES LESS THAN (TO_DATE('01/01/2010','DD/MM/YYYY')),  
  PARTITION future VALUES LESS THAN (MAXVALUE));
```

PRIMARY KEY/UNIQUE Constraint for Partitioned Table

If the CREATE TABLE statement contains range/hash/list partitioning, the following error is reported:

Invalid PRIMARY KEY/UNIQUE constraint for partitioned table

Note: Columns of the PRIMARY KEY/UNIQUE constraint must contain PARTITION KEY.

Scripts : wo_integrate_log_t.sql, wo_change_log_t.sql

Input:

```
create table SD_WO.WO_INTEGRATE_LOG_T  
(  
  LOG_ID NUMBER not null,  
  PROJECT_NUMBER VARCHAR2(40),  
  MESSAGE_ID VARCHAR2(100),  
  BUSINESS_ID VARCHAR2(100),
```

```
BUSINESS_TYPE VARCHAR2(100),
INTEGRATE_CONTENT CLOB,
OPERATION_RESULT VARCHAR2(100),
FAILED_MSG VARCHAR2(4000),
HOST_NAME VARCHAR2(100) not null,
CREATED_BY NUMBER not null,
CREATION_DATE DATE not null,
LAST_UPDATED_BY NUMBER not null,
LAST_UPDATE_DATE DATE not null,
SOURCE_CODE VARCHAR2(100),
TENANT_ID NUMBER
)
partition by range (CREATION_DATE)
(
partition P2018 values less than (TO_DATE(' 2018-10-01 00:00:00', 'YYYY-MM-DD HH24:MI:SS',
'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P53873 values less than (TO_DATE(' 2018-11-01 00:00:00', 'YYYY-MM-DD HH24:MI:SS',
'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P104273 values less than (TO_DATE(' 2018-12-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P105533 values less than (TO_DATE(' 2019-01-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P108153 values less than (TO_DATE(' 2019-02-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P127173 values less than (TO_DATE(' 2019-03-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P130313 values less than (TO_DATE(' 2019-04-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA
);
alter table SD_WO.WO_INTEGRATE_LOG_T
add constraint WO_INTEGRATE_LOG_PK primary key (LOG_ID);
create index SD_WO.WO_INTEGRATE_LOG_N1 on SD_WO.WO_INTEGRATE_LOG_T (BUSINESS_ID);
create index SD_WO.WO_INTEGRATE_LOG_N2 on SD_WO.WO_INTEGRATE_LOG_T (CREATION_DATE,
BUSINESS_TYPE);
create index SD_WO.WO_INTEGRATE_LOG_N3 on SD_WO.WO_INTEGRATE_LOG_T
(PROJECT_NUMBER, BUSINESS_TYPE);
```

Output:

```
CREATE
TABLE
SD_WO.WO_INTEGRATE_LOG_T (
LOG_ID NUMBER NOT NULL
,PROJECT_NUMBER VARCHAR2 (40)
,MESSAGE_ID VARCHAR2 (100)
,BUSINESS_ID VARCHAR2 (100)
,BUSINESS_TYPE VARCHAR2 (100)
,INTEGRATE_CONTENT CLOB
,OPERATION_RESULT VARCHAR2 (100)
,FAILED_MSG VARCHAR2 (4000)
,HOST_NAME VARCHAR2 (100) NOT NULL
,CREATED_BY NUMBER NOT NULL
,CREATION_DATE DATE NOT NULL
,LAST_UPDATED_BY NUMBER NOT NULL
,LAST_UPDATE_DATE DATE NOT NULL
,SOURCE_CODE VARCHAR2 (100)
,TENANT_ID NUMBER
,CONSTRAINT WO_INTEGRATE_LOG_PK PRIMARY KEY (LOG_ID)
) partition BY range (CREATION_DATE) (
partition P2018
VALUES LESS than (
TO_DATE(' 2018-10-01 00:00:00', 'YYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN') /
) /* tablespace SDWO_DATA */
,partition SYS_P53873
```

```
VALUES LESS than (
TO_DATE( ' 2018-11-01 00:00:00' , 'YYYY-MM-DD HH24:MI:SS'/*, 'NLS_CALENDAR=GREGORIAN'*/ )
) /* tablespace SDWO_DATA */
,partition SYS_P104273
VALUES LESS than (
TO_DATE( ' 2018-12-01 00:00:00' , 'YYYY-MM-DD HH24:MI:SS'/*, 'NLS_CALENDAR=GREGORIAN'*/ )
) /* tablespace SDWO_DATA */
,partition SYS_P105533
VALUES LESS than (
TO_DATE( ' 2019-01-01 00:00:00' , 'YYYY-MM-DD HH24:MI:SS'/*, 'NLS_CALENDAR=GREGORIAN'*/ )
) /* tablespace SDWO_DATA */
,partition SYS_P108153
VALUES LESS than (
TO_DATE( ' 2019-02-01 00:00:00' , 'YYYY-MM-DD HH24:MI:SS'/*, 'NLS_CALENDAR=GREGORIAN'*/ )
) /* tablespace SDWO_DATA */
,partition SYS_P127173
VALUES LESS than (
TO_DATE( ' 2019-03-01 00:00:00' , 'YYYY-MM-DD HH24:MI:SS'/*, 'NLS_CALENDAR=GREGORIAN'*/ )
) /* tablespace SDWO_DATA */
,partition SYS_P130313
VALUES LESS than (
TO_DATE( ' 2019-04-01 00:00:00' , 'YYYY-MM-DD HH24:MI:SS'/*, 'NLS_CALENDAR=GREGORIAN'*/ )
) /* tablespace SDWO_DATA */
);
CREATE
index WO_INTEGRATE_LOG_N1
ON SD_WO.WO_INTEGRATE_LOG_T (BUSINESS_ID) LOCAL ;
CREATE
index WO_INTEGRATE_LOG_N2
ON SD_WO.WO_INTEGRATE_LOG_T (
CREATION_DATE
,BUSINESS_TYPE
) LOCAL ;
CREATE
index WO_INTEGRATE_LOG_N3
ON SD_WO.WO_INTEGRATE_LOG_T (
PROJECT_NUMBER
,BUSINESS_TYPE
) LOCAL ;
```

Input:

```
create table SD_WO.WO_INTEGRATE_LOG_T
(
LOG_ID          NUMBER not null,
PROJECT_NUMBER  VARCHAR2(40),
MESSAGE_ID     VARCHAR2(100),
BUSINESS_ID    VARCHAR2(100),
BUSINESS_TYPE  VARCHAR2(100),
INTEGRATE_CONTENT CLOB,
OPERATION_RESULT VARCHAR2(100),
FAILED_MSG     VARCHAR2(4000),
HOST_NAME     VARCHAR2(100) not null,
CREATED_BY    NUMBER not null,
CREATION_DATE  DATE not null,
LAST_UPDATED_BY NUMBER not null,
LAST_UPDATE_DATE DATE not null,
SOURCE_CODE   VARCHAR2(100),
TENANT_ID     NUMBER
)
partition by range (CREATION_DATE)
(
partition P2018 values less than (TO_DATE(' 2018-10-01 00:00:00', 'YYYY-MM-DD HH24:MI:SS',
'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P53873 values less than (TO_DATE(' 2018-11-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P104273 values less than (TO_DATE(' 2018-12-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
```

```
partition SYS_P105533 values less than (TO_DATE(' 2019-01-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P108153 values less than (TO_DATE(' 2019-02-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P127173 values less than (TO_DATE(' 2019-03-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P130313 values less than (TO_DATE(' 2019-04-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA
);

alter table SD_WO.WO_INTEGRATE_LOG_T
add constraint WO_INTEGRATE_LOG_PK primary key (LOG_ID);
create index SD_WO.WO_INTEGRATE_LOG_N1 on SD_WO.WO_INTEGRATE_LOG_T (BUSINESS_ID);
create index SD_WO.WO_INTEGRATE_LOG_N2 on SD_WO.WO_INTEGRATE_LOG_T (CREATION_DATE,
BUSINESS_TYPE);
create index SD_WO.WO_INTEGRATE_LOG_N3 on SD_WO.WO_INTEGRATE_LOG_T
(PROJECT_NUMBER, BUSINESS_TYPE);
```

Output:

```
create table SD_WO.WO_INTEGRATE_LOG_T
(
LOG_ID          NUMBER not null,
PROJECT_NUMBER  VARCHAR2(40),
MESSAGE_ID      VARCHAR2(100),
BUSINESS_ID     VARCHAR2(100),
BUSINESS_TYPE   VARCHAR2(100),
INTEGRATE_CONTENT CLOB,
OPERATION_RESULT VARCHAR2(100),
FAILED_MSG      VARCHAR2(4000),
HOST_NAME       VARCHAR2(100) not null,
CREATED_BY      NUMBER not null,
CREATION_DATE   DATE not null,
LAST_UPDATED_BY NUMBER not null,
LAST_UPDATE_DATE DATE not null,
SOURCE_CODE     VARCHAR2(100),
TENANT_ID       NUMBER
)
partition by range (CREATION_DATE)
(
partition P2018 values less than (TO_DATE(' 2018-10-01 00:00:00', 'YYYY-MM-DD HH24:MI:SS',
'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P53873 values less than (TO_DATE(' 2018-11-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P104273 values less than (TO_DATE(' 2018-12-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P105533 values less than (TO_DATE(' 2019-01-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P108153 values less than (TO_DATE(' 2019-02-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P127173 values less than (TO_DATE(' 2019-03-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA,
partition SYS_P130313 values less than (TO_DATE(' 2019-04-01 00:00:00', 'YYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
tablespace SDWO_DATA
);

alter table SD_WO.WO_INTEGRATE_LOG_T
add constraint WO_INTEGRATE_LOG_PK primary key (LOG_ID);
create index SD_WO.WO_INTEGRATE_LOG_N1 on SD_WO.WO_INTEGRATE_LOG_T (BUSINESS_ID);
create index SD_WO.WO_INTEGRATE_LOG_N2 on SD_WO.WO_INTEGRATE_LOG_T (CREATION_DATE,
```

```
BUSINESS_TYPE);
create index SD_WO.WO_INTEGRATE_LOG_N3 on SD_WO.WO_INTEGRATE_LOG_T
(PROJECT_NUMBER, BUSINESS_TYPE);
```

Data Type

Remove the BYTE keyword from the data type.

Oracle Syntax	Syntax After Migration
<pre>CREATE TABLE BL_ORACLE (ID Number, Name VARCHAR2(100 BYTE), ADDRESS VARCHAR2(200 BYTE));</pre>	<pre>CREATE TABLE TBL_ORACLE (ID NUMBER ,Name VARCHAR2 (100) ,ADDRESS VARCHAR2 (200));</pre>

Partition (Comment Partition)

In configuration parameter for oracle "#Unique or primary key constraint for partitioned table" to comment_partition.

Oracle Syntax	Syntax After Migration
<pre>CREATE TABLE TBL_ORACLE (ID Number, Name VARCHAR2(100 BYTE), ADDRESS VARCHAR2(200 BYTE)) TABLESPACE space1 PCTUSED 40 PCTFREE 0 INITRANS 1 MAXTRANS 255 NOLOGGING PARTITION BY RANGE (ID) (PARTITION PART_2010 VALUES LESS THAN (10) NOLOGGING, PARTITION PART_2011 VALUES LESS THAN (20) NOLOGGING , PARTITION PART_2012 VALUES LESS THAN (MAXVALUE) NOLOGGING) ENABLE ROW MOVEMENT; ALTER TABLE TBL_ORACLE ADD CONSTRAINT SAMPLE_PK PRIMARY KEY (ID);</pre>	<pre>CREATE UNLOGGED TABLE TBL_ORACLE (ID NUMBER ,Name VARCHAR2 (100) ,ADDRESS VARCHAR2 (200) ,CONSTRAINT SAMPLE_PK PRIMARY KEY (ID)) TABLESPACE space1 /*PCTUSED 40*/ PCTFREE 0 INITRANS 1 MAXTRANS 255 /* PARTITION BY RANGE(ID)(PARTITION PART_2010 VALUES LESS THAN(10) , PARTITION PART_2011 VALUES LESS THAN(20) , PARTITION PART_2012 VALUES LESS THAN(MAXVALUE)) ENABLE ROW MOVEMENT */ ;</pre>

Partition (Comment Constraint)

In configuration parameter for oracle "#Unique or primary key constraint for partitioned table" to comment_unique.

Oracle Syntax	Syntax After Migration
<pre>CREATE TABLE TBL_ORACLE (ID Number, Name VARCHAR2(100 BYTE), ADDRESS VARCHAR2(200 BYTE)) TABLESPACE space1 PCTUSED 40 PCTFREE 0 INITRANS 1 MAXTRANS 255 NOLOGGING PARTITION BY RANGE (ID) (PARTITION PART_2010 VALUES LESS THAN (10) NOLOGGING, PARTITION PART_2011 VALUES LESS THAN (20) NOLOGGING , PARTITION PART_2012 VALUES LESS THAN (MAXVALUE) NOLOGGING) ENABLE ROW MOVEMENT; ALTER TABLE TBL_ORACLE ADD CONSTRAINT SAMPLE_PK PRIMARY KEY (ID);</pre>	<pre>CREATE UNLOGGED TABLE TBL_ORACLE (ID NUMBER ,Name VARCHAR2 (100) ,ADDRESS VARCHAR2 (200) /*,CONSTRAINT SAMPLE_PK PRIMARY KEY (ID)*/) TABLESPACE space1 /*PCTUSED 40*/ PCTFREE 0 INITRANS 1 MAXTRANS 255 PARTITION BY RANGE (ID) (PARTITION PART_2010 VALUES LESS THAN (10) ,PARTITION PART_2011 VALUES LESS THAN (20) ,PARTITION PART_2012 VALUES LESS THAN (MAXVALUE)) ENABLE ROW MOVEMENT ;</pre>

Partition (I)

Comment ALTER TABLE TRUNCATE PARTITION for non-partitioned tables.

Oracle Syntax	Syntax After Migration
<pre>CREATE TABLE product_range (product_id VARCHAR2(20), Product_Name VARCHAR2(50), Year_Manufacture DATE) partition by range (Year_Manufacture) (partition Year_Manufacture values less than (TO_DATE(' 2007-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS')) pctfree 10 initrans 1); CREATE TABLE product_list (product_id VARCHAR2(20), Product_Name VARCHAR2(50), Year_Manufacture VARCHAR2(10)) partition by list (Year_Manufacture) (partition P_2020 VALUES (2020) pctfree 10 initrans 1); CREATE OR REPLACE PROCEDURE Range_test IS V_ID VARCHAR2(10); BEGIN EXECUTE IMMEDIATE 'ALTER TABLE product TRUNCATE PARTITION PART' V_ID; NULL; END; / CREATE OR REPLACE PROCEDURE List_test IS V_ID VARCHAR2(10); BEGIN EXECUTE IMMEDIATE 'ALTER TABLE product TRUNCATE PARTITION PART' V_ID; NULL; END; /</pre>	<pre>CREATE TABLE product_range (product_id VARCHAR2(20), Product_Name VARCHAR2(50), Year_Manufacture DATE) partition by range (Year_Manufacture) (partition Year_Manufacture values less than (TO_DATE(' 2007-01-01 00:00:00', 'SYYYY-MM-DD HH24:MI:SS')) pctfree 10 initrans 1); CREATE TABLE product_list (product_id VARCHAR2(20), Product_Name VARCHAR2(50), Year_Manufacture VARCHAR2(10)) /*partition by list (Year_Manufacture) (partition P_2020 VALUES (2020) pctfree 10 initrans 1)*/; CREATE OR REPLACE PROCEDURE Range_test IS V_ID VARCHAR2(10); BEGIN EXECUTE IMMEDIATE 'ALTER TABLE product TRUNCATE PARTITION PART' V_ID; NULL; END; / CREATE OR REPLACE PROCEDURE List_test IS V_ID VARCHAR2(10); BEGIN /*EXECUTE IMMEDIATE 'ALTER TABLE product TRUNCATE PARTITION PART' V_ID;*/ NULL; END; /</pre>

Partition (II)

Delete data for ALTER TABLE TRUNCATE PARTITION for non-partitioned tables.

Oracle Syntax	Syntax After Migration
<pre>CREATE TABLE product_list (product_id VARCHAR2(20), Product_Name VARCHAR2(50), Year_Manufacture VARCHAR2(10)) partition by list (Year_Manufacture) (partition PART_2015 VALUES (2011,2012,2013,2014,2015) pctfree 10 initrans 1 , partition PART_2016 VALUES (2016) pctfree 10 initrans 1 , partition PART_2017 VALUES (2017) pctfree 10 initrans 1 , partition PART_2018 VALUES (2018) pctfree 10 initrans 1 , partition PART_2019 VALUES (2019) pctfree 10 initrans 1 , partition PART_2020 VALUES (2020) pctfree 10 initrans 1 , PARTITION PART_unknown VALUES (DEFAULT)); CREATE OR REPLACE PROCEDURE List_test IS V_ID VARCHAR2(10); BEGIN EXECUTE IMMEDIATE 'ALTER TABLE product_list TRUNCATE PARTITION PART_2020; NULL; END; / CREATE OR REPLACE PROCEDURE List_test IS V_ID VARCHAR2(10); BEGIN EXECUTE IMMEDIATE 'ALTER TABLE product_list TRUNCATE PARTITION PART_' V_ID; NULL; END; /</pre>	<pre>CREATE TABLE product_list (product_id VARCHAR2(20), Product_Name VARCHAR2(50), Year_Manufacture VARCHAR2(10)) /*partition by list (Year_Manufacture) (partition PART_2015 VALUES (2011,2012,2013,2014,2015) pctfree 10 initrans 1 , partition PART_2016 VALUES (2016) pctfree 10 initrans 1 , partition PART_2017 VALUES (2017) pctfree 10 initrans 1 , partition PART_2018 VALUES (2018) pctfree 10 initrans 1 , partition PART_2019 VALUES (2019) pctfree 10 initrans 1 , partition PART_2020 VALUES (2020) pctfree 10 initrans 1 , PARTITION PART_unknown VALUES (DEFAULT))*/; CREATE OR REPLACE PROCEDURE List_test IS V_ID VARCHAR2(10); BEGIN EXECUTE IMMEDIATE 'ALTER TABLE product_list TRUNCATE PARTITION PART_' V_ID; NULL; END; / CREATE OR REPLACE PROCEDURE List_test IS V_ID VARCHAR2(10); BEGIN /* EXECUTE IMMEDIATE 'ALTER TABLE product_list TRUNCATE PARTITION PART_' V_ID; */ IF 'PART_' V_ID = 'PART_2015' THEN DELETE FROM product_list WHERE Year_Manufacture IN (2011,2012,2013,2014,2015); ELSIF 'PART_' V_ID = 'PART_2016' THEN DELETE FROM product_list WHERE Year_Manufacture IN (2016); ELSIF 'PART_' V_ID = 'PART_2017' THEN DELETE FROM product_list WHERE Year_Manufacture IN (2017); ELSIF 'PART_' V_ID = 'PART_2018' THEN DELETE FROM product_list WHERE Year_Manufacture IN (2018); ELSIF 'PART_' V_ID = 'PART_2019' THEN DELETE FROM product_list WHERE Year_Manufacture IN (2019); ELSIF 'PART_' V_ID = 'PART_2020' THEN DELETE FROM product_list WHERE Year_Manufacture IN (2020); ELSE DELETE FROM product_list WHERE Year_Manufacture NOT IN (2011,2012,2013,2014,2015,2016,2017,2018,2019,2020); END IF; NULL;</pre>

Oracle Syntax	Syntax After Migration
	END; /

SEGMENT CREATION

SEGMENT CREATION { IMMEDIATE | DEFERRED } is not supported in Gauss, hence it is commented in the migrated output. This is based on the following configuration item: **commentStorageParameter=true**.

Input - TABLE with SEGMENT CREATION

```
CREATE TABLE T1
  ( MESSAGE_CODE VARCHAR2(50),
  MAIL_TITLE VARCHAR2(1000),
  MAIL_BODY VARCHAR2(1000),
  MAIL_ADDRESS VARCHAR2(1000),
  MAIL_ADDRESS_CC VARCHAR2(1000)
  ) SEGMENT CREATION DEFERRED
  PCTFREE 10 PCTUSED 0 INITRANS 1 MAXTRANS 255
  NOCOMPRESS LOGGING
  STORAGE( INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645
  PCTINCREASE 0
  BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)
  TABLESPACE Test ;
```

Output

```
CREATE TABLE T1
  ( MESSAGE_CODE VARCHAR2(50),
  MAIL_TITLE VARCHAR2(1000),
  MAIL_BODY VARCHAR2(1000),
  MAIL_ADDRESS VARCHAR2(1000),
  MAIL_ADDRESS_CC VARCHAR2(1000)
  ) /*SEGMENT CREATION DEFERRED */
  /*PCTFREE 10*/
  /* PCTUSED 0 */
  /*INITRANS 1 */
  /*MAXTRANS 255 */
  /* NOCOMPRESS LOGGING*/
  /* STORAGE( INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645
  PCTINCREASE 0
  BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)*/
  /* TABLESPACE Test */;
```

STORAGE

Storage parameters including **BUFFER_POOL** and **MAXEXTENTS** are not supported in Gauss. Storage parameters are commented when it appears in tables or indexes based on the value of the config parameter **comment_storage_parameter**.

Input - TABLE with STORAGE

```
CREATE UNIQUE INDEX PK_BASE_APPR_STEP_DEF ON BASE_APPR_STEP_DEF (FLOW_ID, NODE_ID,
STEP_ID)
  PCTFREE 10 INITRANS 2 MAXTRANS 255 COMPUTE STATISTICS
  STORAGE(INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645
  PCTINCREASE 0 FREELISTS 1 FREELIST GROUPS 1
  BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)
  TABLESPACE SPMS_DATA ;
```

```
CREATE TABLE UFP_MAIL
 ( MAIL_ID NUMBER(*,0),
 MAIL_TITLE VARCHAR2(1000),
 MAIL_BODY VARCHAR2(4000),
 STATUS VARCHAR2(50),
 CREATE_TIME DATE,
 SEND_TIME DATE,
 MAIL_ADDRESS CLOB,
 MAIL_CC CLOB,
 BASE_ID VARCHAR2(20),
 BASE_STATUS VARCHAR2(50),
 BASE_VERIFY VARCHAR2(20),
 BASE_LINK VARCHAR2(4000),
 MAIL_TYPE VARCHAR2(20),
 BLIND_COPY_TO CLOB,
 FILE_NAME VARCHAR2(4000),
 FULL_FILEPATH VARCHAR2(4000)
 ) SEGMENT CREATION IMMEDIATE
 PCTFREE 10 PCTUSED 0 INITRANS 1 MAXTRANS 255
 NOCOMPRESS LOGGING
 STORAGE(INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645
 PCTINCREASE 0 FREELISTS 1 FREELIST GROUPS 1
 BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)
 TABLESPACE SPMS_DATA
 LOB (MAIL_ADDRESS) STORE AS BASICFILE (
 TABLESPACE SPMS_DATA ENABLE STORAGE IN ROW CHUNK 8192 RETENTION
 NOCACHE LOGGING
 STORAGE(INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645
 PCTINCREASE 0 FREELISTS 1 FREELIST GROUPS 1
 BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT))
 LOB (MAIL_CC) STORE AS BASICFILE (
 TABLESPACE SPMS_DATA ENABLE STORAGE IN ROW CHUNK 8192 RETENTION
 NOCACHE LOGGING
 STORAGE(INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645
 PCTINCREASE 0 FREELISTS 1 FREELIST GROUPS 1
 BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT))
 LOB (BLIND_COPY_TO) STORE AS BASICFILE (
 TABLESPACE SPMS_DATA ENABLE STORAGE IN ROW CHUNK 8192 RETENTION
 NOCACHE LOGGING
 STORAGE(INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645
 PCTINCREASE 0 FREELISTS 1 FREELIST GROUPS 1
 BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT));
```

Output

```
CREATE
  UNIQUE INDEX PK_BASE_APPR_STEP_DEF
    ON BASE_APPR_STEP_DEF (
      FLOW_ID
    ,NODE_ID
    ,STEP_ID
  ) /*PCTFREE 10*/
  /*INITRANS 2*/
  /*MAXTRANS 255*/
  /*COMPUTE STATISTICS*/
  /*STORAGE(INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645 FREELISTS 1
FREELIST GROUPS 1 BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)*/
  /*TABLESPACE SPMS_DATA */
;
```

NOTE

If **comment_storage_parameter** is set TRUE, then storage parameters are commented.

STORE

The STORE keyword for LOB columns is not supported in Gauss, and it is commented in the migrated output.

Input - TABLE with STORE

```
CREATE TABLE CTP_PROC_LOG
  ( PORC_NAME VARCHAR2(100),
    LOG_TIME VARCHAR2(100),
    LOG_INFO CLOB
  ) SEGMENT CREATION IMMEDIATE
  PCTFREE 10 PCTUSED 0 INITRANS 1 MAXTRANS 255
  NOCOMPRESS LOGGING
  STORAGE(INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645
  PCTINCREASE 0 FREELISTS 1 FREELIST GROUPS 1
  BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)
  TABLESPACE SPMS_DATA
  LOB (LOG_INFO) STORE AS BASICFILE (
  TABLESPACE SPMS_DATA ENABLE STORAGE IN ROW CHUNK 8192 RETENTION
  NOCACHE LOGGING
  STORAGE(INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645
  PCTINCREASE 0 FREELISTS 1 FREELIST GROUPS 1
  BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)) ;
```

Output

```
CREATE
TABLE
  CTP_PROC_LOG (
    PORC_NAME VARCHAR2 (100)
    ,LOG_TIME VARCHAR2 (100)
    ,LOG_INFO CLOB
  ) /*SEGMENT CREATION IMMEDIATE*/
/*PCTFREE 10*/
/*PCTUSED 0*/
/*INITRANS 1*/
/*MAXTRANS 255*/
/*NOCOMPRESS*/
/*LOGGING*/
/*STORAGE(INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645 FREELISTS 1
FREELIST GROUPS 1 BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)*/
/*TABLESPACE SPMS_DATA */
/*LOB (LOG_INFO) STORE AS BASICFILE ( TABLESPACE SPMS_DATA ENABLE STORAGE IN ROW
CHUNK 8192 RETENTION NOCACHE LOGGING STORAGE(INITIAL 65536 NEXT 1048576 MINEXTENTS 1
MAXEXTENTS 2147483645 FREELISTS 1 FREELIST GROUPS 1 BUFFER_POOL DEFAULT FLASH_CACHE
DEFAULT CELL_FLASH_CACHE DEFAULT))*/
;
```

PCTINCREASE

The storage parameter **PCTINCREASE** is not supported for all the tables. In addition, all storage parameters (like pctfree, minextents, maxextents) are not allowed for partitioned tables.

Input - TABLE with PCTINCREASE

```
CREATE TABLE tab1 (
  col1 < datatype >
  , col2 < datatype >
  , ...
  , colN < datatype > )
TABLESPACE testts
PCTFREE 10 INITRANS 1 MAXTRANS
255
/* STORAGE (
INITIAL 5 M NEXT 5 M MINEXTENTS 1 MAXEXTENTS UNLIMITED PCTINCREASE 0 );*/
```

Output

```
CREATE TABLE tab1 (
  col1 < datatype >
  , col2 < datatype >
```

```
, ...  
, colN < datatype > )  
  TABLESPACE testts  
  PCTFREE 10 INITRANS 1 MAXTRANS 255  
  /* STORAGE (  
  INITIAL 5 M NEXT 5 M MINEXTENTS 1 MAXEXTENTS  
  UNLIMITED );*/
```

FOREIGN KEY

A foreign key is a way to enforce referential integrity within an Oracle database. A foreign key means that values in one table must also appear in another table. The referenced table is called the parent table while the table with the foreign key is called the child table. The foreign key in the child table will generally reference a primary key in the parent table. A foreign key can be defined in either a CREATE TABLE statement or an ALTER TABLE statement.

A foreign key constraint must be established with the REFERENCE clause. An inline constraint clause appears as part of the column definition clause or the object properties clause. An out-of-line constraint appears as part of a relational properties clause or the object properties clause.

If the configuration parameter [foreignKeyHandler](#) is set to **true** (default value), then the tool will migrate these statements into commented statements.

DSC supports inline and out-of-line foreign key constraints as shown in the following examples.

Input - Foreign Key with inline constraint in CREATE TABLE

```
CREATE TABLE orders (  
  order_no INT NOT NULL PRIMARY KEY,  
  order_date DATE NOT NULL,  
  cust_id INT  
  [CONSTRAINT fk_orders_cust]  
  REFERENCES customers(cust_id)  
  [ON DELETE SET NULL]  
  [INITIALLY DEFERRED]  
  [ENABLE NOVALIDATE]  
);
```

Output

```
CREATE TABLE orders (  
  order_no INT NOT NULL PRIMARY KEY,  
  order_date DATE NOT NULL,  
  cust_id INT  
  /*  
  [CONSTRAINT fk_orders_cust]  
  REFERENCES customers(cust_id)  
  [ON DELETE SET NULL]  
  [INITIALLY DEFERRED]  
  [ENABLE NOVALIDATE] */  
);
```

Input - Foreign Key with out-of-line constraint in CREATE TABLE

```
CREATE TABLE customers (  
  cust_id INT NOT NULL,  
  cust_name VARCHAR(64) NOT NULL,  
  cust_addr VARCHAR(256),  
  cust_contact_no VARCHAR(16),  
  PRIMARY KEY (cust_id)  
);
```

```
CREATE TABLE orders (  
  order_no INT NOT NULL,  
  order_date DATE NOT NULL,  
  cust_id INT NOT NULL,  
  PRIMARY KEY (order_no),  
  CONSTRAINT fk_orders_cust  
  FOREIGN KEY (cust_id)  
  REFERENCES customers(cust_id)  
  ON DELETE CASCADE  
);
```

Output

```
CREATE TABLE customers (  
  cust_id INT NOT NULL,  
  cust_name VARCHAR(64) NOT NULL,  
  cust_addr VARCHAR(256),  
  cust_contact_no VARCHAR(16),  
  PRIMARY KEY (cust_id)  
);  
  
CREATE TABLE orders (  
  order_no INT NOT NULL,  
  order_date DATE NOT NULL,  
  cust_id INT NOT NULL,  
  PRIMARY KEY (order_no) /*,  
  CONSTRAINT fk_orders_cust  
  FOREIGN KEY (cust_id)  
  REFERENCES customers(cust_id)  
  ON DELETE CASCADE */  
);
```

LONG Data Type

Columns defined as LONG can store variable-length character data containing up to two gigabytes of information. The tool supports LONG data types in TABLE structure and PL/SQL.

Input - LONG data type in table structure

```
CREATE TABLE project ( proj_cd INT  
  , proj_name VARCHAR2(32)  
  , dept_no INT  
  , proj_det LONG );
```

Output

```
CREATE TABLE project ( proj_cd INT  
  , proj_name VARCHAR2(32)  
  , dept_no INT  
  , proj_det TEXT );
```

Input - LONG data type in PL/SQL

```
CREATE OR REPLACE FUNCTION fn_proj_det  
  ( i_proj_cd INT )  
RETURN LONG  
IS  
  v_proj_det LONG;  
BEGIN  
  SELECT proj_det  
  INTO v_proj_det  
  FROM project  
  WHERE proj_cd = i_proj_cd;  
  
  RETURN v_proj_det;  
END;  
/
```

Output

```
CREATE OR REPLACE FUNCTION fn_proj_det
  ( i_proj_cd INT )
RETURN TEXT
IS
  v_proj_det TEXT;
BEGIN
  SELECT proj_det
  INTO v_proj_det
  FROM project
  WHERE proj_cd = i_proj_cd;

  RETURN v_proj_det;
END;
/
```

TYPE

MDSYS.MBRCOORDLIST should be replaced with CLOB.

Oracle Syntax	Syntax After Migration
<pre>create table product_part (partid VARCHAR2(24), mbrcoords MDSYS.MBRCOORDLIST);</pre>	<pre>CREATE TABLE product_part (partid VARCHAR2(24), mbrcoords CLOB);</pre>

MDSYS.SDO_GEOMETRY should be replaced with CLOB.

Oracle Syntax	Syntax After Migration
<pre>create table product_part (partid VARCHAR2(24), shape MDSYS.SDO_GEOMETRY);</pre>	<pre>CREATE TABLE product_part (partid VARCHAR2(24), shape CLOB);</pre>

GEOMETRY should be replaced with CLOB.

Oracle Syntax	Syntax After Migration
<pre>create table product_part (partid VARCHAR2(24), shape GEOMETRY);</pre>	<pre>CREATE TABLE product_part (partid VARCHAR2(24), shape CLOB);</pre>

Columns

xmax, xmin, left, right and maxvalue are Gauss keywords and should be concatenated with double quotes in upper case.

Oracle Syntax	Syntax After Migration
<pre>create table product (xmax VARCHAR2(20), xmin VARCHAR2(50), left VARCHAR2(50), right VARCHAR2(50), maxvalue VARCHAR2(50));</pre>	<pre>CREATE TABLE product1 ("XMAX" VARCHAR2(20), "XMIN" VARCHAR2(50), "LEFT" VARCHAR2(50), "RIGHT" VARCHAR2(50), "MAXVALUE" VARCHAR2(50));</pre>

Interval Partition

Partition should be commented for interval partition.

Oracle Syntax	Syntax After Migration
<pre>create table product (product_id VARCHAR2(20), product_name VARCHAR2(50), manufacture_month DATE) partition by range (manufacture_month) interval (NUMTODSINTERVAL (1, 'MONTH')) (partition T_PARTITION_2018_11_LESS values less than (TO_DATE(' 2018-11-01 00:00:00', 'SYYYY- MM-DD HH24:MI:SS')); </pre>	<pre>CREATE TABLE product (product_id VARCHAR2(20), product_name VARCHAR2(50), manufacture_month DATE) /*partition by range (manufacture_month) interval (NUMTODSINTERVAL (1, 'MONTH')) (partition T_PARTITION_2018_11_LESS values less than (TO_DATE(' 2018-11-01 00:00:00', 'SYYYY- MM-DD HH24:MI:SS'))*/;</pre>

6.9.2.2 Temporary Tables

GaussDB(DWS) does not support **GLOBAL TEMPORARY TABLE**, and it will be migrated to **LOCAL TEMPORARY TABLE**.

ON COMMIT DELETE ROWS is also not supported, and will be migrated to **ON COMMIT PRESERVE ROWS**.

Figure 6-7 Input: TEMPORARY TABLE

```
CREATE
  GLOBAL TEMPORARY TABLE
  schema1.temp_tbl1 (
    col1 VARCHAR2 (400)
    ,col2 DATE NOT NULL
  )
  ON COMMIT DELETE ROWS
;
```

Figure 6-8 Output: TEMPORARY TABLE

```
CREATE
  LOCAL TEMPORARY TABLE
  schema1_temp_tbl1 (
    col1 VARCHAR2 (400)
    ,col2 DATE NOT NULL
  )
  ON COMMIT PRESERVE ROWS
;
```

6.9.2.3 Global Temporary Tables

Global temporary tables are converted to local temporary tables.

Input - GLOBAL TEMPORARY TABLE

```
CREATE GLOBAL TEMPORARY TABLE
"Pack1"."GLOBAL_TEMP_TABLE"
( "ID" VARCHAR2(8)
) ON COMMIT DELETE ROWS ;
```

Output

```
CREATE
LOCAL TEMPORARY TABLE
"Pack1_GLOBAL_TEMP_TABLE" (
"ID" VARCHAR2 (8)
)
ON COMMIT PRESERVE ROWS ;
```

6.9.2.4 Indexes

When an index is created in GaussDB(DWS), a schema name cannot be specified along with the index name. The index will be automatically created in the schema where the index table is created.

Figure 6-9 Input: INDEX

```
CREATE
INDEX scott.ix_tab1_col1
ON scott.tab1 (col1) tablespace users pctfree 10 initrans 2 maxtrans 255 storage (
initial 256 K NEXT 256 K minextents 1 maxextents unlimited
)
```

Figure 6-10 Output: INDEX

```
CREATE
INDEX ix_tab1_col1
ON scott.tab1 (col1) tablespace users pctfree 10 initrans 2 maxtrans 255 storage (
initial 256 K NEXT 256 K minextents 1 maxextents unlimited
)
```

Input - Function-based indexes by using CASE

A function-based index is an index that is created on the results of a function or expression on top of a column.

Output

```
CREATE
UNIQUE index GCC_RSRC_ASSIGN_U1
ON GCC_PLAN.GCC_RSRC_ASSIGN_T (
(CASE
WHEN( ENABLE_FLAG = 'Y' AND ASSIGN_TYPE = '13' AND WORK_ORDER_ID IS NOT NULL )
THEN WORK_ORDER_ID
ELSE NULL
END)
);
```

 **NOTE**

The expression or function needs to be put inside brackets.

Input - Function-based indexes by using DECODE

```
CREATE UNIQUE index GCC_PLAN_N2
ON GCC_PLAN.GCC_PLAN_T (
  DECODE (
    ENABLE_FLAG
    ,'Y'
    ,BUSINESS_ID
    ,NULL
  )
);
```

Output

```
CREATE UNIQUE index GCC_PLAN_N2
ON GCC_PLAN.GCC_PLAN_T (
  (DECODE (
    ENABLE_FLAG
    ,'Y'
    ,BUSINESS_ID
    ,NULL
  ))
);
```

 **NOTE**

The expression or function needs to be put inside brackets.

ORA_HASH

ORA_HASH is a function that computes a hash value for a given expression or column. If this function is specified on the column(s) in the CREATE INDEX statement, this function will be removed.

Input

```
create index SD_WO.WO_WORK_ORDER_T_N3 on SD_WO.WO_WORK_ORDER_T (PROJECT_NUMBER,
ORA_HASH(WORK_ORDER_NAME));
```

Output

```
CREATE
index WO_WORK_ORDER_T_N3
ON SD_WO.WO_WORK_ORDER_T (
PROJECT_NUMBER
,ORA_HASH( WORK_ORDER_NAME )
);
```

DECODE

If DECODE function in the CREATE INDEX statement is used as a part of a column, the following error will be reported: "syntax error at or near 'DECODE' (Script - gcc_plan_t.sql)".

Input

```
create unique index GCC_PLAN.GCC_PLAN_N2 on GCC_PLAN.GCC_PLAN_T
(DECODE(ENABLE_FLAG,'Y',BUSINESS_ID,NULL));
```

Output

```
CREATE
UNIQUE index GCC_PLAN_N2
```

```
ON GCC_PLAN.GCC_PLAN_T (  
  DECODE (  
    ENABLE_FLAG  
    , 'Y'  
    , BUSINESS_ID  
    , NULL  
  )  
);
```

CASE statement

The CASE statement is not supported in the CREATE INDEX statement.

Input

```
CREATE  
  UNIQUE index GCC_RSRC_ASSIGN_U1  
  ON GCC_PLAN.GCC_RSRC_ASSIGN_T (  
    (CASE  
      WHEN( ENABLE_FLAG = 'Y' AND ASSIGN_TYPE = '13' AND WORK_ORDER_ID IS NOT NULL )  
      THEN WORK_ORDER_ID  
      ELSE NULL  
    END)  
  );
```

Output

```
CREATE UNIQUE INDEX gcc_rsrc_assign_u1  
ON gcc_plan.gcc_rsrc_assign_t ( ( CASE  
                                WHEN( enable_flag = 'Y'  
                                    AND assign_type = '13'  
                                    AND work_order_id IS NOT NULL )  
                                THEN work_order_id  
                                ELSE NULL END ) );
```

6.9.2.5 Views

A view is a logical table that is based on one or more tables or views. A view itself contains no data.

In the source file, if the table names are not qualified with the schema name, then the target file is modified such that the table is also qualified with the same schema name as that of the view.

Figure 6-11 Input: Views

```

CREATE
OR REPLACE VIEW schema1.v_view_name AS SELECT
    dict_code code
    ,dict_name name
FROM
    tab1
WHERE
    BEAN_CODE = 'LOA_PERSONAL_ACCOUNT#PRTYCODE'
    AND WORK_WT = (
        SELECT
            MAX( WORK_DT )
        FROM
            tab2
        WHERE
            BEAN_CODE = 'LOA_PERSONAL_ACCOUNT#PRTYCODE'
    )
    AND WORK_WT = (
        SELECT
            MAX( WORK_DT )
        FROM
            schema2.tab3
        WHERE
            BEAN_CODE = 'LOA_PERSONAL_ACCOUNT#PRTYCODE'
    )
;

```

Figure 6-12 Output: Views

```

CREATE
OR REPLACE VIEW schema1.v_view_name AS (
    SELECT
        dict_code code
        ,dict_name "NAME"
    FROM
        schema1.tab1
    WHERE
        BEAN_CODE = 'LOA_PERSONAL_ACCOUNT#PRTYCODE'
        AND WORK_WT = (
            SELECT
                MAX( WORK_DT )
            FROM
                schema1.tab2
            WHERE
                BEAN_CODE = 'LOA_PERSONAL_ACCOUNT#PRTYCODE'
        )
        AND WORK_WT = (
            SELECT
                MAX( WORK_DT )
            FROM
                schema2.tab3
            WHERE
                BEAN_CODE = 'LOA_PERSONAL_ACCOUNT#PRTYCODE'
        )
    )
;

```


Input - NEXTVAL

```
SELECT
  EMP_ID_SEQ.NEXTVAL INTO
  SEQ_NUM
FROM
  dual
;
```

Output

```
SELECT
  PUBLIC.NEXTVAL ('EMP_ID_SEQ') INTO
  SEQ_NUM
FROM
  dual
;
```

CURRVAL

To migrate the CURRVAL function, you can customize one to return the current value of a sequence. During the installation, this function should be created in all the databases where the migration is to be performed.

CURRVAL is a system function of Oracle and is not implicitly supported by GaussDB(DWS). To support this function, DSC creates a **CURRVAL** function in the **PUBLIC** schema. The **PUBLIC.CURRVAL** function is used in the migrated statements.

 **NOTE**

If **MigSupportSequence** is set to **true**, CURRVAL is migrated to PUBLIC.CURRVAL('[schema].sequence').

If **MigSupportSequence** is set to **false**, CURRVAL is migrated to CURRVAL('[schema].sequence').

Before migrating the NEXTVAL function, copy the content in the **custom_scripts.sql** file and paste it to execute the script in all the target databases. For details, see [Migration Process](#).

Input - CURRVAL

```
[schema].sequence.CURRVAL
```

Output

```
currval('[schema].sequence')
```

Input - CURRVAL

```
INSERT
  INTO
  Line_items_tab (
    Orderno
    ,Partno
    ,Quantity
  )
VALUES (
  Order_seq.CURRVAL
  ,20321
  ,3
)
;
```

Output

```
INSERT
  INTO
```

```
Line_items_tab (  
  Orderno  
  ,Partno  
  ,Quantity  
) SELECT  
  PUBLIC.CURRVAL ('Order_seq')  
  ,20321  
  ,3  
;
```

6.9.2.7 PURGE

In Oracle, the **DROP TABLE** statement moves a table to the recycle bin. The **PURGE** statement is used to remove a table or index from the recycle bin and release all of the space associated with the object. This statement also removes the entire recycle bin, or part or all of a dropped tablespace from the recycle bin. The migrated query does not contain **PURGE**.

Figure 6-13 Input: PURGE

```
Execute immediate 'Drop table  
table1 purge' ;  
  
drop table test.emp purge ;
```

Figure 6-14 Output: PURGE

```
Execute immediate 'Drop table table1' ;  
  
drop table test.emp ;
```

6.9.2.8 Database Keywords

DSC supports GaussDB(DWS) keywords, such as **NAME**, **LIMIT**, **OWNER**, **KEY**, and **CAST**. These keywords must be enclosed in double quotation marks.

Gauss Keywords (NAME, VERSION, LABEL, POSITION)

The keywords **NAME**, **VERSION**, **LABEL**, and **POSITION** are changed to **ASKeyword**.

Input - NAME, VERSION, LABEL, POSITION

```
SELECT id, NAME,label,description  
FROM (SELECT a.id      id,  
            b.NAME     NAME,  
            b.description description,  
            b.default_label label,  
            ROWNUM     ROW_ID  
FROM CTP_ITEM A  
LEFT OUTER JOIN CTP_ITEM-NLS B ON A.ID = B.ID  
AND B.LOCALE = i_language  
ORDER BY a.id ASC)  
WHERE ROW_ID >= to_number(begNum)  
AND ROW_ID < to_number(begNum) + to_number(fetchNum);  
  
SELECT DISTINCT REPLACE(VERSION,' ') ID, VERSION TEXT  
FROM (SELECT T1.SOFTASSETS_NAME, T2.VERSION
```

```

FROM SPMS_SOFT_ASSETS T1, SPMS_SYSSOFT_ASSETS T2
WHERE T1.SOFTASSETS_ID = T2.SOFTASSETS_ID)
WHERE SOFTASSETS_NAME = I_SOFT_NAME;

SELECT COUNTRY, AMOUNT
FROM (SELECT " COUNTRY || " AMOUNT, '1' POSITION
FROM DUAL )
ORDER BY POSITION;

```

Output

```

SELECT id,NAME,label,description FROM (
SELECT a.id id,b.NAME AS NAME,
b.description description
,b.default_label AS label,
ROW_NUMBER( ) OVER( ) ROW_ID
FROM CTP_ITEM A LEFT OUTER JOIN
CTP_ITEM_NLS B
ON A.ID = B.ID AND
B.LOCALE = i_language
ORDER BY a.id ASC) WHERE
ROW_ID >= to_number( begNum )
AND
ROW_ID < to_number( begNum ) + to_number( fetchNum )
;

SELECT
DISTINCT REPLACE( VERSION ,',' ,") ID
,VERSION AS TEXT
FROM
(
SELECT
T1.SOFTASSETS_NAME
,T2.VERSION
FROM
SPMS_SOFT_ASSETS T1
,SPMS_SYSSOFT_ASSETS T2
WHERE
T1.SOFTASSETS_ID = T2.SOFTASSETS_ID
)
WHERE SOFTASSETS_NAME = I_SOFT_NAME ;

SELECT COUNTRY ,AMOUNT
FROM ( SELECT " COUNTRY || " AMOUNT
,'1' AS POSITION
FROM
DUAL
)
ORDER BY
POSITION
;

```

TEXT & YEAR

Input – TEXT, YEAR

```

SELECT
NAME,
VALUE,
DESCRIPTION TEXT,
JOINED YEAR,
LIMIT
FROM
EMPLOYEE;

SELECT
NAME,

```

```
TEXT,  
YEAR,  
VALUE,  
DESCRIPTION,  
LIMIT  
FROM  
EMPLOYEE_DETAILS;
```

Output

```
SELECT  
"NAME",  
VALUE,  
DESCRIPTION AS TEXT,  
JOINED AS YEAR,  
"LIMIT"  
FROM  
EMPLOYEE;  
  
SELECT  
"NAME",  
"TEXT",  
"YEAR",  
VALUE,  
DESCRIPTION,  
"LIMIT"  
FROM  
EMPLOYEE_DETAILS;
```

NAME and LIMIT

Input: GaussDB(DWS) keywords NAME and LIMIT

```
CREATE TABLE NAME  
( NAME VARCHAR2(50) NOT NULL  
, VALUE VARCHAR2(255)  
, DESCRIPTION VARCHAR2(4000)  
, LIMIT NUMBER(9)  
)  
/*TABLESPACE users*/  
pctfree 10 initrans 1 maxtrans  
255  
storage ( initial 256K next 256K  
minextents 1 maxextents  
unlimited );  
  
SELECT NAME, VALUE, DESCRIPTION, LIMIT  
FROM NAME;
```

Output

```
CREATE TABLE "NAME"  
( "NAME" VARCHAR2 (50) NOT NULL  
, VALUE VARCHAR2 (255)  
, DESCRIPTION VARCHAR2 (4000)  
, "LIMIT" NUMBER (9)  
)  
/*TABLESPACE users*/  
pctfree 10 initrans 1 maxtrans 255  
storage ( initial 256 K NEXT 256 K minextents 1  
maxextents unlimited );  
  
SELECT "NAME", VALUE, DESCRIPTION, "LIMIT"  
FROM "NAME";
```

OWNER

Bulk Operations

Input: Use SELECT to query the GaussDB(DWS) keyword OWNER

```
SELECT
  owner
FROM
  Test_Col;
```

Output

```
SELECT
  "OWNER"
FROM
  Test_Col;
```

Input: Use DELETE to query the GaussDB(DWS) keyword OWNER

```
DELETE FROM emp14
WHERE
  ename = 'Owner';
```

Input

```
DELETE FROM emp14
WHERE
  ename = 'Owner'
```

KEY**Blogic Operations****Input: GaussDB(DWS) keyword KEY**

```
CREATE
OR REPLACE FUNCTION myfct RETURN VARCHAR2 parallel_enable IS res VARCHAR2 ( 200 ) ;
BEGIN
  res := 100 ;
  INSERT INTO emp18 RW ( RW.empno ,RW.ename ) SELECT
    res ,RWN.ename KEY
  FROM
    emp16 RWN ;
  COMMIT ;
  RETURN res ;
END ;
/
```

Output

```
CREATE
OR REPLACE FUNCTION myfct RETURN VARCHAR2 IS res VARCHAR2 ( 200 ) ;
BEGIN
  res := 100 ;
  INSERT INTO emp18 ( empno ,ename ) SELECT
    res ,RWN.ename "KEY"
  FROM
    emp16 RWN ;
  /* COMMIT; */
  null ;
  RETURN res ;
END ;
```

Range, Account and Language

When Gauss keywords are used as aliases for any column in the SELECT list without defining the AS keyword, the AS keyword to define the aliases.

Input

```
CREATE
OR REPLACE /*FORCE*/
VIEW SAD.FND_TERRITORIES_TL_V (
  TERRITORY_CODE
  ,TERRITORY_SHORT_NAME
  ,LANGUAGE
  ,Account
  ,Range
  ,LAST_UPDATED_BY
  ,LAST_UPDATE_DATE
  ,LAST_UPDATE_LOGIN
  ,DESCRIPTION
  ,SOURCE_LANG
  ,ISO_NUMERIC_CODE
) AS SELECT
  t.TERRITORY_CODE
  ,t.TERRITORY_SHORT_NAME
  ,t.LANGUAGE
  ,t.Account
  ,t.Range
  ,t.LAST_UPDATED_BY
  ,t.LAST_UPDATE_DATE
  ,t.LAST_UPDATE_LOGIN
  ,t.DESCRPTION
  ,t.SOURCE_LANG
  ,t.ISO_NUMERIC_CODE
FROM
  fnd_territories_tl t
UNION
ALL SELECT
  'SS' TERRITORY_CODE
  ,'Normal Country' TERRITORY_SHORT_NAME
  ,NULL LANGUAGE
  ,NULL Account
  ,NULL Range
  ,NULL LAST_UPDATED_BY
  ,NULL LAST_UPDATE_DATE
  ,NULL LAST_UPDATE_LOGIN
  ,NULL DESCRIPTION
  ,NULL SOURCE_LANG
  ,NULL ISO_NUMERIC_CODE
FROM
  DUAL ;
```

Output

```
CREATE
OR REPLACE /*FORCE*/
VIEW SAD.FND_TERRITORIES_TL_V (
  TERRITORY_CODE
  ,TERRITORY_SHORT_NAME
  ,LANGUAGE
  ,CREATED_BY
  ,CREATION_DATE
  ,LAST_UPDATED_BY
  ,LAST_UPDATE_DATE
  ,LAST_UPDATE_LOGIN
  ,DESCRIPTION
  ,SOURCE_LANG
  ,ISO_NUMERIC_CODE
) AS SELECT
  t.TERRITORY_CODE
  ,t.TERRITORY_SHORT_NAME
  ,t.LANGUAGE
  ,t.CREATED_BY
  ,t.CREATION_DATE
  ,t.LAST_UPDATED_BY
  ,t.LAST_UPDATE_DATE
  ,t.LAST_UPDATE_LOGIN
  ,t.DESCRPTION
```

```
,t.SOURCE_LANG
,t.ISO_NUMERIC_CODE
FROM
  fnd_territories_tl t
UNION
ALL SELECT
  'SS' TERRITORY_CODE
,'Normal Country' TERRITORY_SHORT_NAME
,NULL AS LANGUAGE
,NULL CREATED_BY
,NULL CREATION_DATE
,NULL LAST_UPDATED_BY
,NULL LAST_UPDATE_DATE
,NULL LAST_UPDATE_LOGIN
,NULL DESCRIPTION
,NULL SOURCE_LANG
,NULL ISO_NUMERIC_CODE
FROM
  DUAL ;
```

Primary Key and Unique Key

If primary and unique keys are declared on table creation, only the primary key needs to consider for migration.

```
create table SD_WO.WO_DU_TRIGGER_REVENUE_T
(
  TRIGGER_REVENUE_ID NUMBER not null,
  PROJECT_NUMBER   VARCHAR2(40),
  DU_ID            NUMBER,
  STANDARD_MS_CODE VARCHAR2(100),
  TRIGGER_STATUS   NUMBER,
  TRIGGER_MSG      VARCHAR2(4000),
  BATCH_NUMBER     NUMBER,
  PROCESS_STATUS   NUMBER,
  ENABLE_FLAG      CHAR(1) default 'Y',
  CREATED_BY       NUMBER,
  CREATION_DATE    DATE,
  LAST_UPDATE_BY   NUMBER,
  LAST_UPDATE_DATE DATE
)
;

alter table SD_WO.WO_DU_TRIGGER_REVENUE_T
  add constraint WO_DU_TRIGGER_REVENUE_PK primary key (TRIGGER_REVENUE_ID);
alter table SD_WO.WO_DU_TRIGGER_REVENUE_T
  add constraint WO_DU_TRIGGER_REVENUE_N1 unique (DU_ID, STANDARD_MS_CODE);
```

Output

```
CREATE
TABLE
  SD_WO.WO_DU_TRIGGER_REVENUE_T (
    TRIGGER_REVENUE_ID NUMBER NOT NULL
    ,PROJECT_NUMBER VARCHAR2 (40)
    ,DU_ID NUMBER
    ,STANDARD_MS_CODE VARCHAR2 (100)
    ,TRIGGER_STATUS NUMBER
    ,TRIGGER_MSG VARCHAR2 (4000)
    ,BATCH_NUMBER NUMBER
    ,PROCESS_STATUS NUMBER
    ,ENABLE_FLAG CHAR( 1 ) DEFAULT 'Y'
    ,CREATED_BY NUMBER
    ,CREATION_DATE DATE
    ,LAST_UPDATE_BY NUMBER
    ,LAST_UPDATE_DATE DATE
    ,CONSTRAINT WO_DU_TRIGGER_REVENUE_PK PRIMARY KEY (TRIGGER_REVENUE_ID)
  ) ;
```

PROMPT

PROMPT should be converted to \ECHO supported by GAUSS.

Oracle Syntax	Syntax after Migration
<pre>prompt prompt Creating table product prompt ===== prompt create table product (product_id VARCHAR2(20), product_name VARCHAR2(50));</pre>	<pre>\echo \echo Creating table product \echo ===== \echo CREATE TABLE product (product_id VARCHAR2(20), product_name VARCHAR2(50));</pre>

6.9.3 COMPRESS Phrase

Input – COMPRESS Phrase

```
CREATE TABLE test_tab (
  id          NUMBER(10) NOT NULL,
  description VARCHAR2(100) NOT NULL,
  created_date DATE NOT NULL,
  created_by  VARCHAR2(50) NOT NULL,
  updated_date DATE,
  updated_by  VARCHAR2(50)
)
NOCOMPRESS
PARTITION BY RANGE (created_date) (
  PARTITION test_tab_q1 VALUES LESS THAN (TO_DATE('01/04/2003', 'DD/MM/YYYY')) COMPRESS,
  PARTITION test_tab_q2 VALUES LESS THAN (MAXVALUE)
);
```

Output

```
CREATE
TABLE
  test_tab (
    id NUMBER (10) NOT NULL
    ,description VARCHAR2 (100) NOT NULL
    ,created_date DATE NOT NULL
    ,created_by VARCHAR2 (50) NOT NULL
    ,updated_date DATE
    ,updated_by VARCHAR2 (50)
  ) /*NOCOMPRESS*/
PARTITION BY RANGE (created_date) (
  PARTITION test_tab_q1
  VALUES LESS THAN (
    TO_DATE( '01/04/2003' , 'DD/MM/YYYY' )
  ) /*COMPRESS*/
  ,PARTITION test_tab_q2
  VALUES LESS THAN (MAXVALUE)
);
```

6.9.4 Bitmap Index

There is a configuration parameter that is introduced for this feature named **BitmapIndexSupport** which default value is **comment**, then the sample input and output are as follows:

Input – Bitmap index


```
CREATE BITMAP INDEX  
emp_bitmap_idx  
ON index_demo (gender);
```

Output

```
/*CREATE BITMAP INDEX emp_bitmap_idx ON index_demo (gender);*/
```

However, if the configuration parameter is set to **BTREE**, then the output is as follows:

Output

```
CREATE  
/*bitmap*/  
INDEX emp_bitmap_idx  
ON index_demo  
USING btree (gender);
```

6.9.5 Custom Tablespace

Input – custom tablespace

```
CREATE  
TABLE  
SEAS_VERSION_DDL_REL_ORA (  
VERSION_ORA_ID VARCHAR2 (20)  
,TAB_OBJ_ID VARCHAR2 (20)  
,AUDIT_ID VARCHAR2 (20)  
,DDL_SYS CLOB  
,DDL_USER CLOB  
,IF_CONFORM VARCHAR2 (3)  
,DDL_TYPE_SYS VARCHAR2 (5)  
,DDL_REN_REASON_SYS VARCHAR2 (4000)  
,DDL_ERR_SYS VARCHAR2 (4000)  
) SEGMENT CREATION IMMEDIATE PCTFREE 10 PCTUSED 40 INITRANS 1 MAXTRANS 255  
NOCOMPRESS LOGGING STORAGE (  
INITIAL 655360 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645 PCTINCREASE 0  
FREELISTS 1 FREELIST GROUPS 1 BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE  
DEFAULT  
) TABLESPACE DRMS LOB (DDL_SYS) STORE AS BASICFILE (  
TABLESPACE DRMS ENABLE STORAGE IN ROW CHUNK 8192 RETENTION NOCACHE LOGGING  
STORAGE (  
INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645 PCTINCREASE 0  
FREELISTS 1 FREELIST GROUPS 1 BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE  
DEFAULT  
)  
) LOB (DDL_USER) STORE AS BASICFILE (  
TABLESPACE DRMS ENABLE STORAGE IN ROW CHUNK 8192 RETENTION NOCACHE LOGGING  
STORAGE (  
INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645 PCTINCREASE 0  
FREELISTS 1 FREELIST GROUPS 1 BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE  
DEFAULT  
)  
)  
)
```

Output

```
CREATE  
TABLE  
SEAS_VERSION_DDL_REL_ORA (  
VERSION_ORA_ID VARCHAR2 (20)  
,TAB_OBJ_ID VARCHAR2 (20)  
,AUDIT_ID VARCHAR2 (20)  
,DDL_SYS CLOB  
,DDL_USER CLOB  
,IF_CONFORM VARCHAR2 (3)  
,DDL_TYPE_SYS VARCHAR2 (5)  
,DDL_REN_REASON_SYS VARCHAR2 (4000)
```

```

        ,DDL_ERR_SYS VARCHAR2 (4000)
    ) /*SEGMENT CREATION IMMEDIATE*/
    /*PCTFREE 10*/
    /*PCTUSED 40*/
    /*INITRANS 1*/
    /*MAXTRANS 255*/
    /*NOCOMPRESS*/
    /*LOGGING*/
    /*STORAGE(INITIAL 655360 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645 FREELISTS 1
FREELIST GROUPS 1 BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)*/
    /*TABLESPACE DRMS */
    /*LOB (DDL_SYS) STORE AS BASICFILE ( TABLESPACE DRMS ENABLE STORAGE IN ROW CHUNK
8192 RETENTION NOCACHE LOGGING STORAGE(INITIAL 65536 NEXT 1048576 MINEXTENTS 1
MAXEXTENTS 2147483645 FREELISTS 1 FREELIST GROUPS 1 BUFFER_POOL DEFAULT FLASH_CACHE
DEFAULT CELL_FLASH_CACHE DEFAULT))*/
    /*LOB (DDL_USER) STORE AS BASICFILE ( TABLESPACE DRMS ENABLE STORAGE IN ROW CHUNK
8192 RETENTION NOCACHE LOGGING STORAGE(INITIAL 65536 NEXT 1048576 MINEXTENTS 1
MAXEXTENTS 2147483645 FREELISTS 1 FREELIST GROUPS 1 BUFFER_POOL DEFAULT FLASH_CACHE
DEFAULT CELL_FLASH_CACHE DEFAULT))*/
;

```

6.9.6 Supplemental Log Data

Supplemental columns can be recorded in redo log files. The process of recording these additional columns is called supplemental logging. The Oracle database supports this function, but GaussDB does not.

Input

```

CREATE TABLE sad.fnd_lookup_values_t
(
    lookup_code_id NUMBER NOT NULL /* ENABLE */
    ,lookup_code VARCHAR2 (40) NOT NULL /* ENABLE */
    ,meaning VARCHAR2 (100)
    ,other_meaning VARCHAR2 (100)
    ,order_by_no NUMBER
    ,start_time DATE DEFAULT SYSDATE NOT NULL /* ENABLE */
    ,end_time DATE
    ,enable_flag CHAR( 1 ) DEFAULT 'Y' NOT NULL /* ENABLE */
    ,disable_date DATE
    ,created_by NUMBER ( 15 ,0 ) NOT NULL /* ENABLE */
    ,creation_date DATE NOT NULL /* ENABLE */
    ,last_updated_by NUMBER ( 15 ,0 ) NOT NULL /* ENABLE */
    ,last_update_date DATE NOT NULL /* ENABLE */
    ,last_update_login NUMBER ( 15 ,0 ) DEFAULT 0 NOT NULL /* ENABLE */
    ,description VARCHAR2 (500)
    ,lookup_type_id NUMBER NOT NULL /* ENABLE */
    ,attribute4 VARCHAR2 (250)
    ,supplemental log data (ALL) COLUMNS
);

```

Output

```

CREATE TABLE sad.fnd_lookup_values_t
(
    lookup_code_id NUMBER NOT NULL /* ENABLE */
    ,lookup_code VARCHAR2 (40) NOT NULL /* ENABLE */
    ,meaning VARCHAR2 (100)
    ,other_meaning VARCHAR2 (100)
    ,order_by_no NUMBER
    ,start_time DATE DEFAULT SYSDATE NOT NULL /* ENABLE */
    ,end_time DATE
    ,enable_flag CHAR( 1 ) DEFAULT 'Y' NOT NULL /* ENABLE */
    ,disable_date DATE
    ,created_by NUMBER ( 15 ,0 ) NOT NULL /* ENABLE */
    ,creation_date DATE NOT NULL /* ENABLE */
    ,last_updated_by NUMBER ( 15 ,0 ) NOT NULL /* ENABLE */
    ,last_update_date DATE NOT NULL /* ENABLE */
);

```

```
,last_update_login NUMBER ( 15 ,0 ) DEFAULT 0 NOT NULL /* ENABLE */  
,description VARCHAR2 (500)  
,lookup_type_id NUMBER NOT NULL /* ENABLE */  
,attribute4 VARCHAR2 (250)  
/* ,supplemental log data (ALL) COLUMNS */  
);
```

NOTE

The **SUPPLEMENTAL LOG DATA** functions that are not supported by GaussDB need to be commented out.

SUPPLEMENTAL LOG DATA is not supported by **CREATE TABLE** and needs to be commented out.

Input

```
CREATE TABLE SAD.FND_DATA_CHANGE_LOGS_T  
( LOGID NUMBER,  
  TABLE_NAME VARCHAR2(40) NOT NULL ENABLE,  
  TABLE_KEY_COLUMNS VARCHAR2(200),  
  TABLE_KEY_VALUES VARCHAR2(200),  
  COLUMN_NAME VARCHAR2(40) NOT NULL ENABLE,  
  COLUMN_CHANGE_FROM_VALUE VARCHAR2(200),  
  COLUMN_CHANGE_TO_VALUE VARCHAR2(200),  
  DESCRIPTION VARCHAR2(500),  
  SUPPLEMENTAL LOG DATA (ALL) COLUMNS  
);
```

Output

```
CREATE TABLE sad.fnd_data_change_logs_t  
(  
  logid NUMBER  
  ,table_name VARCHAR2 (40) NOT NULL /* ENABLE */  
  ,table_key_columns VARCHAR2 (200)  
  ,table_key_values VARCHAR2 (200)  
  ,column_name VARCHAR2 (40) NOT NULL /* ENABLE */  
  ,column_change_from_value VARCHAR2 (200)  
  ,column_change_to_value VARCHAR2 (200)  
  ,description VARCHAR2 (500)  
  /*, SUPPLEMENTAL LOG DATA (ALL) COLUMNS*/  
)
```

6.9.7 LONG RAW

"Data type LONG RAW" is not supported in the CREATE TABLE statement. LONG RAW data type needs to be replaced with Byte.

Input

```
CREATE TABLE SAD.WORKFLOWDEFS  
( ID NUMBER(*,0),  
  WF_NAME VARCHAR2(200),  
  WF_DEFINITION LONG RAW,  
  WF_VERSION NUMBER(*,0),  
  WF_PUBLISH CHAR(1),  
  WF_MAINFLOW CHAR(1),  
  WF_APP_NAME VARCHAR2(20),  
  CREATED_BY NUMBER,  
  CREATION_DATE DATE,  
  LAST_UPDATED_BY NUMBER,  
  LAST_UPDATE_DATE DATE,  
  WFDESC VARCHAR2(2000)  
);
```

Output

```
CREATE TABLE sad.workflowdefs
(
  id          NUMBER (38, 0),
  wf_name     VARCHAR2 (200),
  wf_definition BYTEA,
  wf_version  NUMBER (38, 0),
  wf_publish  CHAR(1),
  wf_mainflow CHAR(1),
  wf_app_name VARCHAR2 (20),
  created_by  NUMBER,
  creation_date DATE,
  last_updated_by NUMBER,
  last_update_date DATE,
  wfdesc     VARCHAR2 (2000)
);
```

6.9.8 DML

This section describes the migration syntax of Oracle DML. The migration syntax decides how the keywords/features are migrated.

For details, see the following topics:

[SELECT](#)

[INSERT](#)

[MERGE](#)

SELECT

Overview

The Oracle **SELECT** statement starts a query, with an optional **ORDER BY** clause. The clause is used to retrieve records from one or more tables in a database.

Input - SELECT

```
SELECT col1, col2
FROM tab1;
```

Output

```
SELECT col1, col2
FROM tab1;
```

1. Order of Clauses

The **HAVING** clause must follow the **GROUP BY** clause. However, Oracle allows **HAVING** to be in front of or behind the **GROUP BY** clause. In the target database, the **HAVING** clause is moved to behind the **GROUP BY** clause.

Figure 6-15 Input - Order of Clauses

```

SELECT
    DEPTNO
    ,COUNT( * )
    ,SUM (SAL)
FROM
    EMP
WHERE
    JOB = 'CLERK'
HAVING
    SUM (SAL) >= 500
GROUP BY
    DEPTNO
ORDER BY
    DEPTNO
;
    
```

Figure 6-16 Output - Order of Clauses

```

1 SELECT
2     DEPTNO
3     ,COUNT( * )
4     ,SUM (SAL)
5 FROM
6     EMP
7 WHERE
8     JOB = 'CLERK'
9
10    GROUP BY
11        DEPTNO
12    HAVING
13        SUM (SAL) >= 500
14    ORDER BY
15        DEPTNO
16 ;
    
```

2. Extended Group By Clause

The **GROUP BY** clause can be specified if you want the database to group the selected rows based on the value of expr(s). If this clause contains **CUBE**, **ROLLUP**, or **GROUPING SETS** extensions, then the database produces super-aggregate groupings in addition to the regular groupings. These features are not supported by GaussDB(DWS) but can be enabled using the **UNION ALL** operator.

Figure 6-17 Input - Extended group by clause

```

SELECT
  d.dname
  ,e.job
  ,MAX( e.sal )
FROM
  emp e RIGHT OUTER JOIN dept d
    ON e.deptno = d.deptno
WHERE
  e.job IS NOT NULL
GROUP BY
  ROLLUP (
    d.dname
    ,e.job
  )
;

```

Figure 6-18 Output - Extended group by clause

```

SELECT
  dname
  ,job
  ,ColumnAlias1
FROM
  (
    SELECT
      MAX( e.sal ) AS ColumnAlias1
      ,d.dname
      ,e.job
    FROM
      emp e RIGHT OUTER JOIN dept d
        ON e.deptno = d.deptno
    WHERE
      e.job IS NOT NULL
    GROUP BY
      d.dname ,e.job
    UNION
    ALL SELECT
      MAX( e.sal ) AS ColumnAlias1
      ,d.dname
      ,NULL AS job
    FROM
      emp e RIGHT OUTER JOIN dept d
        ON e.deptno = d.deptno
    WHERE
      e.job IS NOT NULL
    GROUP BY
      d.dname
    UNION
    ALL SELECT
      MAX( e.sal ) AS ColumnAlias1
      ,NULL AS dname
      ,NULL AS job
    FROM
      emp e RIGHT OUTER JOIN dept d
        ON e.deptno = d.deptno
    WHERE
      e.job IS NOT NULL
  )
;

```

GROUPING_ID and ROLLUP

GROUPING_ID returns a number that corresponds to the **GROUPING** bit vector associated with a row. **GROUPING_ID** is applicable only in a **SELECT** statement containing a **GROUP BY** extension, such as the **ROLLUP** operator and **GROUPING** function. In queries with multiple **GROUP BY** expressions, determining the **GROUP BY** level of a particular row requires multiple **GROUPING** functions, which may complicate SQL statements. In such scenarios, **GROUPING_ID** is used to avoid statement complexity.

3. Table Name Inside Brackets

Table names do not need to be specified within parentheses. However, allows using brackets.

Figure 6-19 Input - Table name inside brackets

```
SELECT
    *
FROM
    (emp) e
WHERE
    e.deptno = 1
;
```

Figure 6-20 Output - Table name inside brackets

```
SELECT
    *
FROM
    emp e
WHERE
    e.deptno = 1
;
```

4. UNIQUE Keyword

Unique keyword is migrated as Distinct keyword.

Input - SELECT UNIQUE

```
SELECT UNIQUE a.item_id id,
    a.menu_id parent_id,a.serialno menu_order
FROM ctp_menu_item_rel a WHERE
    a.item_id IN(SELECT UNIQUE id FROM ctp_temp_item_table);
```

Output

```
SELECT DISTINCT a.item_id id,
    a.menu_id parent_id,a.serialno menu_order
FROM ctp_menu_item_rel a WHERE
    a.item_id IN(SELECT UNIQUE id FROM ctp_temp_item_table);
```

5. USERENY

Input - CLIENT_INFO

Returns user session information.

```
SELECT 1
FROM sp_ht ht
WHERE ht.hth = pi_contract_number
/* AND ht.contract_status = 2 --delete by leinian 2014-03-03(ECO) */
AND ht.contract_status IN ( 1, 2 ) /* add by leinian 2014-03-20(ECO) */
AND Nvl(ht.s3_pilot_flag, 'N') = 'N'
```

```

AND NOT EXISTS (SELECT 1
                 FROM   asms.asms_lookup_values alv
                 WHERE  alv.type_code = 'HTLX_LOAN'
                 AND ht.htlx = alv.code)
AND ht.duty_erp_ou_id = To_number(Nvl(Rtrim(Ltrim(Substr(Userenv(
                                                                    'client_info'),
                                                                    1,
                                                                    8))), 218))
AND ht.source_code = 'ECONTRACT'
AND ht.needng_engineering_service IS NOT NULL
AND ht.khm != '28060'
AND ht.htlx != '111' ;

```

Output

```

SELECT
  1
FROM   sp_ht ht
WHERE  ht.hth = pi_contract_number /* AND ht.contract_status = 2 --delete by leinian
2014-03-03(ECO) */
AND ht.contract_status IN (
  1
 ,2
) /* add by leinian 2014-03-20(ECO) */
AND Nvl( ht.s3_pilot_flag , 'N' ) = 'N'
AND NOT EXISTS (
  SELECT
    1
  FROM
    asms.asms_lookup_values alv
  WHERE
    alv.type_code = 'HTLX_LOAN'
    AND ht.htlx = alv.code
)
AND ht.duty_erp_ou_id = To_number( Nvl( Rtrim( Ltrim( SUBSTR( MIG_ORA_EXT.USERENV
('client_info' ) ,1 ,8 ) ) ) , 218 ) )
AND ht.source_code = 'ECONTRACT'
AND ht.needng_engineering_service IS NOT NULL
AND ht.khm != '28060'
AND ht.htlx != '111' ;

```

USERENV('CLIENT_INFO')

After the function in the package is converted, the function tag is not deleted.
4. The svproduct_is_for_pa function in **sad_lookup_contract_pkg.bdy** is used.

USERENV('CLIENT_INFO')

USERENV used during the migration process. Migration fails due to the tool.

```

SELECT 1
FROM   sp_ht ht
WHERE  ht.hth = pi_contract_number
/* AND ht.contract_status = 2 --delete by leinian 2014-03-03(ECO) */
AND ht.contract_status IN ( 1, 2 ) /* add by leinian 2014-03-20(ECO) */
AND Nvl(ht.s3_pilot_flag, 'N') = 'N'
/* add by yangyirui 2012-09-10: S3 Data is not provided for the contract cutover. */
AND NOT EXISTS (SELECT 1
                FROM   asms.asms_lookup_values alv
                WHERE  alv.type_code = 'HTLX_LOAN'
                AND ht.htlx = alv.code)
AND ht.duty_erp_ou_id = To_number(Nvl(Rtrim(Ltrim(Substr(Userenv(
                                                                    'client_info'),
                                                                    1,
                                                                    8))), 218))
AND ht.source_code = 'ECONTRACT'
AND ht.needng_engineering_service IS NOT NULL
AND ht.khm != '28060'
AND ht.htlx != '111'

```

Input


```
Error message :client_info argument for USERENV function is not supported by the DSC.

4_sad_lookup_contract_pkg

=====
CREATE OR REPLACE PACKAGE BODY SAD.sad_lookup_contract_pkg IS
FUNCTION svproduct_is_for_pa(pi_contract_number IN VARCHAR2) RETURN VARCHAR2 IS
  L_flag VARCHAR2(1) := 'N';
BEGIN
  FOR rec_lookup IN (SELECT 1
    FROM asms.asms_lookup_values alv
    WHERE alv.type_code = 'HTLX_LOAN'
    AND alv.duty_erp_ou_id = to_number(nvl(rtrim(ltrim(substr(userenv('client_info'), 1, 8))), 218))
  )
  LOOP
    L_flag := 'Y';
  END LOOP;

  RETURN L_flag;
END svproduct_is_for_pa;
END sad_lookup_contract_pkg;
/
```

Output

```
CREATE OR replace FUNCTION sad_lookup_contract_pkg.Svproduct_is_for_pa (
pi_contract_number IN VARCHAR2)
RETURN VARCHAR2
IS
  L_flag VARCHAR2 ( 1 ) := 'N';
BEGIN
  FOR rec_lookup IN (SELECT 1
    FROM asms.asms_lookup_values alv
    WHERE alv.type_code = 'HTLX_LOAN'
    AND alv.duty_erp_ou_id = To_number(Nvl(
      Rtrim(Ltrim(Substr(
        mig_ora_ext.Userenv (
          'client_info'), 1, 8))
      ),
      218))
  )
  LOOP
    L_flag := 'Y';
  END LOOP;

  RETURN L_flag;
END;
/
```

INSERT

Overview

The Oracle **INSERT** statement is used to insert a single record or multiple records into a table.

NOLOGGING

NOLOGGING is commented from the inserted script.

Oracle Syntax	Syntax After Migration
INSERT INTO TBL_ORACLE NOLOGGING SELECT emp_id, emp_name FROM emp;	INSERT INTO TBL_ORACLE /*NOLOGGING*/ SELECT emp_id, emp_name FROM emp;

1. INSERT ALL

The Oracle **INSERT ALL** statement is used to add multiple rows using a single **INSERT** statement. The rows can be inserted into either a single table or multiple tables. The target query is converted as a common table expression (CTE).

Figure 6-21 Input - INSERT ALL

```
INSERT
  ALL INTO
    ap_cust
  VALUES (
    customer_id
    ,program_id
    ,delivered_date
  ) INTO
    ap_orders (
      ord_dt
      ,Prg_id
    )
  VALUES (
    order_date
    ,program_id
  ) SELECT
    program_id
    ,delivered_date
    ,customer_id
    ,order_date
  FROM
    ORDER
  WHERE
    deptno = 10
```

Figure 6-22 Output - Insert All

```
WITH Sel AS (  
    SELECT  
        program_id  
        ,delivered_date  
        ,customer_id  
        ,order_date  
    FROM  
        ORDER  
    WHERE  
        deptno = 10  
)  
,ins1 AS (  
    INSERT  
        INTO  
        ap_cust (  
            SELECT  
                customer_id  
                ,program_id  
                ,delivered_date  
            FROM  
                Sel  
        ) returning *  
)  
INSERT  
    INTO  
    ap_orders (  
        ord_dt  
        ,Prg_id  
    ) (  
        ) (  
        SELECT  
            order_date  
            ,program_id  
        FROM  
        Sel  
    )  
)
```

2. **INSERT FIRST**

The Oracle **INSERT FIRST** is used to execute an INSERT statement when the first condition is true; other statements are ignored. The target query is converted as a CTE.

Figure 6-23 Input - Insert first

```

INSERT
FIRST WHEN deptno <= 10
THEN INTO
emp12 WHEN comm > 500
THEN INTO
emp13 SELECT
empno
,ename
,job
,mgr
,hiredate
,sal
,comm
,deptno
FROM
emp
WHERE
deptno IS NOT NULL
    
```

Figure 6-24 Output - Insert first

```

WITH sel AS (
SELECT
ROW_NUMBER() OVER() AS Ins_First_RN
,empno
,ename
,job
,mgr
,hiredate
,sal
,comm
,deptno
FROM
emp
WHERE
deptno IS NOT NULL
)
,ins1 AS (
INSERT
INTO
emp12 (
SELECT
empno
,ename
,job
,mgr
,hiredate
,sal
,comm
,deptno
FROM
sel
WHERE
deptno <= 10
) returning 1
)
INSERT
INTO
emp13 (
SELECT
empno
,ename
,job
,mgr
,hiredate
,sal
,comm
,deptno
FROM
(
SELECT
*
FROM
sel
WHERE
comm > 500
) s1 LEFT JOIN (
SELECT
Ins_First_RN
FROM
sel
WHERE
deptno <= 10
) s2
ON s1.Ins_First_RN = s2.Ins_First_RN
WHERE
s2.Ins_First_RN IS NULL
)
    
```

3. INSERT with Table Alias

The Oracle **table aliases** is used to clarify and improve readability when referring to a table in a query by assigning it a name or code. **INSERT with table alias** can be used with **INSERT INTO** statement. The tool supports the migration of **INSERT INTO** statements with **table alias**.

a. Blogic Operations

Input - INSERT with Table Alias

```
CREATE
OR REPLACE FUNCTION myfct RETURN VARCHAR2 IS res VARCHAR2 ( 200 ) ;
BEGIN
  res := 100 ;
  INSERT INTO emp18 RW ( RW.empno ,RW.ename ) SELECT
    res ,RWN.ename
  FROM
    emp16 RWN ;
  COMMIT ;
  RETURN res ;
END ;
/
```

Output

```
CREATE
OR REPLACE FUNCTION myfct RETURN VARCHAR2 IS res VARCHAR2 ( 200 ) ;
BEGIN
  res := 100 ;
  INSERT INTO emp18 ( empno ,ename ) SELECT
    res ,RWN.ename
  FROM
    emp16 RWN ;
  /* COMMIT ; */
  null ;
  RETURN res ;
END ;
/
```

b. Bulk Operations

Input - INSERT with Table Alias

```
INSERT
INTO
  Public.emp14 ats (
    ats.empno
    ,ats.ename
  )
VALUES (
  3
  , 'Categories'
)
;
```

Output

```
INSERT
INTO
  Public.emp14 (
    empno
    ,ename
  ) SELECT
    3
    , 'Categories'
;
```

Input - INSERT with Table Alias

```
INSERT
INTO
  "abc" . "emp18" wmc (
    wmc.empno
```

```
        ,wmc.ename
    ) SELECT
        wmc.empno
        ,wm_concat (wmc.ename) AS eName
    FROM
        emp16 wmc
    GROUP BY
        empno
;

```

Output

```
INSERT
INTO
    "abc" . "emp18" (
        empno
        ,ename
    ) SELECT
        wmc.empno
        ,STRING_AGG (
            wmc.ename
            ,''
            ) AS eName
    FROM
        emp16 wmc
    GROUP BY
        empno
;

```

Input - INSERT with Table Alias

```
INSERT
INTO
    emp14 "TABLE" (
        "TABLE" .empno
        ,ename
    ) SELECT
        empno
        ,ename
    FROM
        emp12
    WHERE
        emp12.salary > (
            SELECT
                MAX( salary )
            FROM
                emp13 "TABLE"
            WHERE
                "TABLE" .empno > 5
        )
;

```

Output

```
INSERT
INTO
    emp14 (
        empno
        ,ename
    ) SELECT
        empno
        ,ename
    FROM
        emp12
    WHERE
        emp12.salary > (
            SELECT
                MAX( salary )
            FROM
                emp13 "TABLE"
            WHERE
                "TABLE" .empno > 5
        )
;

```

```
);
```

MERGE

MERGE is an ANSI-compliant SQL syntax operator used to select rows from one or more sources for updating or inserting a table or view. The criteria for updating or inserting the target table or view can be specified.

Currently, this function is supported by GaussDB(DWS) 6.5.0 and later. DSC uses multiple methods to migrate **MERGE** to SQL statements compatible with GaussDB(DWS).

Configure parameter **mergeImplementation** as follows:

- Set to **With** by default. In this option, the target query is converted as a CTE.

Figure 6-25 Input - MERGE

```
MERGE INTO
  student a
  USING (
    SELECT
      id
      ,sname
      ,score
    FROM
      student_n
  ) b
  ON( a.id = b.id ) WHEN MATCHED
  THEN UPDATE
  SET
    a.sname = b.sname
    ,a.score = b.score DELETE
  WHERE
    a.score < 640
;
```

Figure 6-26 Output - MERGE

```

WITH b AS (
  SELECT
    id
    ,sname
    ,score
  FROM
    student_n
)
,UPD_REC AS (
  UPDATE
    student a
  SET
    a.sname = b.sname
    ,a.score = b.score
  FROM
    b
  WHERE
    a.id = b.id returning a. *
) DELETE FROM student a
  USING b
  WHERE
    a.score < 640
    AND a.id = b.id
;

```

- Set to **SPLIT**. In this option, the **MERGE** statement is split into multiple **INSERT** and **UPDATE** statements.

Figure 6-27 Input - MERGE

```

MERGE INTO employees01 e
  USING (SELECT empid, ename, startdate, address
        FROM hr_records
        WHERE empid > 100) h
  ON (e.id = h.empid)
  WHEN MATCHED THEN
    UPDATE SET e.address = h.address
            , e.ename = h.ename
  WHEN NOT MATCHED THEN
    INSERT (empid,ename,startdate,address)
    VALUES (h.empid,h.ename,h.startdate,h.address);

```


Figure 6-28 Output - MERGE

```
UPDATE employees01 e
  SET e.address = h.address
    , e.ename = h.ename
  FROM ( SELECT empid, ename, startdate, address
        FROM hr_records
        WHERE empid > 100
        ) h
 WHERE e.id = h.empid;

INSERT INTO employees01 ( empid, ename, startdate, address )
SELECT h.empid, h.ename, h.startdate, h.address
  FROM ( SELECT empid, ename, startdate, address
        FROM hr_records
        WHERE empid > 100
        ) h LEFT OUTER JOIN employees01 e
  ON e.id = h.empid
 WHERE e.id IS NULL;
```

6.9.9 Pseudo Columns

This section contains the migration syntax of Oracle Pseudo Columns. The migration syntax decides how the keywords/features are migrated.

A **pseudo column** is similar to a table column, but is not actually stored in the table. User can select values from pseudo columns, but cannot insert, update, or delete values in the pseudo columns.

ROWID

The **ROWID** pseudo column returns the address of a specific row.

Figure 6-29 Input - ROWID

```
SELECT
  empid
  ,ename
  ,ROWID
FROM
  employees
;
```

Figure 6-30 Output - ROWID

```
SELECT
  empid
  ,ename
  ,CAST( ( xc_node_id || '#' || tableoid || '#' || ctid ) AS TEXT ) AS rowid
FROM
  employees
;
```

ROWNUM

For each row of data returned by the query, the **ROWNUM** pseudo column returns a number, indicating the order with which the Oracle database selects rows from a table or a group of joined rows. The value of **ROWNUM** in the first row is **1**, the value of **ROWNUM** in the second row is **2**, and so on.

Figure 6-31 Input - ROWNUM

```
SELECT
    e.empid
    ,e.ename
FROM
    employees e
WHERE
    ROWNUM < 6
;
```

Figure 6-32 Output - ROWNUM

```
SELECT
    e.empid
    ,e.ename
FROM
    employees e LIMIT 6 - 1
;
```

Input-ROWNUM with UPDATE

When executing **UPDATE**, if ROWNUM with some value (integer) is used, the system will UPDATE records using the operator near ROWNUM accordingly.

```
UPDATE SCMS_MSGPOOL_LST
SET MSG_STD = '11'
WHERE UNISEQNO = IN_OUNISEQNO
AND MSG_TYP1 IN ('MT103', 'MT199')
AND ROWNUM = 1;
```

Output

```
UPDATE SCMS_MSGPOOL_LST
SET MSG_STD = '11'
WHERE (xc_node_id,ctid) in (select xc_node_id, ctid
from SCMS_MSGPOOL_LST
where UNISEQNO = IN_OUNISEQNO
AND MSG_TYP1 IN ('MT103', 'MT199')
LIMIT 1)
```

Input-ROWNUM with DELETE

When executing **DELETED**, if ROWNUM with some value (integer) is used, system will DELETE records using the operator near ROWNUM accordingly.

```
delete from test1
where c1='abc' and rownum = 1;
```

Output

```
delete from test1 where (xc_node_id,ctid) in (select xc_node_id, ctid from test1 where c1='abc' limit 1);
```

Input - UPDATE with ROWNUM

Scripts of UPDATE and DELETE that are migrated through ROWNUM contains LIMIT, which is not supported by Gauss.

```
UPDATE SCMS_MSGPOOL_LST
SET MSG_STD = '11'
WHERE UNISEQNO = IN_OUNISEQNO
AND MSG_TYP1 IN ('MT103', 'MT199')
AND ROWNUM = 1;
```

Output

```
UPDATE SCMS_MSGPOOL_LST
SET MSG_STD = '11'
WHERE (xc_node_id, ctid) = ( SELECT xc_node_id, ctid
FROM SCMS_MSGPOOL_LST
WHERE UNISEQNO = IN_OUNISEQNO
AND MSG_TYP1 IN ('MT103', 'MT199')
LIMIT 1
);
```

Input - DELETE with ROWNUM

```
DELETE FROM SPMS_APP_PUBLISH
WHERE NOVA_NO = IN_NOVA_NO
AND DELIVERY_TYPE = '1'
AND PUBLISH_DATE = IN_PUBLISH_DATE
AND ROWNUM = 1;
```

Output

```
DELETE FROM SPMS_APP_PUBLISH
WHERE (xc_node_id, ctid) IN (SELECT xc_node_id, ctid
FROM SPMS_APP_PUBLISH
WHERE NOVA_NO = IN_NOVA_NO
AND DELIVERY_TYPE = '1'
AND PUBLISH_DATE = IN_PUBLISH_DATE
LIMIT 1
);
```

6.9.10 OUTER JOIN

This section describes the migration syntax of Oracle **OUTER JOIN**. The migration syntax determines how the keywords/features are migrated.

An **OUTER JOIN** returns all rows that meet the join condition. If rows of a table cannot join any rows in the other table, the statement returns these rows. In Oracle:

- Left outer join of tables A and B returns all rows from A and rows that satisfy the join condition by applying the outer join operator (+) to all columns of B in the **WHERE** conditions.
- Right outer join of tables A and B returns all rows from B and rows that satisfy the join condition by applying the outer join operator (+) to all columns of A in the **WHERE** condition.

GaussDB(DWS) does not support the + operator. The function of this operator is enabled using **LEFT OUTER JOIN** and **RIGHT OUTER JOIN** keywords.

Figure 6-33 Input: OUTER JOIN

```
SELECT
    empno
    ,ename
    ,job
    ,dname
    ,loc
FROM
    emp
    ,dept
WHERE
    emp.deptno = dept.deptno (+)
    AND salary > 50000
;
```

Figure 6-34 Output: OUTER JOIN

```
SELECT
    empno
    ,ename
    ,job
    ,dname
    ,loc
FROM
    emp LEFT OUTER JOIN dept
        ON emp.deptno = dept.deptno
WHERE
    salary > 50000
```

6.9.11 OUTER QUERY (+)

Join is supported in Gauss 18.2.0, so parameter **supportJoinOperator** is added. **OUTER QUERY (+)** can be migrated when **supportJoinOperator** is set to **false**.

Input-OUTER QUERY(+)

```
SELECT PP.PUBLISH_NO
    FROM SPMS_PARAM_PUBLISH PP
    WHERE PP.PUBLISH_ID(+) = TB2.PUBLISH_ID;

SELECT I.APP_CHNAME, I.APP_SHORTNAME
    FROM SPMS_APPVERSION SA, SPMS_APP_INFO I
    WHERE SA.APP_ID = I.APP_ID(+)
    AND SA.DELIVERY_USER = IN_USERID
    ORDER BY APPVER_ID DESC ;
```

Output

```
SELECT
    PP.PUBLISH_NO
FROM
    SPMS_PARAM_PUBLISH PP
WHERE
    PP.PUBLISH_ID (+) = TB2.PUBLISH_ID
;
```

```
SELECT
  I.APP_CHNAME
  ,I.APP_SHORTNAME
FROM
  SPMS_APPVERSION SA
  ,SPMS_APP_INFO I
WHERE
  SA.APP_ID = I.APP_ID (+)
  AND SA.DELIVERY_USER = IN_USERID
ORDER BY
  APPVER_ID DESC
;
```

6.9.12 CONNECT BY

Input-CONNECT BY

```
select id from city_branch start with id=roleBranchId connect by prior id=parent_id;
SELECT T.BRANCH_LEVEL, t.ID
  FROM city_branch c
  WHERE (c.branch_level = '1' OR T.BRANCH_LEVEL = '2')
  AND (T.SIGN = '1' OR T.SIGN = '4' OR T.SIGN = '8')
  AND T.STATUS = '1'
START WITH c.ID = I_BRANCH_ID
CONNECT BY c.ID = PRIOR c.parent_id
ORDER BY c.branch_level DESC ;
```

Output

```
WITH RECURSIVE migora_cte AS (
  SELECT
    id
    ,1 AS LEVEL
  FROM
    city_branch
  WHERE
    id = roleBranchId
  UNION
  ALL SELECT
    mig_ora_cte_join_alias.id
    ,mig_ora_cte_tab_alias.LEVEL + 1 AS LEVEL
  FROM
    migora_cte mig_ora_cte_tab_alias INNER JOIN city_branch mig_ora_cte_join_alias
    ON mig_ora_cte_tab_alias.id = mig_ora_cte_join_alias.parent_id
) SELECT
  id
FROM
  migora_cte
ORDER BY
  LEVEL
;

WITH RECURSIVE migora_cte AS (
  SELECT
    BRANCH_LEVEL
    ,ID
    ,SIGN
    ,STATUS
    ,parent_id
    ,1 AS LEVEL
  FROM
    city_branch c
  WHERE
    c.ID = I_BRANCH_ID
  UNION
  ALL SELECT
    c.BRANCH_LEVEL
    ,c.ID
    ,c.SIGN
```

```
        ,c.STATUS
        ,c.parent_id
        ,mig_ora_cte_tab_alias.LEVEL + 1 AS LEVEL
    FROM
        migora_cte mig_ora_cte_tab_alias INNER JOIN city_branch c
            ON c.ID = mig_ora_cte_tab_alias.parent_id
) SELECT
    BRANCH_LEVEL
    ,ID
FROM
    migora_cte c
WHERE
    (
        c.branch_level = '1'
        OR T.BRANCH_LEVEL = '2'
    )
    AND( T.SIGN = '1' OR T.SIGN = '4' OR T.SIGN = '8' )
    AND T.STATUS = '1'
ORDER BY
    c.branch_level DESC
;
```

Input - CONNECT BY multiple tables

The syntax shows the relationship between each child row and its parent row. It uses the **CONNECT BY xxx PRIOR** clause to define the relationship between the current row (child row) and the previous row (parent row).

```
SELECT DISTINCT a.id menuId,
    F.name menuName,
    a.status menuState,
    a.parent_id menuParentId,
    '-1' menuPrivilege,
    a.serialNo menuSerialNo
FROM CTP_MENU a, CTP_MENU_NLS F
START WITH a.serialno in (1, 2, 3)
CONNECT BY a.id = PRIOR a.parent_id
    AND f.locale = Language
    AND a.id = f.id
ORDER BY menuId, menuParentId;
```

Output

```
WITH RECURSIVE migora_cte AS (
    SELECT pr.service_product_id
        , t.enabled_flag
        , pr.operation_id
        , pr.enabled_flag
        , pr.product_code
        , 1 AS LEVEL
    FROM asms.cppsv_operation_sort t
        , asms.cppsv_product_class pr
    WHERE level_id = 3
        AND pr.operation_id = t.operation_id(+)
    UNION ALL
    SELECT pr.service_product_id
        , t.enabled_flag
        , pr.operation_id
        , pr.enabled_flag
        , pr.product_code
        , mig_ora_cte_tab_alias.LEVEL + 1 AS LEVEL
    FROM migora_cte mig_ora_cte_tab_alias
        , asms.cppsv_operation_sort t
        , asms.cppsv_product_class pr
    WHERE mig_ora_cte_tab_alias.service_product_id = pr.service_product_father_id
        AND pr.operation_id = t.operation_id(+) )
SELECT pr.service_product_id
FROM migora_cte
WHERE nvl( UPPER( enabled_flag ) , 'Y' ) = 'Y'
```

```
AND nvl( enabled_flag , 'Y' ) = 'Y'  
AND pr.product_code = rec_product1.service_product_code  
ORDER BY LEVEL;
```

6.9.13 System Functions

This section describes the migration syntax of Oracle system functions. The migration syntax determines how the keywords and features are migrated.

The system functions include:

Date functions, LOB functions, string functions, analytical functions, and regular expression functions. For details, see [Date Functions](#) to [Regular Expression Functions](#).

6.9.13.1 Date Functions

This section describes the following date functions:

- [ADD_MONTHS](#)
- [DATE_TRUNC](#)
- [LAST_DAY](#)
- [MONTHS_BETWEEN](#)
- [SYSTIMESTAMP](#)

ADD_MONTHS

ADD_MONTHS is an Oracle system function and is not implicitly supported by GaussDB(DWS).

NOTE

Before using this function, perform the following operations:

1. Create and use the **MIG_ORA_EXT** schema.
2. Copy the content of the custom script and execute the script in all target databases for which migration is to be performed. For details, see [Migration Process](#).

ADD_MONTHS returns a date with the month.

- Data type of the **date** parameter is DATETIME.
- Data type of the **integer** parameter is INTEGER.

The return type is DATE.

Input - ADD_MONTHS

```
SELECT  
  TO_CHAR( ADD_MONTHS ( hire_date , 1 ) , 'DD-MON-YYYY' ) "Next month"  
FROM  
  employees  
WHERE  
  last_name = 'Baer'  
;
```

Output

```
SELECT  
  TO_CHAR( MIG_ORA_EXT.ADD_MONTHS ( hire_date , 1 ) , 'DD-MON-YYYY' ) "Next month"  
FROM  
  employees
```

```
WHERE
  last_name = 'Baer'
;
```

TO_DATE with Third Parameter

In `TO_DATE(' 2019-05-02 00:00:00', 'SYYYY-MM-DD HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN')`, the third parameter should be commented.

Input

```
CREATE TABLE PRODUCT
( prod_id    INTEGER
, prod_code  VARCHAR(5)
, prod_name  VARCHAR(100)
, unit_price NUMERIC(6,2) NOT NULL
, manufacture_date DATE DEFAULT sysdate )
PARTITION BY RANGE (manufacture_date)
(PARTITION "P_20190501" VALUES LESS THAN (TO_DATE(' 2019-05-02 00:00:00', 'SYYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
);
```

Output

```
CREATE TABLE PRODUCT
( prod_id    INTEGER
, prod_code  VARCHAR(5)
, prod_name  VARCHAR(100)
, unit_price NUMERIC(6,2) NOT NULL
, manufacture_date DATE DEFAULT sysdate )
PARTITION BY RANGE (manufacture_date)
(PARTITION "P_20190501" VALUES LESS THAN (TO_DATE(' 2019-05-02 00:00:00', 'YYYY-MM-DD
HH24:MI:SS'/* , 'NLS_CALENDAR=GREGORIAN' */))
);
```

TO_DATE with SYYYY in Year Format

SYYYY is not supported in date format. This is applicable for GaussDB T.

Input

```
CREATE TABLE PRODUCT
( prod_id    INTEGER
, prod_code  VARCHAR(5)
, prod_name  VARCHAR(100)
, unit_price NUMERIC(6,2) NOT NULL
, manufacture_date DATE DEFAULT sysdate )
PARTITION BY RANGE (manufacture_date)
(PARTITION "P_20190501" VALUES LESS THAN (TO_DATE(' 2019-05-02 00:00:00', 'SYYYY-MM-DD
HH24:MI:SS'))
);
```

Output

```
CREATE TABLE PRODUCT
( prod_id    INTEGER
, prod_code  VARCHAR(5)
, prod_name  VARCHAR(100)
, unit_price NUMERIC(6,2) NOT NULL
, manufacture_date DATE DEFAULT sysdate )
PARTITION BY RANGE (manufacture_date)
(PARTITION "P_20190501" VALUES LESS THAN (TO_DATE(' 2019-05-02 00:00:00', 'YYYY-MM-DD
HH24:MI:SS'))
);
```


DATE_TRUNC

The DATE_TRUNC function returns a date with the time portion of the day truncated to the unit specified by the format model **fmt**.

Input

```
select trunc(to_char(trunc(add_months(sysdate,-12),'MM'),'YYYYMMDD')/100) into v_start_date_s from dual;
select trunc(to_char(trunc(sysdate,'mm'),'YYYYMMDD')/100) into v_end_date_e from dual;
ID_MNTH>=TRUNC(TO_CHAR(ADD_MONTHS(to_date(to_char('||
v_curr_date||'),'YYYYMMDD'),-12),'YYYYMMDD')/100)
AND ID_MNTH>=TRUNC(TO_CHAR(ADD_MONTHS(to_date(to_char('||
v_curr_date||'),'YYYYMMDD'),-12),'YYYYMMDD')/100)

select
TRUNC(to_char(add_months(trunc(TO_DATE(TO_CHAR(P_DATE),'YYYYMMDD'),'MM')-1,-2),'YYYYMMDD')/
100) INTO START_MONTH from dual;
select TRUNC(TO_CHAR(trunc(TO_DATE(TO_CHAR(P_DATE),'YYYYMMDD'),'MM')-1,'YYYYMMDD')/100)
INTO END_MONTH from dual;
```

Output

```
SELECT Trunc(To_char(Date_trunc ('MONTH', mig_ora_ext.Add_months (SYSDATE, -12)) , 'YYYYMMDD') /
100)
INTO v_start_date_s
FROM dual;

SELECT Trunc(To_char(Date_trunc ('MONTH', SYSDATE), 'YYYYMMDD') / 100)
INTO v_end_date_e
FROM dual;

SELECT Trunc(To_char(mig_ora_ext.Add_months (Date_trunc ('MONTH', To_date(To_char(p_date),
'YYYYMMDD' )) - 1 , -2), 'YYYYMMDD') / 100)
INTO start_month
FROM dual;

SELECT Trunc(To_char(Date_trunc ('MONTH', To_date(To_char(p_date), 'YYYYMMDD')) - 1, 'YYYYMMDD') /
100)
INTO end_month
FROM dual;
```

LAST_DAY

The Oracle LAST_DAY function returns the last day of the month based on a date value.

```
LAST_DAY(date)
```

The return type is always DATE, regardless of the data type of the date.

LAST_DAY is an Oracle system function and is not implicitly supported by GaussDB(DWS). To support this function, DSC creates a LAST_DAY function in the **MIG_ORA_EXT** schema. The migrated statements will use the new function MIG_ORA_EXT.LAST_DAY as shown in the following example.

NOTE

Before using this function, perform the following operations:

1. Create and use the **MIG_ORA_EXT** schema.
2. Copy the content of the custom script and execute the script in all target databases for which migration is to be performed. For details, see [Migration Process](#).

Input - LAST_DAY

```
SELECT
  to_date( '01/' || '07/' || to_char( sysdate , 'YYYY' ) , 'dd/mm/yyyy' ) FIRST
, last_day( to_date( '01/' || '07/' || to_char( sysdate , 'YYYY' ) , 'dd/mm/yyyy' ) ) last__day
FROM
  dual;
```

Output

```
SELECT
  to_date( '01/' || '07/' || to_char( sysdate , 'YYYY' ) , 'dd/mm/yyyy' ) FIRST
, MIG_ORA_EXT.LAST_DAY (
  to_date( '01/' || '07/' || to_char( sysdate , 'YYYY' ) , 'dd/mm/yyyy' )
) last__day
FROM
  dual;
```

MONTHS_BETWEEN

The MONTHS_BETWEEN function returns the number of months between two dates.

MONTHS_BETWEEN is an Oracle system function and is not implicitly supported by GaussDB(DWS). To support this function, use DSC to create a MONTHS_BETWEEN function in the **MIG_ORA_EXT** schema. The migrated statements will use the new function MIG_ORA_EXT.MONTHS_BETWEEN as shown in the following example.

NOTE

Before using this function, perform the following operations:

1. Create and use the **MIG_ORA_EXT** schema.
2. Copy the contents of the custom script and execute the script in all target databases for which migration is to be performed. For details, see [Migration Process](#).

Input - MONTHS_BETWEEN

```
Select Months_Between(to_date('2017-06-20', 'YYYY-MM-DD'), to_date('2011-06-20', 'YYYY-MM-DD')) from dual;
```

Output

```
Select MIG_ORA_EXT.MONTHS_BETWEEN(to_date('2017-06-20', 'YYYY-MM-DD'), to_date('2011-06-20', 'YYYY-MM-DD')) from dual;
```

SYSTIMESTAMP

The SYSTIMESTAMP function returns the system date, including fractional seconds and time zones, of the system on which the database resides. The return type is **TIMESTAMP WITH TIME ZONE**.

Figure 6-35 Input - SYSTIMESTAMP

```
SELECT
  SYSTIMESTAMP
FROM
  tab1
;
```

Figure 6-36 Output - SYSTIMESTAMP

```
SELECT
CURRENT_TIMESTAMP
FROM
tab1
;
```

6.9.13.2 LOB Functions

This section describes the following LOB functions:

- [DBMS_LOB.APPEND](#)
- [DBMS_LOB.COMPARE](#)
- [DBMS_LOB.CREATETEMPORARY](#)
- [DBMS_LOB.INSTR](#)
- [DBMS_LOB.SUBSTR](#)

DBMS_LOB.APPEND

DBMS_LOB.APPEND function appends the content of a source LOB to a specified LOB.

Input - DBMS_LOB.APPEND

```
[sys.]dbms_lob.append(o_menusxml, to_clob('DSJKSDAJKSFDA'));
```

Output

```
o_menusxml := CONCAT(o_menusxml, CAST('DSJKSDAJKSFDA' AS CLOB));
```

Input - DBMS_LOB.APPEND

```
CREATE
OR REPLACE PROCEDURE append_example IS clobSrc CLOB ;
clobDest CLOB ;
BEGIN
SELECT
clobData INTO clobSrc
FROM
myTable
WHERE
id = 2 ;
SELECT
clobData INTO clobDest
FROM
myTable
WHERE
id = 1 ;
readClob ( 1 ) ;
DBMS_LOB.APPEND ( clobDest ,clobSrc ) ;
readClob ( 1 ) ;
END append_example ;
/
```

Output

```
CREATE
OR REPLACE PROCEDURE append_example IS clobSrc CLOB ;
clobDest CLOB ;
BEGIN
SELECT
```

```
        clobData INTO clobSrc
FROM
  myTable
WHERE
  id = 2 ;
SELECT
  clobData INTO clobDest
FROM
  myTable
WHERE
  id = 1 ;
  readClob ( 1 ) ;
  clobDest := CONCAT( clobDest ,clobSrc ) ;
  readClob ( 1 ) ;
end ;
/
```

DBMS_LOB.COMPARE

DBMS_LOB.COMPARE is an Oracle system function and is not implicitly supported by GaussDB(DWS).

This function is used to compare the full/partial content of two LOBs. To support this feature, use DSC to create a **COMPARE** function in the **MIG_ORA_EXT** schema. The migrated statements will use the new function **MIG_ORA_EXT.MIG_CLOB_COMPARE**, and the examples of using functions in SQL statements are shown as follows.

COMPARE in SQL

Input - DBMS_LOB.COMPARE in SQL

```
SELECT a.empno ,dbms_lob.compare ( col1 ,col2 ) FROM emp a ,emp b ;
```

Output

```
SELECT a.empno ,MIG_ORA_EXT.MIG_CLOB_COMPARE ( col1 ,col2 ) FROM emp a ,emp b ;
```

Input - DBMS_LOB.COMPARE in SQL with CREATE TABLE using 5 parameters

```
CREATE TABLE abc nologging AS SELECT dbms_lob.compare ( col1 ,col2 ,3 ,5 ,4 ) FROM emp a ,emp b ;
```

Output

```
CREATE UNLOGGED TABLE abc AS ( SELECT MIG_ORA_EXT.MIG_CLOB_COMPARE ( col1 ,col2 ,3 ,5 ,4 )
FROM emp a ,emp b ) ;
```

Input - DBMS_LOB.COMPARE in SQL of a function (NVL2)

```
SELECT REPLACE( NVL2( DBMS_LOB.COMPARE ( ENAME ,Last_name ) ,'NO NULL' ,'ONE NULL' ) , 'NULL' )
FROM emp ;
```

Output

```
SELECT REPLACE( DECODE ( MIG_ORA_EXT.MIG_CLOB_COMPARE ( ENAME ,Last_name ) ,NULL ,'ONE
NULL' ,'NO NULL' ) , 'NULL' ,'' ) FROM emp ;
```

COMPARE in PL/SQL

Input - DBMS_LOB.COMPARE in PL/SQL

```
declare v_clob clob;
        v_text varchar(1000);
        v_compare_res INT;
BEGIN
  v_clob := TO_CLOB('abcdedf');
  v_text := '123454';
```

```
v_compare_res := dbms_lob.compare(v_clob, TO_CLOB(v_text));
DBMS_OUTPUT.PUT_LINE(v_compare_res);
end;
/
```

Output

```
declare v_clob clob;
        v_text varchar(1000);
        v_compare_res INT;
BEGIN
  v_clob := CAST('abcdedf' AS CLOB);
  v_text := '123454';
  v_compare_res := MIG_ORA_EXT.MIG_CLOB_COMPARE(v_clob,cast(v_text as CLOB));
  DBMS_OUTPUT.PUT_LINE(v_compare_res);
end;
/
```

DBMS_LOB.CREATETEMPORARY

The DBMS_LOB.CREATETEMPORARY function creates a temporary LOB and its corresponding index in the default temporary tablespace.

DBMS_LOB.FREETEMPORARY is used to delete the temporary LOB and its index.

Input - DBMS_LOB.CREATETEMPORARY with DBMS_LOB.FREETEMPORARY

```
declare v_clob clob;
begin
  DBMS_LOB.CREATETEMPORARY(v_clob, TRUE, DBMS_LOB.SESSION);
  v_clob := TO_CLOB('abcdedf');
  DBMS_OUTPUT.PUT_LINE(v_clob);
  DBMS_LOB.FREETEMPORARY(v_clob);
end;
/
```

Output

```
declare v_clob clob;
begin
  -- DBMS_LOB.CREATETEMPORARY(v_clob, TRUE, DBMS_LOB.SESSION);
  v_clob := CAST('abcdedf' AS CLOB);
  DBMS_OUTPUT.PUT_LINE(CAST(v_clob AS TEXT));
  -- DBMS_LOB.FREETEMPORARY(v_clob);
  NULL;
end;
/
```

DBMS_LOB.FREETEMPORARY

The DBMS_LOB.FREETEMPORARY function frees the temporary BLOB or CLOB in the default temporary tablespace. After the call to FREETEMPORARY, the LOB locator that is freed is marked as invalid.

Input - DBMS_LOB.CREATETEMPORARY and DBMS_LOB.FREETEMPORARY

```
declare v_clob clob;
begin
  DBMS_LOB.CREATETEMPORARY(v_clob, TRUE, DBMS_LOB.SESSION);
  v_clob := TO_CLOB('abcdedf');
  DBMS_OUTPUT.PUT_LINE(v_clob);
  DBMS_LOB.FREETEMPORARY(v_clob);
end;
/
```

Output

```
declare v_clob clob ;
BEGIN
  /*DBMS_LOB.CREATETEMPORARY(v_clob, TRUE, DBMS_LOB.SESSION);*/
  v_clob := cast( 'abcdedf' as CLOB );
  DBMS_OUTPUT.PUT_LINE ( v_clob );
  /* DBMS_LOB.FREETEMPORARY(v_clob); */
  null ;
end ;
/
```

DBMS_LOB.INSTR

DBMS_LOB.INSTR function returns the matching position of the nth occurrence of the pattern in the LOB, starting from the offset specified.

Input - DBMS_LOB.INSTR in SQL

```
SELECT expr1, ..., DBMS_LOB.INSTR(str, septr, 1, 5)
FROM tab1
WHERE ...;
```

Output

```
SELECT expr1, ..., INSTR(str, septr, 1, 5)
FROM tab1
WHERE ...
```

Input - DBMS_LOB.INSTR in PL/SQL

```
BEGIN
...
  pos := DBMS_LOB.INSTR(str,septr,1, i);
...
END;
/
```

Output

```
BEGIN
...
  pos := INSTR(str,septr,1, i);
...
END;
/
```

DBMS_LOB.SUBSTR

DBMS_LOB.SUBSTR is supported in V1R8C10. You can specify whether to migrate this function by configuring parameter **MigDbmsLob**.

Input - DBMS_LOB.SUBSTR when MigDbmsLob is set to true

If the value of **MigDbmsLob** is **true**, then migration happens. If the value is **false**, then migration does not happen.

Input

```
select dbms_lob.substr('!2d3d4dd!',1,5);
```

Output

If the config param is true, it should be migrated as below:

```
select substr('!2d3d4dd!',5,1);
```

If false, it should be retained as it is:

```
select dbms_lob.substr('!2d3d4dd!',1,5);
```

Input

```
select dbms_lob.substr('!2d3d4dd!',5);
```

Output

If the config param is true, it should be migrated as below:

```
select substr('!2d3d4dd!',1,5);
```

If false, it should be retained as it is:

```
select dbms_lob.substr('!2d3d4dd!',5);
```

6.9.13.3 String Functions

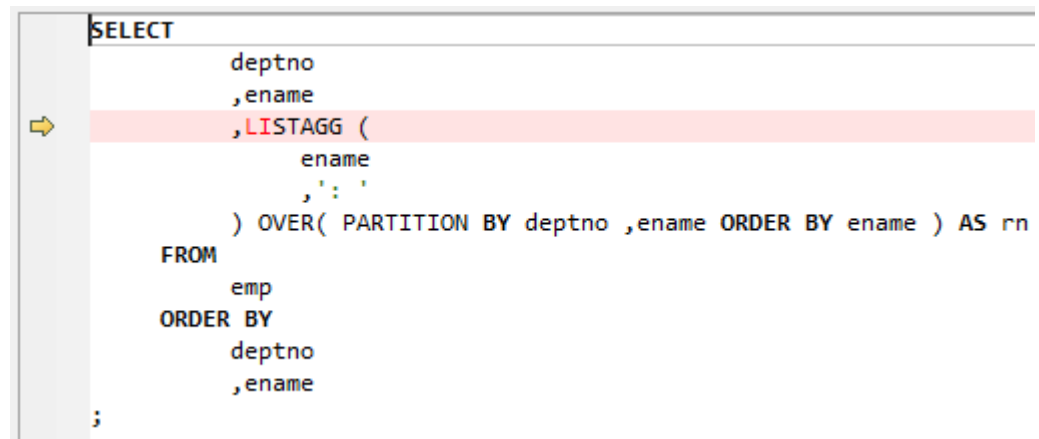
This section describes the following string functions:

- [LISTAGG](#)
- [STRAGG](#)
- [WM_CONCAT](#)
- [NVL2 and REPLACE](#)
- [QUOTE](#)

LISTAGG

LISTAGG is used to order data in columns within each group specified in the **ORDER BY** clause and concatenates the order results.

Figure 6-37 Input - Listagg



```
SELECT
    deptno
    ,ename
    ,LISTAGG (
        ename
        ,': '
    ) OVER( PARTITION BY deptno ,ename ORDER BY ename ) AS rn
FROM
    emp
ORDER BY
    deptno
    ,ename
;
```

Figure 6-38 Output - Listagg

```
SELECT
    deptno
    ,ename
    ,STRING_AGG (
        ename
        ,':'
    ) OVER( PARTITION BY deptno ,ename ORDER BY ename ) AS rn
FROM
    emp
ORDER BY
    deptno
    ,ename
;
```

LISTAGG can be migrated after **MigSupportForListAgg** is set to **false**.

Input- LISTAGG

```
SELECT LISTAGG(BRANCH_ID,')') WITHIN GROUP(ORDER BY AREA_ORDER) PRODUCTRANGE
FROM (SELECT DISTINCT VB.BRANCH_ID,
    VB.VER_ID,
    VB.AREA_ORDER
FROM SPMS_VERSION_BRANCH VB, SPMS_NODE_SET NS
WHERE VB.BRANCH_TYPE IN ('1', '3')
AND VB.AGENCY_BRANCH = NS.BRANCH_ID);
```

Output

```
SELECT LISTAGG (BRANCH_ID,')') WITHIN GROUP (
ORDER BY AREA_ORDER ) PRODUCTRANGE
FROM ( SELECT
    DISTINCT VB.BRANCH_ID
    ,VB.VER_ID
    ,VB.AREA_ORDER
FROM
    SPMS_VERSION_BRANCH VB
    ,SPMS_NODE_SET NS
WHERE VB.BRANCH_TYPE IN (
    '1','3')
AND VB.AGENCY_BRANCH = NS.BRANCH_ID)
;
```

STRAGG

STRAGG is a string aggregate function used to collect values from multiple rows into a comma-separated string.

Input-STRAGG

```
SELECT DEPTNO,ENAME,STRAGG(ename) over (partition by deptno order by
    ename RANGE BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING)
AS ENAME_STR FROM EMP;
```

Output

```
SELECT DEPTNO,ENAME,STRING_AGG (
    ename,')') over( partition BY deptno ORDER BY
    ename RANGE BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED
    FOLLOWING ) AS ENAME_STR
FROM EMP
;
```


WM_CONCAT

WM_CONCAT is used to aggregate data from a number of rows into a single row, giving a list of data associated with a specific value.

Figure 6-39 Input - WM_Concat

```
SELECT
    deptno
    ,WM_CONCAT (ename) over( partition BY deptno ORDER BY ename ) AS OUTPUT
    ,COUNT( ename ) over( partition BY deptno ) AS tot_count
FROM
    emp
;
```

Figure 6-40 Output - WM_Concat

```
SELECT
    deptno
    ,STRING_AGG (
        ename
        ,','
    ) over( partition BY deptno ORDER BY ename ) AS OUTPUT
    ,COUNT( ename ) over( partition BY deptno ) AS tot_count
FROM
    emp
;
```

NVL2 and REPLACE

NVL2(expression, value1, value2) is a function used to determine the value returned by a query based on whether a specified expression is null or not. If the expression is not null, then NVL2 returns value1. If the expression is null, then NVL2 returns value2.

Input - NVL2

```
NVL2(Expr1, Expr2, Expr3)
```

Output

```
DECODE(Expr1, NULL, Expr3, Expr2)
```

The **REPLACE** function is used to return char with every occurrence of search_string replaced with replacement_string. If replacement_string is omitted or null, then all occurrences of search_string are removed.

The **REPLACE** function in Oracle contains two mandatory parameters and one optional parameter. The **REPLACE** function in GaussDB(DWS) contains three mandatory parameters.

Input - Nested REPLACE

```
CREATE
OR REPLACE FUNCTION F_REPLACE_COMMA ( IS_STR IN VARCHAR2 ) RETURN VARCHAR2 IS BEGIN
IF
```

```
        IS_STR IS NULL
        THEN RETURN NULL ;
    ELSE
        RETURN REPLACE( REPLACE( IS_STR ,'a' ),CHR ( 10 ) ) ;
    END IF ;
END F_REPLACE_COMMA ;
/
```

Output

```
CREATE
OR REPLACE FUNCTION F_REPLACE_COMMA ( IS_STR IN VARCHAR2 ) RETURN VARCHAR2 IS BEGIN
    IF
        IS_STR IS NULL
        THEN RETURN NULL ;
    ELSE
        RETURN REPLACE( REPLACE( IS_STR ,'a' ',' ),CHR ( 10 ) ',' ) ;
    END IF ;
end ;
/
```

Input - More than one REPLACE

```
SELECT
    REPLACE( 'JACK and JUE' ,'J' ,'' ) "Changes"
    ,REPLACE( 'JACK1 and JUE' ,'J' ) "Changes1"
    ,REPLACE( 'JACK2 and JUE' ,'J' ) "Changes2"
FROM
    DUAL
;
```

Output

```
SELECT
    REPLACE( 'JACK and JUE' ,'J' ,'' ) "Changes"
    ,REPLACE( 'JACK1 and JUE' ,'J' ,'' ) "Changes1"
    ,REPLACE( 'JACK2 and JUE' ,'J' ,'' ) "Changes2"
FROM
    DUAL
;
```

Input - REPLACE with Three parameters

```
SELECT
    REPLACE( '123tech123' ,'123' , '1' )
FROM
    dual
;
```

Output

```
SELECT
    REPLACE( '123tech123' ,'123' , '1' )
FROM
    dual
;
```

QUOTE

QUOTE allows the user to embed single-quotes in literal strings without having to resort to double quotes. That is, you can use single quotes to specify a literal string.

For example:

```
SELECT q'[I'm using quote operator in SQL statement]' "Quote (q) Operator" FROM dual;
```

Figure 6-41 Input - Quote

```
SELECT
    q'[It's a string quote operator.]'
FROM
    dual
;
```

Figure 6-42 Output - Quote

```
SELECT
    $q$It's a string quote operator.$q$
FROM
    dual
;
```

6.9.13.4 Analytical Functions

Analytical functions compute an aggregate value based on a group of rows. They differ from aggregate functions in that they return multiple rows for each group. Analytical functions are commonly used to compute cumulative, moving, centered, and reporting aggregates. DSC supports analytical functions including the RATIO_TO_REPORT function.

Input - Analytical Functions

```
SELECT empno, ename, deptno
, COUNT(*) OVER() AS cnt
, AVG(DISTINCT empno) OVER (PARTITION BY deptno) AS cnt_dst
FROM emp
ORDER BY empno;
```

Output

```
WITH aggDistQuery1 AS (
    SELECT
        deptno
        ,AVG (
            DISTINCT empno
        ) aggDistAlias1
    FROM
        emp
    GROUP BY
        deptno
) SELECT
    empno
    ,ename
    ,deptno
    ,COUNT( * ) OVER( ) AS cnt
    ,(
        SELECT
            aggDistAlias1
        FROM
            aggDistQuery1
        WHERE
            deptno = MigTblAlias.deptno
    ) AS cnt_dst
FROM
    emp MigTblAlias
ORDER BY
    empno
;
```

RATIO_TO_REPORT

RATIO_TO_REPORT is an analytic function which returns the proportion of a value to a group of values.

Input - RATIO_TO_REPORT

```
SELECT last_name, salary
       , RATIO_TO_REPORT(salary) OVER () AS rr
FROM employees
WHERE job_id = 'PU_CLERK';
```

Output

```
SELECT last_name, salary
       , salary / NULLIF( SUM (salary) OVER( , 0 ) AS rr
FROM employees
WHERE job_id = 'PU_CLERK';
```

Input - RATIO_TO_REPORT with AGGREGATE column in SELECT

```
SELECT
  Ename
  ,Deptno
  ,Empno
  ,SUM (salary)
  ,RATIO_TO_REPORT (
    COUNT( DISTINCT Salary )
  ) OVER( PARTITION BY Deptno ) RATIO
FROM
  emp1
ORDER BY
  Ename
  ,Deptno
  ,Empno
;
```

Output

```
SELECT
  Ename
  ,Deptno
  ,Empno
  ,SUM (salary)
  ,COUNT( DISTINCT Salary ) / NULLIF( SUM ( COUNT( DISTINCT Salary ) ) OVER( PARTITION BY
Deptno ) ,0 ) RATIO
FROM
  emp1
ORDER BY
  Ename
  ,Deptno
  ,Empno
;
```

Input - RATIO_TO_REPORT with the AGGREGATE column using extending grouping feature but OUNT (Salary) in the RATIO TO REPORT column is not present in SELECT

Use the [extendedGroupByClause](#) configuration parameter to configure migration of the extended GROUP BY clause.

```
SELECT
  Ename
  ,Deptno
  ,Empno
  ,SUM (salary)
  ,RATIO_TO_REPORT (
```

```

COUNT( Salary )
) OVER( PARTITION BY Deptno ) RATIO
FROM
emp1
GROUP BY
GROUPING SETS (
Ename
,Deptno
,Empno
)
ORDER BY
Ename
,Deptno
,Empno
;

```

Output

```

SELECT
Ename
,Deptno
,Empno
,ColumnAlias1
,aggColumnalias1 / NULLIF( SUM ( aggColumnalias1 ) OVER( PARTITION BY Deptno ) ,0 ) RATIO
FROM
(
SELECT
SUM (salary) AS ColumnAlias1
,COUNT( Salary ) aggColumnalias1
,NULL AS Deptno
,NULL AS Empno
,Ename
FROM
emp1
GROUP BY
Ename
UNION
ALL SELECT
SUM (salary) AS ColumnAlias1
,COUNT( Salary ) aggColumnalias1
,Deptno
,NULL AS Empno
,NULL AS Ename
FROM
emp1
GROUP BY
Deptno
UNION
ALL SELECT
SUM (salary) AS ColumnAlias1
,COUNT( Salary ) aggColumnalias1
,NULL AS Deptno
,Empno
,NULL AS Ename
FROM
emp1
GROUP BY
Empno
)
ORDER BY
Ename
,Deptno
,Empno
;

```

6.9.13.5 Regular Expression Functions

Regular expressions specify patterns to match strings using standardized syntax conventions. In Oracle, regular expressions are implemented using a set of SQL functions that allow you to search and use string data.

DSC can migrate **REGEXP_INSTR**, **REGEXP_SUBSTR**, and **REGEXP_REPLACE** regular expressions. Details are as follows:

- Regexp (REGEXP_INSTR and REGEXP_SUBSTR) that includes the **sub_expr** parameter are not supported. If the input script includes **sub_expr**, the DSC will log an error for it.
- Regexp (REGEXP_INSTR, REGEXP_SUBSTR, and REGEXP_REPLACE) uses the **match_param** parameter to set the default matching behavior. The DSC supports values *i* (case-insensitive) and *c* (case-sensitive) for this parameter. Other values for **match_param** are not supported.
- Regexp (REGEXP_INSTR) uses the **return_option** parameter to set what is returned for regexp. The DSC supports the value 0 (zero) for this parameter. Other values for **return_option** are not supported.

REGEXP_INSTR

REGEXP_INSTR extends the functionality of the INSTR function by supporting the regular expression pattern for the search string. REGEXP_INSTR with 2 to 6 parameters are supported for migration.

The **sub_expr** parameter (parameter #7) is available in Oracle but is not supported for migration. If the input script includes **sub_expr**, the DSC will log an error for it.

For **return_option**, the value 0 (zero) is supported. Other values for **return_option** are not supported.

For **match_param**, values *i* (case-insensitive) and *c* (case-sensitive) are supported. Other values for **match_param** are not supported.

```
REGEXP_INSTR(  
    string,  
    pattern,  
    [start_position,]  
    [nth_appearance,]  
    [return_option,]  
    [match_param,]  
    [sub_expr]  
)
```

Bulk Operations

- **Input - REGEXP_INSTR**

```
SELECT  
    REGEXP_INSTR( 'TechOnTheNet is a great resource' , 't' )  
FROM  
    dual  
;
```

Output

```
SELECT  
    MIG_ORA_EXT.REGEXP_INSTR (  
        'TechOnTheNet is a great resource'  
        , 't'
```

```
)  
FROM  
dual  
;
```

- **Input - REGEXP_INSTR with 7 parameters (Invalid)**

```
SELECT  
Empno  
,ename  
,REGEXP_INSTR( ename , 'a|e|i|o|u' , 1 , 1 , 0 , 'i' , 7 ) AS Dname  
FROM  
emp19  
;
```

Output

The input expression has 7 parameters. Since the tool supports REGEXP_INSTR with 2 to 6 arguments, an error will be logged, starting "*Seven(7) arguments for REGEXP_INSTR function is not supported.*"

```
SELECT  
Empno  
,ename  
,REGEXP_INSTR( ename , 'a|e|i|o|u' , 1 , 1 , 0 , 'i' , 7 ) AS Dname  
FROM  
emp19  
;
```

BLogic Operations

- **Input - REGEXP_INSTR**

```
CREATE OR REPLACE FUNCTION myfct  
RETURN VARCHAR2  
IS  
res VARCHAR2(200) ;  
BEGIN  
res := 100 ;  
INSERT INTO emp19 RW(RW.empno,RW.ename,dname) SELECT res, RWN.ename key  
, regexp_instr(ename , '[ae]', 4, 2, 0, 'i') as Dname FROM emp19 RWN ;  
  
RETURN res ;  
END ;  
/
```

Output

```
CREATE  
OR REPLACE FUNCTION myfct RETURN VARCHAR2 IS res VARCHAR2 ( 200 ) ;  
BEGIN  
res := 100 ;  
INSERT INTO emp19 ( empno ,ename ,dname ) SELECT  
res ,RWN.ename "KEY" ,MIG_ORA_EXT.REGEXP_INSTR ( ename , '[ae]' , 4 , 2 , 0 , 'i' ) as Dname  
FROM  
emp19 RWN ;  
RETURN res ; END ;  
/
```

REGEXP_SUBSTR

REGEXP_SUBSTR extends the functionality of the SUBSTR function by supporting regular expression pattern for the search string. REGEXP_SUBSTR with 2 to 5 parameters are supported for migration.

The **sub_expr** parameter (parameter #6) is available in Oracle but is not supported for migration. If the input script includes **sub_expr**, the DSC will log an error for it.

For **match_param**, values i (case-insensitive) and c (case-sensitive) are supported. Other values for **match_param** are not supported.

```
REGEXP_SUBSTR(  
  string,  
  pattern,  
  [start_position,]  
  [nth_appearance,]  
  [match_param,]  
  [sub_expr]  
)
```

Bulk Operations

- **Input - REGEXP_SUBSTR**

```
SELECT  
  Ename  
  ,REGEXP_SUBSTR( 'Programming' ,'\w).*?\1' ,1 ,1 ,'i' )  
FROM  
  emp16  
;
```

Output

```
SELECT  
  Ename  
  ,MIG_ORA_EXT.REGEXP_SUBSTR (  
    'Programming'  
    ,'\w).*?\1'  
    ,1  
    ,1  
    , 'i'  
  )  
FROM  
  emp16  
;
```

- **Input - REGEXP_SUBSTR**

```
SELECT  
  REGEXP_SUBSTR( '1234567890' ,'(123)(4(56)(78))' ,1 ,1 ,'i' ) "REGEXP_SUBSTR"  
FROM  
  DUAL  
;
```

Output

```
SELECT  
  MIG_ORA_EXT.REGEXP_SUBSTR (  
    '1234567890'  
    ,'(123)(4(56)(78))'  
    ,1  
    ,1  
    , 'i'  
  ) "REGEXP_SUBSTR"  
FROM  
  DUAL  
;
```

- **Input - REGEXP_SUBSTR with 6 parameters (Invalid)**

```
SELECT  
  REGEXP_SUBSTR( '1234567890' ,'(123)(4(56)(78))' ,1 ,1 , 'i' ,1 ) "REGEXP_SUBSTR"  
FROM  
  DUAL  
;
```

Output

The input expression has 6 arguments. Since the tool supports REGEXP_SUBSTR with 2 to 5 parameters an error will be logged, starting "*Error message :Six(6) arguments for REGEXP_SUBSTR function is not supported.*"

```
SELECT
  REGEXP_SUBSTR( '1234567890' ,(123)(4(56)(78))' ,1 ,1 ,'i' ,1 ) "REGEXP_SUBSTR"
FROM
  DUAL
;
```

BLogic Operations

- **Input - REGEXP_SUBSTR**

```
CREATE OR REPLACE FUNCTION myfct
RETURN VARCHAR2
IS
res VARCHAR2(200) ;
BEGIN
  res := 100 ;
  INSERT INTO emp19 RW(RW.empno,RW.ename,dname) SELECT res, RWN.ename key
,REGEXP_ SUBSTR ('TechOnTheNet', 'a|e|i|o|u', 1, 1, 'i') as Dname FROM emp19 RWN ;

  RETURN res ;
END ;
/
```

Output

```
CREATE
OR REPLACE FUNCTION myfct RETURN VARCHAR2 IS res VARCHAR2 ( 200 ) ;
BEGIN
  res := 100 ;
  INSERT INTO emp19 ( empno ,ename ,dname ) SELECT
  res ,RWN.ename "KEY" ,MIG_ORA_EXT.REGEXP_ SUBSTR ( 'TechOnTheNet' ,a|e|i|o|u' ,1 ,1 ,'i' ) as
Dname
FROM
  emp19 RWN ;
  RETURN res ;
END ;
/
```

REGEXP_REPLACE

REGEXP_REPLACE extends the functionality of the REPLACE function by supporting regular expression pattern for the search string. REGEXP_REPLACE with 2 to 6 parameters are supported for migration.

For **match_param**, values i (case-insensitive) and c (case-sensitive) are supported. Other values for **match_param** are not supported.

```
REGEXP_REPLACE(
  string,
  pattern,
  [replacement_string,]
  [start_position,]
  [nth_appearance,]
  [match_param]
)
```

Bulk Operations

- **Input - REGEXP_REPLACE**

```
SELECT
  testcol
,regexp_replace( testcol ,'([[:digit:]]{3})\.[[:digit:]]{3}\.[[:digit:]]{4}','(\1) \2-\3' ) RESULT
```

```
FROM
  test
WHERE
  LENGTH( testcol ) = 12
;
```

Output

```
SELECT
  testcol
  ,MIG_ORA_EXT.REGEXP_REPLACE (
    testcol
    ,'([[:digit:]]{3})\.[[:digit:]]{3})\. ([[:digit:]]{4})'
    ,'\1) \2-\3'
  ) RESULT
FROM
  test
WHERE
  LENGTH( testcol ) = 12
;
```

- **Input - REGEXP_REPLACE**

```
SELECT
  UPPER( regexp_replace ( 'foobarbequebazilbarfbnk barbeque' ,'(b[^b]+)(b[^b]+)' ) )
FROM
  DUAL
;
```

Output

```
SELECT
  UPPER( MIG_ORA_EXT.REGEXP_REPLACE ( 'foobarbequebazilbarfbnk barbeque' ,'(b[^b]+)(b[^b]+)' ) )
FROM
  DUAL
;
```

- **Input - REGEXP_REPLACE with 7 parameters (Invalid)**

```
SELECT
  REGEXP_REPLACE( 'TechOnTheNet' , 'a|e|i|o|u' , 'Z' , 1 , 1 , 'i' , '\1) \2-\3' ) AS First_Occurrence
FROM
  emp
;
```

Output

The input expression has 7 parameters. Since the tool supports REGEXP_REPLACE with 2 to 6 parameters, an error will be logged, starting "*Too many arguments for REGEXP_REPLACE function [Max:6 argument(s) is/are allowed].*"

```
SELECT
  REGEXP_REPLACE( 'TechOnTheNet' , 'a|e|i|o|u' , 'Z' , 1 , 1 , 'i' , '\1) \2-\3' ) AS First_Occurrence
FROM
  emp
;
```

BLogic Operations

- **Input - REGEXP_REPLACE**

```
CREATE OR REPLACE FUNCTION myfct
RETURN VARCHAR2
IS
  res VARCHAR2(200) ;
BEGIN
  res := 100 ;
  INSERT INTO emp19 RW(RW.empno,RW.ename,dname) SELECT res, RWN.ename key
  ,REGEXP_REPLACE ( 'TechOnTheNet' , 'a|e|i|o|u' , 'Z' , 1 , 1 , 'i' ) as Dname FROM emp19 RWN ;
```

```
RETURN res ;
END ;
/
```

Output

```
CREATE
OR REPLACE FUNCTION myfct RETURN VARCHAR2 IS res VARCHAR2 ( 200 ) ;
BEGIN
res := 100 ;
INSERT INTO emp19 ( empno ,ename ,dname ) SELECT
res ,RWN.ename "KEY" ,MIG_ORA_EXT.REGEXP_REPLACE ( 'TechOnTheNet' ,'a|e|i|o|u' ,'Z' ,1 ,1 ,'i' )
as Dname
FROM
emp19 RWN ;
RETURN res ;
END ;
/
```

LISTAGG/regexp_replace/regexp_instr

Configure the following parameters before migrating LISTAGG/regexp_replace/regexp_instr:

- MigSupportForListAgg=false
- MigSupportForRegexReplace=false

Input- REMOVE LISTAGG/regexp_replace/regexp_instr

```
SELECT LISTAGG(T.OS_SOFTASSETS_ID,') WITHIN GROUP(ORDER BY T.SOFTASSETS_ID)
INTO V_OS_SOFTASSETS_IDS
FROM SPMS_SYSSOFT_PROP_APPR T
WHERE T.APPR_ID = I_APPR_ID
AND T.SYSSOFT_PROP = '001';
```

```
V_ONLY_FILE_NAME := REGEXP_REPLACE( I_FILENAME ,'.*/' ,'' ) ;
```

```
THEN v_auth_type := 102;
ELSIF v_status IN ('0100', '0200')
AND REGEXP_INSTR (v_role_str, '(411|414),') > 0
```

Output

```
"SELECT LISTAGG(T.OS_SOFTASSETS_ID,') WITHIN GROUP(ORDER BY T.SOFTASSETS_ID)
INTO V_OS_SOFTASSETS_IDS
FROM SPMS_SYSSOFT_PROP_APPR T
WHERE T.APPR_ID = I_APPR_ID
AND T.SYSSOFT_PROP = '001';
```

```
V_ONLY_FILE_NAME := REGEXP_REPLACE (I_FILENAME, '.*', '');
```

```
THEN v_auth_type := 102;
ELSIF v_status IN ('0100', '0200')
AND REGEXP_INSTR (v_role_str, '(411|414),') > 0"
```

6.9.14 PL/SQL

This section describes the migration syntax of Oracle PL/SQL. The migration syntax determines how the keywords and features are migrated.

PL/SQL combines the procedural features of SQL and programming languages.

SQL Commands

Oracle Syntax	Syntax After Migration
<pre>set define off spool ORACLE.log create table product (product_id VARCHAR2(20), product_name VARCHAR2(50)); spool off</pre>	<pre>/*set define off;*/ /*spool ORACLE.log*/ CREATE TABLE product (product_id VARCHAR2(20), product_name VARCHAR2(50)); /*spool off*/</pre>

For details, see the following topics:

[EDITIONABLE](#)

[Variable Assignment](#)

[END](#)

[EXCEPTION Handling](#)

[Subtransaction Handling](#)

[STRING](#)

[LONG](#)

[RESULT_CACHE](#)

[Relational Operators with Spaces](#)

[Substitution Variables](#)

[PARALLEL_ENABLE](#)

[TRUNCATE TABLE](#)

[ALTER SESSION](#)

[AUTONOMOUS](#)

[Procudure Call](#)

EDITIONABLE

The EDITIONABLE keyword is not supported in GaussDB. So it needs to be removed from the target database.

Input – EDITIONABLE

```
CREATE OR REPLACE EDITIONABLE PACKAGE "PACK1"."PACKAGE_SEND_MESSAGE"
AS
  TYPE filelist IS REF CURSOR;
  PROCEDURE get_message_info (in_userid      IN   VARCHAR2,
                             in_branchid   IN   VARCHAR2,
                             in_appverid  IN   VARCHAR2,
                             in_app_list_flag IN VARCHAR2,
                             in_filetype  IN   VARCHAR2,
                             in_filestate  IN   VARCHAR2,
                             o_retcode    OUT VARCHAR2,
                             o_errormsg   OUT VARCHAR2,
                             o_seq       OUT VARCHAR2,
```

```
o_totalnum    OUT NUMBER,
o_filelist    OUT fileList);
```

Output

```
/*~~PACKAGE_SEND_MESSAGE~~*/
CREATE
  SCHEMA PACKAGE_SEND_MESSAGE
;
```

Variable Assignment

Figure 6-43 Input - PL/SQL

```
BEGIN
...
v_rowcount := SQL%ROWCOUNT;
..
END;
```

Figure 6-44 Output - PL/SQL

```
BEGIN
...
v_rowcount := SQL%ROWCOUNT;
..
END;
```

END

END with label is not supported in GaussDB T, so, the label name is removed during migration.

Input - END with a procedure name

```
CREATE OR REPLACE PROCEDURE sp_ins_emp
...
...
...
END sp_ins_emp;
```

Output

```
CREATE OR REPLACE PROCEDURE sp_ins_emp
...
...
...
END;
```

Input - END with a function name

```
CREATE FUNCTION fn_get_bal
...
...
...
END get_bal;
/
```

Output

```
CREATE FUNCTION fn_get_bal
...
...
...
END;
/
```

EXCEPTION Handling

GaussDB(DWS) does not support **EXCEPTION** handling. To migrate scripts to V100R200C60, set the **exceptionHandler** parameter to **True**.

For DSC 18.2.0, this parameter must be set to the default value **False**.

Figure 6-45 Input - EXCEPTION Handling

```
1 CREATE
2 OR REPLACE FUNCTION get_salary ( n_emp_id NUMBER ) RETURN NUMBER IS n_salary NUMBER ( 8 ,2 ) ;
3 BEGIN
4     SELECT
5         salary INTO n_salary
6         FROM
7             employees
8         WHERE
9             id = n_emp_id ;
10        RETURN n_salary ;
11        EXCEPTION WHEN NO_DATA_FOUND
12        THEN RETURN NULL ;
13        WHEN TOO_MANY_ROWS
14        THEN RETURN NULL ;
15    END get_salary ;
16 /
```

Figure 6-46 Output - EXCEPTION Handling

```
1
2 CREATE
3 OR REPLACE FUNCTION get_salary ( n_emp_id NUMBER ) RETURN NUMBER IS n_salary NUMBER ( 8 ,2 ) ;
4 BEGIN
5     SELECT
6         salary INTO n_salary
7         FROM
8             employees
9         WHERE
10            id = n_emp_id ;
11           RETURN n_salary ;
12           /* EXCEPTION WHEN NO_DATA_FOUND THEN RETURN NULL ; WHEN TOO_MANY_ROWS THEN RETURN NULL ; */
13    end ;
14 /
```

Subtransaction Handling

Subtransaction (that is commit and rollback statements in PL/SQL) is not supported. This parameter must be set to the default **True**.

Figure 6-47 Input - Subtransaction Handling

```

1 CREATE
2 OR REPLACE FUNCTION SUB_TRANSACTION ( x NUMBER ,y VARCHAR2 ) RETURN NUMBER IS id_val NUMBER ( 8 ,2 ) ;
3 BEGIN
4     INSERT INTO employees ( id ,first_name )
5     VALUES ( x ,y ) ;
6     UPDATE
7     employees
8     SET
9     id = x
10    WHERE
11    first_name = y ;
12    commit ;
13    select
14    id into id_val
15    from
16    employees
17    where
18    first_name = 'James' ;
19    DELETE
20    FROM
21    employees
22    WHERE
23    first_name = y ;
24    RETURN id_val ;
25    Rollback ;
26 END SUB_TRANSACTION ;
27 /

```

Figure 6-48 Output - Subtransaction Handling

```

1 CREATE
2 OR REPLACE FUNCTION SUB_TRANSACTION ( x NUMBER ,y VARCHAR2 ) RETURN NUMBER IS id_val NUMBER ( 8 ,2 ) ;
3 BEGIN
4     INSERT INTO employees ( id ,first_name ) select
5     x ,y ;
6     UPDATE
7     employees
8     SET
9     id = x
10    WHERE
11    first_name = y ;
12    /* commit; */
13    null ;
14    select
15    id into id_val
16    from
17    employees
18    where
19    first_name = 'James' ;
20    DELETE
21    FROM
22    employees
23    WHERE
24    first_name = y ;
25    RETURN id_val ;
26    /* Rollback; */
27    null ;
28 end ;
29 /

```

STRING

STRING is an Oracle PL/SQL data type that is not supported by GaussDB T. This data type is handled by using VARCHAR.

Figure 6-49 Input - STRING

```

20 --STRING
21 CREATE
22 OR REPLACE FUNCTION text_length ( a CLOB ) RETURN String DETERMINISTIC IS BEGIN
23     RETURN DBMS_LOB.GETLENGTH ( a ) ;
24 END text_length ;
25 /

```

Figure 6-50 Output - STRING

```
21 /* STRING */
22 CREATE
23 OR REPLACE FUNCTION text_length ( a CLOB ) RETURN VARCHAR DETERMINISTIC IS BEGIN
24     RETURN DBMS_LOB.GETLENGTH ( a );
25 end ;
26 /
```

LONG

LONG is migrated as TEXT.

Input - LONG

```
CREATE OR REPLACE FUNCTION fn_proj_det
    ( i_proj_cd INT )
RETURN LONG
IS
    v_proj_det LONG;
BEGIN
    SELECT proj_det
        INTO v_proj_det
        FROM project
        WHERE proj_cd = i_proj_cd;

    RETURN v_proj_det;
END;
/
```

Output

```
CREATE OR REPLACE FUNCTION fn_proj_det
    ( i_proj_cd INT )
RETURN TEXT
IS
    v_proj_det TEXT;
BEGIN
    SELECT proj_det
        INTO v_proj_det
        FROM project
        WHERE proj_cd = i_proj_cd;

    RETURN v_proj_det;
END;
/
```

RESULT_CACHE

When a function with result cache is called, Oracle executes the function, adds the result to the result cache, and then returns the function.

When the function call is repeated, Oracle fetches the results from the cache rather than re-executing the function.

Under certain scenarios, this caching behavior can result in significant performance gains.

The target database does not support this keyword, which will be removed from the target file.

Figure 6-51 Input - RESULT_CACHE

```

CREATE OR REPLACE FUNCTION fn_get_emp_by_eno
    ( val_in IN NUMBER )
RETURN NUMBER
RESULT_CACHE
IS
    l_returnvalue NUMBER;
BEGIN
    SELECT deptno
        INTO l_returnvalue
    FROM emp t
    WHERE t.empno = val_in;

    RETURN l_returnvalue;
END fn_get_emp_by_eno;
/

```

Figure 6-52 Output - RESULT_CACHE

```

CREATE OR REPLACE FUNCTION fn_get_emp_by_eno
    ( val_in IN NUMBER )
RETURN NUMBER
//
IS
    l_returnvalue NUMBER ;
BEGIN
    SELECT deptno
        INTO l_returnvalue
    FROM emp t
    WHERE t.empno = val_in ;

    RETURN l_returnvalue ;
END;
/

```

Relational Operators with Spaces

The relational operators (<=, >=, !=) with spaces are not supported by GaussDB(DWS). DSC removes spaces between the operators.

Figure 6-53 Input - Relational operator

```

28 --RELATIONAL OPERATOR
29 CREATE
30 OR REPLACE FUNCTION REL_OPTR ( n_emp_id NUMBER ) RETURN NUMBER IS n_salary NUMBER ( 8 ,2 ) ;
31 BEGIN
32     SELECT
33         salary INTO n_salary
34     FROM
35         employees
36     WHERE
37         id > = n_emp_id ;
38     RETURN n_salary ;
39 END REL_OPTR ;
40 /
41
42

```

Figure 6-54 Output - Relational operator

```
29  /* RELATIONAL OPERATOR */
30  CREATE
31  OR REPLACE FUNCTION REL_OPTR ( n_emp_id NUMBER ) RETURN NUMBER IS n_salary NUMBER ( 8 ,2 ) ;
32  BEGIN
33      SELECT
34          salary INTO n_salary
35      FROM
36          employees
37      WHERE
38          id >= n_emp_id ;
39          RETURN n_salary ;
40  end ;
41  /
42
```

Substitution Variables

Substitution variables are a feature of Oracle SQL*Plus tool. When a substitution variable is used in a statement, SQL*Plus requests an input value and rewrites the statement to include it. The rewritten statement is passed to the Oracle database. When the Oracle script input contains any substitution variables, the DSC displays the following message. Messages are recorded in the console and log files.

```
*****
USER ATTENTION!!! Variable: &bbid should be substituted in the file : "/home/testmigration/V100R002C60/
MigrationTool/Input/proc_frss_jczbsc.SQL" Variable: &wdbbs should be substituted in the file : "/home/
testmigration/V100R002C60/MigrationTool/Input/proc_frss_jczbsc.SQL" Variable: &batch_no should be
substituted in the file : "/home/testmigration/V100R002C60/MigrationTool/Input/proc_frss_jczbsc.SQL"
*****
```

PARALLEL_ENABLE

In Oracle, PARALLEL_ENABLE is used to enable parallel loading among partitions.

Input - PARALLEL_ENABLE

```
CREATE OR REPLACE FUNCTION F_REPLACE_COMMA (IS_STR IN VARCHAR2)
RETURN VARCHAR2
parallel_enable
IS
BEGIN
    IF IS_STR IS NULL THEN
        RETURN NULL;
    ELSE
        RETURN REPLACE(REPLACE(IS_STR, CHR(13) || CHR(10), ''), ',', ', ');
    END IF;
END F_REPLACE_COMMA;
/
```

Output

```
CREATE OR REPLACE FUNCTION F_REPLACE_COMMA (IS_STR IN VARCHAR2)
RETURN VARCHAR2
IS
BEGIN
    IF IS_STR IS NULL THEN
        RETURN NULL;
    ELSE
        RETURN REPLACE(REPLACE(IS_STR, CHR(13) || CHR(10), ''), ',', ', ');
    END IF;
END;
/
```

PARALLEL Clause

PARALLEL should be commented.

Input

```
CREATE TABLE PRODUCT
( prod_id    INTEGER    NOT NULL PRIMARY KEY
, prod_code  VARCHAR(5)
, prod_name  VARCHAR(100)
, unit_price NUMERIC(6,2) NOT NULL )
PARALLEL 8;
```

Output

```
CREATE TABLE PRODUCT
( prod_id    INTEGER    NOT NULL PRIMARY KEY
, prod_code  VARCHAR(5)
, prod_name  VARCHAR(100)
, unit_price NUMERIC(6,2) NOT NULL )
/* PARALLEL 8 */;
```

TRUNCATE TABLE

The **TRUNCATE TABLE** statement in Oracle is used to remove all records from a table. It performs the same function as a DELETE statement without a WHERE clause. After truncating, the table will exist but it will be empty. DSC supports migration of TRUNCATE TABLE statements with static table names only. Migration of TRUNCATE TABLE statements with dynamic table names are not supported by the tool.

NOTE

The tool does not support migration of TRUNCATE TABLE statements with dynamic table names.

Example: `L_table := 'truncate table ' || itable_name`

In this example, **itable_name** indicates a dynamic table name and is not supported by the DSC. The unsupported statements will be copied verbatim to the migrated scripts.

Input - TRUNCATE TABLE with Execute Immediate

```
CREATE OR REPLACE PROCEDURE schema1.proc1
AS
BEGIN
    EXECUTE IMMEDIATE 'TRUNCATE TABLE QUERY_TABLE';
End proc1;
/
```

Output

```
CREATE
OR REPLACE PROCEDURE schema1.proc1 AS BEGIN
    EXECUTE IMMEDIATE 'TRUNCATE TABLE schema1.QUERY_TABLE';
end ;
/
```

Input - TRUNCATE TABLE inside procedure

NOTE

Migration tool does not add schema names for dynamic PL/SQL statements.

```
CREATE
OR REPLACE PROCEDURE schemName.sp_dd_table ( itable_name VARCHAR2 ) IS L_table VARCHAR2
( 255 ) ;
BEGIN
    L_table := 'truncate table ' || itable_name ;
    ---- dbms_utility.exec_ddl_statement(L_table);
dbms_output.put_line ( itable_name || ' ' || 'Truncated' ) ;
```

```
END sp_dd_table ;  
/
```

Output

```
CREATE  
OR REPLACE PROCEDURE schemName.sp_dd_table ( i_table_name VARCHAR2 ) IS l_table VARCHAR2  
( 255 ) ;  
BEGIN  
    l_table := 'truncate table ' || i_table_name ;  
/*  
dbms_utility.exec_ddl_statement(l_table); */  
dbms_output.put_line ( i_table_name || ' ' || 'Truncated' ) ;  
end ;  
/
```

ALTER SESSION

The **ALTER SESSION** statement in Oracle is used to set or modify the parameters and behavior of the database connection. The statement stays in effect until you disconnect from the database. The DSC supports the migration of ALTER SESSION as follows:

- ALTER SESSION with ADVISE, ENABLE, DISABLE, CLOSE and FORCE clauses are migrated as commented scripts.
- ALTER SESSION with SET CLAUSE parameter (Example: NLS_DATE_FORMAT, NLS_DATE_LANGUAGE, and so on) are copied verbatim.

NOTE

The tool does not support migration of ALTER SESSION statements that have a variable for the command clause.

Example: EXECUTE IMMEDIATE ' alter session ' || *command_val* || 'parallel ' || type_value.

In this example, *command_val* is a variable and this is not supported by the DSC. The unsupported statements will be copied verbatim in the migrated scripts.

Input - ALTER SESSION

```
ALTER SESSION ENABLE PARALLEL DDL;  
ALTER SESSION ADVISE COMMIT;  
ALTER SESSION CLOSE DATABASE LINK local;  
ALTER SESSION SET NLS_DATE_FORMAT = 'YYYY MM DD HH24:MI:SS';  
ALTER SESSION SET current_schema = 'isfc';
```

Output

```
/*ALTER SESSION ENABLE PARALLEL DDL;*/  
/*ALTER SESSION ADVISE COMMIT;*/  
/*ALTER SESSION CLOSE DATABASE LINK local;*/  
ALTER SESSION SET NLS_DATE_FORMAT = 'YYYY MM DD HH24:MI:SS';  
ALTER SESSION SET current_schema = 'isfc';
```

Input - ALTER SESSION

```
Create or replace  
PROCEDURE PUBLIC .TEST_CALL is  
command_val varchar2 ( 1000 ) ;  
type_value number ;  
BEGIN  
    command_val := 'enable parallel ddl' ;  
    dbms_output.put_line ( mike ) ;  
-- execute immediate 'ALTER SESSION DISABLE GUARD' ;  
    execute immediate 'ALTER SESSION ADVISE ROLLBACK' ;  
EXECUTE IMMEDIATE ' alter session ' || command_val || 'parallel ' || type_value ;  
END TEST_CALL;
```

```
/
```

Output

```
Create or replace
PROCEDURE PUBLIC.TEST_CALL is
  command_val varchar2 ( 1000 ) ;
  type_value number ;
BEGIN
  command_val := 'enable parallel ddl' ;
dbms_output.put_line ( mike ) ;
/* execute immediate 'ALTER SESSION DISABLE GUARD' ; */
  execute immediate '/*ALTER SESSION ADVISE ROLLBACK*/' ;
EXECUTE IMMEDIATE 'alter session ' || command_val || 'parallel ' || type_value ;
END ;
/
```

AUTONOMOUS

Input - AUTONOMOUS

```
CREATE OR REPLACE EDITIONABLE PACKAGE BODY "Pack1"."DEMO_PROC" is
  PROCEDURE log(proc_name IN VARCHAR2, info IN VARCHAR2) IS
  PRAGMA AUTONOMOUS_TRANSACTION;
```

Output

```
CREATE OR REPLACE PROCEDURE DEMO_PROC.log ( proc_name IN VARCHAR2 ,info IN VARCHAR2 ) IS
/*PRAGMA AUTONOMOUS_TRANSACTION;*/
```

Procedure Call

Procedure with no parameter needs to put () after procedure name while calling the same procedure.

For example, pkg_etl.clear_temp_tables()

Input

```
CREATE OR REPLACE PACKAGE BODY IC_STAGE.pkg_etl
AS
PROCEDURE clear_temp_tables
IS
BEGIN
  NULL;
END clear_temp_tables;
END pkg_etl;
/
CREATE OR REPLACE PACKAGE BODY IC_STAGE.PKG_REVN_ARPU
AS
  PROCEDURE AGGR_X_AGG00_REVN_DEALER (p_date  PLS_INTEGER,
                                     p_days  PLS_INTEGER)
  AS
    v_start_date  PLS_INTEGER;
    v_curr_date   PLS_INTEGER;
  BEGIN
    v_start_date := TO_CHAR (TO_DATE (p_date, 'yyyymmdd') - (p_days - 1), 'yyyymmdd');
    v_curr_date := p_date;

    WHILE (v_curr_date >= v_start_date)
    LOOP
      pkg_etl.clear_temp_tables;
      pkg_dw.bind_variable ('v_curr_date', v_curr_date);

      v_curr_date := TO_CHAR (TO_DATE (v_curr_date, 'yyyymmdd') - 1, 'yyyymmdd');
    END LOOP;
```

```

END;
END PKG_REVN_ARPU;
/

```

Output

```

CREATE OR REPLACE PROCEDURE IC_STAGE.pkg_etl#clear_temp_tables PACKAGE IS
BEGIN
  NULL ;
END ;
/

CREATE OR REPLACE PROCEDURE IC_STAGE.PKG_REVN_ARPU#AGGR_X_AGG00_REVN_DEALER
( p_date INTEGER
, p_days INTEGER )
PACKAGE
AS
v_start_date INTEGER;
v_curr_date INTEGER;
BEGIN
  v_start_date := TO_CHAR( TO_DATE( p_date , 'yyyymmdd' ) - ( p_days - 1 ) , 'yyyymmdd' ) ;
  v_curr_date := p_date ;

  WHILE ( v_curr_date >= v_start_date )
  LOOP
    pkg_etl#clear_temp_tables ( ) ;
    pkg_dw.bind_variable ( 'v_curr_date' , v_curr_date ) ;
    v_curr_date := TO_CHAR( TO_DATE( v_curr_date , 'yyyymmdd' ) - 1 , 'yyyymmdd' ) ;
  END LOOP ;
END ;
/

```

Function Name Having No Parameter Is Called

Function name which does not have any parameter, called by function name with parameter is not supported in EXCEPTION statement that is SAD.SAD_CALC_ITEM_PKG_TEST_OB#error_msg () but this function error_msg is defined without parameter that is

```

CREATE
OR REPLACE FUNCTION SAD.SAD_CALC_ITEM_PKG_TEST_OB#func_name
RETURN VARCHAR2 IS MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2 ( 30 ) :=
MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE ( current_schema ( )
---
BEGIN
---
RETURN l_func_name ;
END ;

```

SCRIPTS : SAD_CALC_ITEM_PKG_TEST_OB.sql, SAD_CALC_ITEM_PRI_TEST_OB.sql

INPUT :

```

CREATE OR REPLACE PACKAGE BODY "SAD"."SAD_CALC_ITEM_PKG_TEST_OB" IS
PROCEDURE back_sad_cost_line_t(pi_contract_number IN VARCHAR2,
pi_quotation_id IN NUMBER,
pi_product_code IN VARCHAR2,
pi_process_batch_number IN NUMBER,
po_error_msg OUT VARCHAR2) IS
BEGIN
---
LOOP
INSERT INTO sad_cost_line_bak
(processing_batch_number,
contract_number,
product_code,
quotation_id,
item_code,

```

```
refresh_date,
split_date,
error_msg,
created_by,
creation_date,
last_updated_by,
last_update_date)
VALUES
(pi_process_batch_number,
cur_1.contract_number,
cur_1.product_code,
cur_1.quotation_id,
cur_1.item_code,
cur_1.refresh_date,
cur_1.split_date,
cur_1.error_msg,
cur_1.created_by,
cur_1.creation_date,
cur_1.last_updated_by,
cur_1.last_update_date);
END LOOP;
---
WHEN OTHERS THEN
po_error_msg := 'Others Exception raise in ' || func_name || ' '; || SQLERRM;
END back_sad_cost_line_t;
END SAD_CALC_ITEM_PKG_TEST_OB;
```

OUTPUT :

```
CREATE
OR REPLACE PROCEDURE SAD.SAD_CALC_ITEM_PKG_TEST_OB#back_sad_cost_line_t ( pi_contract_number
IN VARCHAR2
,pi_quotation_id IN NUMBER
,pi_product_code IN VARCHAR2
,pi_process_batch_number IN NUMBER
,po_error_msg OUT VARCHAR2 ) IS MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2 ( 30 ) :=
MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE ( current_schema ( )
,'SAD_CALC_ITEM_PKG_TEST_OB'
,'g_func_name' ) ::VARCHAR2 ( 30 ) ;
ex_data_error
EXCEPTION ;
ex_prog_error
EXCEPTION ;
BEGIN
---
LOOP
INSERT INTO sad_cost_line_bak (
processing_batch_number
,contract_number
,product_code
,quotation_id
,item_code
,refresh_date
,split_date
,SAD.SAD_CALC_ITEM_PKG_TEST_OB#error_msg ( )
,created_by
,creation_date
,last_updated_by
,last_update_date
)
VALUES
( pi_process_batch_number ,cur_1.contract_number ,cur_1.product_code ,cur_1.quotation_id ,cur_1.item_code
,cur_1.refresh_date ,cur_1.split_date ,cur_1.error_msg ,cur_1.created_by ,cur_1.creation_date ,cur_1.last_updat
ed_by ,cur_1.last_update_date ) ;
END LOOP ;
---
WHEN OTHERS THEN
po_error_msg := 'Others Exception raise in ' || SAD.SAD_CALC_ITEM_PKG_TEST_OB#func_name ( ) || ' '; ||
SQLERRM ;
END ;
```

Input

```
CREATE OR REPLACE PACKAGE BODY SAD.bas_dml_lookup_pkg IS
  g_pkg_name CONSTANT VARCHAR2(30) := 'bas_dml_ic_price_rule_pkg' ;
  g_func_name VARCHAR2(100);

  FUNCTION func_name
  RETURN VARCHAR2
  IS
    l_func_name VARCHAR2(100) ;
  BEGIN
    l_func_name := g_pkg_name || '.' || g_func_name ;
    RETURN l_func_name ;

  END ;

  PROCEDURE data_change_logs ( pi_table_name      IN VARCHAR2
                              , pi_table_key_columns IN VARCHAR2
                              , po_error_msg      OUT VARCHAR2
                              )
  IS
  BEGIN
    g_func_name := 'insert_fnd_data_change_logs_t';

    INSERT INTO fnd_data_change_logs_t
      ( logid, table_name, table_key_columns )
    VALUES
      ( fnd_data_change_logs_t_s.NEXTVAL
        , pi_table_name, pi_table_key_columns );
    EXCEPTION
      WHEN OTHERS THEN
        po_error_msg := 'Others Exception raise in ' || func_name || ',' || SQLERRM;
    END data_change_logs;

  END bas_dml_lookup_pkg;
/
```

Output

```
CREATE OR REPLACE FUNCTION SAD.bas_dml_lookup_pkg#func_name
RETURN VARCHAR2
IS
  MIG_PV_VAL_DUMMY_G_PKG_NAME VARCHAR2(30) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( 'SAD', 'BAS_DML_LOOKUP_PKG', 'G_PKG_NAME' )::VARCHAR2(30) ;
  MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2(100) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( 'SAD', 'BAS_DML_LOOKUP_PKG', 'G_FUNC_NAME' )::VARCHAR2(100) ;
  l_func_name VARCHAR2(100) ;
  BEGIN
    l_func_name := MIG_PV_VAL_DUMMY_G_PKG_NAME || '.' || MIG_PV_VAL_DUMMY_G_FUNC_NAME ;
    RETURN l_func_name ;

  END ;
/
CREATE OR REPLACE PROCEDURE SAD.bas_dml_lookup_pkg#data_change_logs ( pi_table_name IN
  VARCHAR2
                              , pi_table_key_columns IN VARCHAR2
                              , po_error_msg OUT VARCHAR2 )
  IS
  MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2(30) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( 'SAD', 'BAS_DML_LOOKUP_PKG', 'G_FUNC_NAME' )::VARCHAR2(30) ;
  BEGIN
    MIG_PV_VAL_DUMMY_G_FUNC_NAME := 'insert_fnd_data_change_logs_t' ;

    INSERT INTO fnd_data_change_logs_t (
      logid, table_name, table_key_columns )
    VALUES ( NEXTVAL ( 'fnd_data_change_logs_t_s' )
              , pi_table_name, pi_table_key_columns ) ;

    MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE ( 'SAD', 'BAS_DML_LOOKUP_PKG', 'G_FUNC_NAME',
    MIG_PV_VAL_DUMMY_G_FUNC_NAME ) ;
```



```
EXCEPTION
  WHEN OTHERS THEN
    po_error_msg := 'Others Exception raise in ' || SAD.bas_dml_lookup_pkg#func_name( ) || ' ' ||
SQLERRM ;
    MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE ( 'SAD', 'BAS_DML_LOOKUP_PKG', 'G_FUNC_NAME',
MIG_PV_VAL_DUMMY_G_FUNC_NAME ) ;
END ;
/
```

6.9.15 PL/SQL Collections (Using User-Defined Types)

This section describes the migration syntax of Oracle PL/SQL Collections. The migration syntax decides how the keywords/features are migrated.

A user-defined type (UDT) is a data type that is derived from a supported data type.

UDT uses built-in datatypes and other user-defined datatypes as the building blocks for datatypes that model the structure and behavior of data in applications. UDT makes it easier to work with PL/SQL collections.

UDT Table

The table type is created to track the structure of the UDT. No data will be stored in the table.

Input - CREATE TABLE TYPE

```
CREATE <OR REPLACE> TYPE <schema.>inst_no_type IS TABLE OF VARCHAR2 (32767);
```

Output

```
CREATE TABLE<schema.>mig_inst_no_type
( typ_col VARCHAR2 (32767) );
```

UDT VArray

Input - CREATE VArray

```
CREATE TYPE phone_list_typ_demo AS VARRAY(n) OF VARCHAR2(25);
```

Output

```
CREATE TABLE mig_pone_list_typ_demo
( typ_col VARCHAR2 (25) );
```

Declare UDT

Input - Declare UDT

```
DECLARE
  v_SQL_txt_array
  inst_no_type <:=
  inst_no_type(>);
BEGIN
  ...
```

Output

```
DECLARE
/*  v_SQL_txt_array inst_no_type <:= inst_no_type(>); */
BEGIN
```

```
EXECUTE IMMEDIATE 'DROP TABLE IF EXISTS
v_SQL_txt_array;
CREATE LOCAL TEMPORARY TABLE
v_SQL_txt_array
ON COMMIT PRESERVE ROWS
AS SELECT *, CAST(NULL AS INT) AS
typ_idx_col
FROM mig_inst_no_type
WHERE FALSE';
...
```

UDT Count

Input - UDT - COUNT in FOR LOOP

```
BEGIN
...
FOR i IN 1..v_jobnum_list.COUNT
LOOP
SELECT COUNT(*) INTO v_abc
FROM ...
WHERE ...
AND nvl(t.batch_num,
c_batchnum_null_num) =
v_jobnum_list(i);
...
END LOOP;
...
```

Output

```
BEGIN
...
FOR i IN 1..(SELECT COUNT(*) from v_jobnum_list)
LOOP
SELECT COUNT(*) INTO v_abc
FROM ...
WHERE ...
AND nvl(t.batch_num, c_batchnum_null_num) =
(SELECT typ_col FROM v_jobnum_list
WHERE typ_idx_col = i);
...
END LOOP;
...
```

UDT Record

A Record type is used to create records and can be defined in the declarative part of any PL/SQL block, subprogram, or package.

Input - RECORD Type

```
Create
or Replace Procedure test_proc AS TYPE t_log IS RECORD ( col1 int ,col2 emp.ename % type );
fr_wh_SQL t_log ;
BEGIN
fr_wh_SQL.col1 := 101 ;
fr_wh_SQL.col2 := 'abcd' ;
DBMS_OUTPUT.PUT_LINE ( fr_wh_SQL.col1 || ' ' || fr_wh_SQL.col2 ) ;
END test_proc;
/
```

Output

```
Create
or Replace Procedure test_proc AS /*TYPE t_log IS RECORD ( col1 int,col2 emp.ename%type );*/
fr_wh_SQL RECORD ;
MIG_t_log_col1 int ;
```

```
MIG_t_log_col2 emp.ename % type ;
BEGIN
select
  MIG_t_log_col1 as col1 ,MIG_t_log_col2 as col2 INTO FR_WH_SQL ;
  fr_wh_SQL.col1 := 101 ;
  fr_wh_SQL.col2 := 'abcd' ;
DBMS_OUTPUT.PUT_LINE ( fr_wh_SQL.col1 || ',' || fr_wh_SQL.col2 ) ;
END ;
/
```

Enhancement of User-defined types

The tool supports the enhancement of PL/SQL type of TABLE used in Oracle for specific data types and for any table column.

Input - PL/SQL type of TABLE of a specific data-type

```
DECLARE
  type fr_wh_SQL_info_type is table of VARCHAR(10);
  fr_wh_SQL fr_wh_SQL_info_type [:= fr_wh_SQL_info_type()];
BEGIN
  ...
```

Output

```
DECLARE
/* type fr_wh_SQL_info_type is table of varchar(10); */
/* fr_wh_SQL fr_wh_SQL_info_type [:= fr_wh_SQL_info_type()]; */
BEGIN
  EXECUTE IMMEDIATE 'DROP TABLE IF EXISTS mig_fr_wh_SQL_info_type;
  CREATE LOCAL TEMPORARY TABLE mig_fr_wh_SQL_info_type
    ( typ_col VARCHAR (10) )
  ON COMMIT PRESERVE ROWS' ;

  EXECUTE IMMEDIATE 'DROP TABLE IF EXISTS fr_wh_SQL;
  CREATE LOCAL TEMPORARY TABLE fr_wh_SQL
  ON COMMIT PRESERVE ROWS AS
  AS SELECT *, CAST(NULL AS INT) AS typ_idx_col
  FROM mig_fr_wh_SQL_info_type
  WHERE FALSE';
  ...
```

Input - PL/SQL type of TABLE of any table's column

```
DECLARE
  type fr_wh_SQL_info_type is table of fr_wh_SQL_info.col1%type;
  fr_wh_SQL fr_wh_SQL_info_type [:= fr_wh_SQL_info_type()];
BEGIN
  ...
```

Output

```
DECLARE
/* type fr_wh_SQL_info_type is table of fr_wh_SQL_info.col1%type; */
/* fr_wh_SQL fr_wh_SQL_info_type [:= fr_wh_SQL_info_type()]; */
BEGIN
  EXECUTE IMMEDIATE 'DROP TABLE IF EXISTS mig_fr_wh_SQL_info_type;
  CREATE LOCAL TEMPORARY TABLE mig_fr_wh_SQL_info_type
  ON COMMIT PRESERVE ROWS
  AS SELECT col1 AS typ_col
  FROM fr_wh_SQL_info
  WHERE FALSE' ;

  EXECUTE IMMEDIATE 'DROP TABLE IF EXISTS fr_wh_SQL;
  CREATE LOCAL TEMPORARY TABLE fr_wh_SQL
  ON COMMIT PRESERVE ROWS AS
  AS SELECT *, CAST(NULL AS INT) AS typ_idx_col
  FROM mig_fr_wh_SQL_info_type
  WHERE FALSE';
  ...
```

EXTEND

GaussDB supports keyword EXTEND.

Input - Extend

```
FUNCTION FUNC_EXTEND ( in_str IN VARCHAR2)
RETURN ARRAYTYPE
AS
v_count2 INTEGER;
v_strlist arraytype;
v_node VARCHAR2 (2000);
BEGIN
v_count2 := 0;
v_strlist := arraytype ();
FOR v_i IN 1 .. LENGTH (in_str)
LOOP
IF v_node IS NULL
THEN
v_node := "";
END IF;

IF (v_count2 = 0) OR (v_count2 IS NULL)
THEN
EXIT;
ELSE
v_strlist.EXTEND ();
v_strlist (v_i) := v_node;
v_node := "";
END IF;
END LOOP;

RETURN v_strlist;
END;
/
```

Output

```
FUNCTION FUNC_EXTEND ( in_str IN VARCHAR2 )
RETURN ARRAYTYPE AS v_count2 INTEGER ;
v_strlist arraytype ;
v_node VARCHAR2 ( 2000 ) ;
BEGIN
v_count2 := 0 ;
v_strlist := arraytype ( ) ;
FOR v_i IN 1.. LENGTH( in_str ) LOOP
IF
v_node IS NULL
THEN
v_node := " ;
END IF ;
IF
( v_count2 = 0 )
OR( v_count2 IS NULL )
THEN
EXIT ;
ELSE
v_strlist.EXTEND ( 1 ) ;
v_strlist ( v_i ) := v_node ;
v_node := " ;
END IF ;
END LOOP ;
RETURN v_strlist ;
END ;
/
```

RECORD

The Record type declared in the package specification is actually used in the corresponding package body.

After `plsqlCollection` is set to `varray`, UDT will be migrated as `VARRAY`.

Input – RECORD

```
CREATE OR REPLACE FUNCTION func1 (i1 INT)
RETURN INT
As
TYPE r_rthpagat_list IS RECORD (--Record information about cross-border RMB business parameters
(rthpagat)
rthpagat_REQUESTID RMTS_REMITTANCE_PARAM.REQUESTID%TYPE ,rthpagat_PARAMTNAME
RMTS_REMITTANCE_PARAM.PARAMTNAME%TYPE ,rthpagat_PARAMNUM
RMTS_REMITTANCE_PARAM.PARAMNUM%TYPE ,rthpagat_PARAMSTAT
RMTS_REMITTANCE_PARAM.PARAMSTAT%TYPE ,rthpagat_REQTELLERNO
RMTS_REMITTANCE_PARAM.REQTELLERNO%TYPE ,rthpagat_REQUESTTIME
RMTS_REMITTANCE_PARAM.REQUESTTIME%TYPE ,rthpagat_HOSTERRNO
RMTS_REMITTANCE_PARAM.HOSTERRNO%TYPE ,rthpagat_HOSTERRMSG
RMTS_REMITTANCE_PARAM.HOSTERRMSG%TYPE ,rthpagat_GATBANK
RMTS_REMITTANCE_PARAM.VALUE1%TYPE ,rthpagat_GATEEBANK
RMTS_REMITTANCE_PARAM.VALUE2%TYPE ,rthpagat_TELLER
RMTS_REMITTANCE_PARAM.VALUE3%TYPE ,rthpagat_DATE
RMTS_REMITTANCE_PARAM.VALUE4%TYPE ,rthpagat_BM_GATBANK
RMTS_REMITTANCE_PARAM.VALUE5%TYPE ,rthpagat_BM_GATEEBANK
RMTS_REMITTANCE_PARAM.VALUE6%TYPE ,rthpagat_BM_LMTEL
RMTS_REMITTANCE_PARAM.VALUE7%TYPE ,rthpagat_BM_LMDAT
RMTS_REMITTANCE_PARAM.VALUE8%TYPE ) ;

v1 r_rthpagat_list;
BEGIN

END;
/
```

Output

```
CREATE
TYPE rmts_remitparamgmt_rthpagat.r_rthpagat_list AS (/* O_ERRMSG error description */
Rthpagat_REQUESTID
rthpagat_REQUESTID RMTS_REMITTANCE_PARAM.REQUESTID%TYPE ,rthpagat_PARAMTNAME
RMTS_REMITTANCE_PARAM.PARAMTNAME%TYPE ,rthpagat_PARAMNUM
RMTS_REMITTANCE_PARAM.PARAMNUM%TYPE ,rthpagat_PARAMSTAT
RMTS_REMITTANCE_PARAM.PARAMSTAT%TYPE ,rthpagat_REQTELLERNO
RMTS_REMITTANCE_PARAM.REQTELLERNO%TYPE ,rthpagat_REQUESTTIME
RMTS_REMITTANCE_PARAM.REQUESTTIME%TYPE ,rthpagat_HOSTERRNO
RMTS_REMITTANCE_PARAM.HOSTERRNO%TYPE ,rthpagat_HOSTERRMSG
RMTS_REMITTANCE_PARAM.HOSTERRMSG%TYPE ,rthpagat_GATBANK
RMTS_REMITTANCE_PARAM.VALUE1%TYPE ,rthpagat_GATEEBANK
RMTS_REMITTANCE_PARAM.VALUE2%TYPE ,rthpagat_TELLER
RMTS_REMITTANCE_PARAM.VALUE3%TYPE ,rthpagat_DATE
RMTS_REMITTANCE_PARAM.VALUE4%TYPE ,rthpagat_BM_GATBANK
RMTS_REMITTANCE_PARAM.VALUE5%TYPE ,rthpagat_BM_GATEEBANK
RMTS_REMITTANCE_PARAM.VALUE6%TYPE ,rthpagat_BM_LMTEL
RMTS_REMITTANCE_PARAM.VALUE7%TYPE ,rthpagat_BM_LMDAT
RMTS_REMITTANCE_PARAM.VALUE8%TYPE ) ;

CREATE OR REPLACE FUNCTION func1 (i1 INT)
RETURN INT
AS
v1 r_rthpagat_list;
BEGIN

END;
/
```

Naming Convention of Type Name

User-defined types allow for the definition of data types that model the structure and behavior of the data in an application.

Input

```
CREATE
  TYPE t_line AS ( product_line VARCHAR2 ( 30 )
                 ,product_amount NUMBER ) ;
;
```

Output

```
CREATE
  TYPE sad_dml_product_pkg.t_line AS ( product_line VARCHAR2 ( 30 )
                                     ,product_amount NUMBER ) ;
```

Input

```
CREATE
  TYPE t_line AS ( product_line VARCHAR2 ( 30 )
                 ,product_amount NUMBER ) ;
```

Output

```
CREATE
  TYPE SAD.sad_dml_product_pkg#t_line AS ( product_line VARCHAR2 ( 30 )
                                         ,product_amount NUMBER ) ;
```

NOTE

- For the first output(pkg.t), if **pkgSchemaNaming** is set to **true** in the configuration, PL RECORD migration should have package name as a schema name along with a type name.
- For the second output (pkg#t), assume that TYPE belongs to sad_dml_product_pkg package.

If **pkgSchemaNaming** is set to **false** in the configuration, PL RECORD migration should have schema name as a schema name along with a package name + a type name separated by # as a type name.

SUBTYPE

With the SUBTYPE statement, PL/SQL allows you to define your own subtypes or aliases of predefined datatypes, sometimes referred to as abstract datatypes.

Input

```
CREATE OR REPLACE PACKAGE "SAD"."BAS_SUBTYPE_PKG" IS
  SUBTYPE CURRENCY IS BAS_PRICE_LIST_T.CURRENCY%TYPE;
END bas_subtype_pkg;
/
CREATE OR REPLACE PACKAGE BODY "SAD"."BAS_SUBTYPE_PKG" IS
  BEGIN
    NULL;
  END bas_subtype_pkg;
/
_*****
CREATE OR REPLACE PACKAGE BODY SAD.bas_lookup_misc_pkg IS
  FUNCTION get_currency(pi_price_type IN NUMBER) RETURN VARCHAR2 IS
    v_currency bas_subtype_pkg.currency;
  BEGIN
    g_func_name := 'get_currency';
    FOR rec_currency IN (SELECT currency FROM sad_price_type_v WHERE price_type_code = pi_price_type)
  LOOP
```

```
v_currency := rec_currency.currency;  
END LOOP;  
RETURN v_currency;  
END get_currency;  
END SAD.bas_lookup_misc_pkg;  
/  
/
```

Output

```
CREATE OR REPLACE FUNCTION SAD.bas_lookup_misc_pk#get_currency(pi_price_type IN NUMBER)  
RETURN VARCHAR2 IS  
v_currency BAS_PRICE_LIST_T.CURRENCY%TYPE;  
BEGIN  
g_func_name := 'get_currency';  
FOR rec_currency IN (SELECT currency FROM sad_price_type_v WHERE price_type_code = pi_price_type)  
LOOP  
v_currency := rec_currency.currency;  
END LOOP;  
RETURN v_currency;  
END ;  
/  
/
```

NOTE

As SUBTYPE is not supported in GaussDB, the SUBTYPE variable needs to be replaced with the actual type.

6.9.16 PL/SQL Packages

This section describes the migration syntax of Oracle PL/SQL **Packages** and **REF CURSOR**. The migration syntax decides how the keywords/features are migrated.

This section includes the following content:

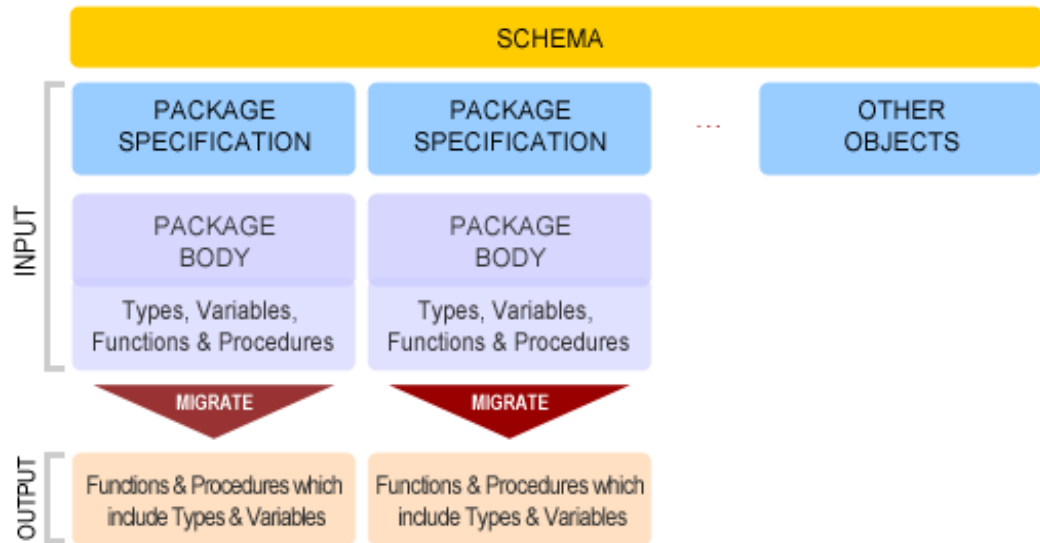
Packages, Package Variables, Package Split, REF CURSOR, VARRAY, Creating a Schema for Package, Grant Execute, Package Name List and Data Type. For details, see **Packages** to **Data Type**.

6.9.16.1 Packages

Packages are schema objects that group logically related PL/SQL types, variables, functions and procedures. In Oracle, each package consists of two parts: package specification and package body. The package specification may contain variables and REF CURSOR in variables. The package REF CURSORS are identified and migrated in the referred places. The functions and procedures in the package body are migrated into individual functions and procedures. The types and variables in the package body are migrated to each of the functions and procedures.

If the schema names of the package specification and package body do not match, then the tool will log a schema name mismatch error to the **DSCError.log** file.

Figure 6-55 Migration of PL/SQL packages



Input - PL/SQL Packages (Package specifications and body)

```
CREATE or REPLACE PACKAGE BODY pkg_get_empdet
IS
PROCEDURE get_ename(eno in number,ename out varchar2)
IS
BEGIN
SELECT ename || ',' || last_name
INTO ename
FROM emp
WHERE empno = eno;

END get_ename;

FUNCTION get_sal(eno in number) return number
IS
lsalary number;
BEGIN
SELECT salary
INTO lsalary
FROM emp
WHERE empno = eno;
RETURN lsalary;

END get_sal;
END pkg_get_empdet;
/
```

Output (The output contains separate functions and procedures for each of the functions and procedures in the package body of the input)

```
CREATE
or REPLACE PROCEDURE
pkg_get_empdet.get_ename ( eno in number ,ename out varchar2 ) IS
BEGIN

SELECT

ename || ',' || last_name INTO ename
FROM

emp
WHERE

empno = eno ;
```



```
        END ;
        /

CREATE
  or REPLACE FUNCTION
pkg_get_empdet.get_sal ( eno in number )
  return number IS lsalary number ;
BEGIN

SELECT

salary INTO lsalary

FROM

emp

WHERE

empno = eno ;

RETURN lsalary ;
  END ;
  /
```

Input - PL/SQL Packages

```
CREATE OR replace VIEW vw_emp_name AS
  Select pkg_get_empdet.get_sal(emp.empno) as empsal from emp;
```

Output

```
CREATE
OR replace VIEW vw_emp_name AS (SELECT

pkg_get_empdet.get_sal (emp.empno) AS empsal
  FROM
    emp)
;

output:
set
package_name_list = 'func' ;
CREATE
OR REPLACE FUNCTION func1 ( i1 INT )
RETURN INT As TYPE r_rthpagat_list IS RECORD ( /* Record
information about cross-border RMB */
business parameters ( rthpagat ) rthpagat_REQUESTID
RMTS_REMITTANCE_PARAM.REQUESTID%TYPE ,rthpagat_PARAMTNAME
RMTS_REMITTANCE_PARAM.PARAMTNAME%TYPE ,rthpagat_PARAMNUM
RMTS_REMITTANCE_PARAM.PARAMNUM%TYPE ,rthpagat_PARAMSTAT
RMTS_REMITTANCE_PARAM.PARAMSTAT%TYPE ,rthpagat_REQTELLERNO
RMTS_REMITTANCE_PARAM.REQTELLERNO%TYPE
,rthpagat_REQUESTTIME RMTS_REMITTANCE_PARAM.REQUESTTIME%TYPE
,rthpagat_HOSTERRNO RMTS_REMITTANCE_PARAM.HOSTERRNO%TYPE ,rthpagat_HOSTERRMSG
RMTS_REMITTANCE_PARAM.HOSTERRMSG%TYPE ,rthpagat_GATBANK
RMTS_REMITTANCE_PARAM.VALUE1%TYPE ,rthpagat_GATEEBANK
RMTS_REMITTANCE_PARAM.VALUE2%TYPE ,rthpagat_TELLER
RMTS_REMITTANCE_PARAM.VALUE3%TYPE ,rthpagat_DATE
RMTS_REMITTANCE_PARAM.VALUE4%TYPE ,rthpagat_BM_GATBANK
RMTS_REMITTANCE_PARAM.VALUE5%TYPE ,rthpagat_BM_GATEEBANK
RMTS_REMITTANCE_PARAM.VALUE6%TYPE ,rthpagat_BM_LMTEL
RMTS_REMITTANCE_PARAM.VALUE7%TYPE ,rthpagat_BM_LMDAT
RMTS_REMITTANCE_PARAM.VALUE8%TYPE ) ;
v1 r_rthpagat_list ;
BEGIN
  END ;
  /
  reset
package_name_list ;
```

Input -Function/Procedure With No Parameter

In case a procedure or function does not have any parameter or argument, put () after procedure or function name while calling the same procedure or function.

```
CREATE OR REPLACE PACKAGE BODY SAD.bas_lookup_misc_pkg IS

    g_pkg_name CONSTANT VARCHAR2(30) := 'bas_lookup_misc_pkg';
    g_func_name VARCHAR2(30);

    FUNCTION func_name
    RETURN VARCHAR2
    IS
        l_func_name VARCHAR2(100);
    BEGIN
        l_func_name := g_pkg_name || '.' || g_func_name;
        RETURN l_func_name;
    END func_name;

    -----
    PROCEDURE insert_fnd_data_change_logs(pi_table_name          IN VARCHAR2,
                                         pi_table_key_columns   IN VARCHAR2,
                                         pi_table_key_values    IN VARCHAR2,
                                         pi_column_name         IN VARCHAR2,
                                         pi_column_change_from_value IN VARCHAR2,
                                         pi_column_change_to_value IN VARCHAR2,
                                         pi_op_code             IN NUMBER,
                                         pi_description         IN VARCHAR2,
                                         po_error_msg          OUT VARCHAR2)
    IS

    BEGIN
        g_func_name := 'insert_fnd_data_change_logs_t';

    EXCEPTION
        WHEN OTHERS THEN
            po_error_msg := 'Others Exception raise in ' || func_name || ',' || SQLERRM;

    END insert_fnd_data_change_logs;
END SAD.bas_lookup_misc_pkg;
/
```

Output

```
CREATE
    OR REPLACE FUNCTION SAD.bas_lookup_misc_pkg#func_name
    RETURN VARCHAR2
PACKAGE
IS
    l_func_name VARCHAR2 ( 100 ) ;
    MIG_PV_VAL_DUMMY_G_PKG_NAME VARCHAR2 ( 30 ) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( 'SAD', 'bas_lookup_misc_pkg', 'g_pkg_name' ) ::VARCHAR2 ( 30 ) ;
    MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2 ( 30 ) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( 'SAD', 'bas_lookup_misc_pkg', 'g_func_name' ) ::VARCHAR2 ( 30 ) ;

    BEGIN
        l_func_name := MIG_PV_VAL_DUMMY_G_PKG_NAME || '.' || MIG_PV_VAL_DUMMY_G_FUNC_NAME ;

        MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( 'SAD', 'bas_lookup_misc_pkg', 'g_pkg_name', MIG_PV_VAL_DUMMY_G_PKG_NAME ) ;
        MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( 'SAD', 'bas_lookup_misc_pkg', 'g_func_name', MIG_PV_VAL_DUMMY_G_FUNC_NAME ) ;

        RETURN l_func_name ;

    END ;

    -----
CREATE
```

```
OR REPLACE PROCEDURE SAD.bas_lookup_misc_pkg#insert_fnd_data_change_logs ( pi_table_name IN
VARCHAR2
,pi_table_key_columns IN VARCHAR2
,pi_table_key_values IN VARCHAR2
,pi_column_name IN VARCHAR2
,pi_column_change_from_value IN VARCHAR2
,pi_column_change_to_value IN VARCHAR2
,pi_op_code IN NUMBER
,pi_description IN VARCHAR2
,po_error_msg OUT VARCHAR2 )
PACKAGE
IS

MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2 ( 30 ) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( 'SAD', 'bas_lookup_misc_pkg', 'g_func_name' ) ::VARCHAR2 ( 30 ) ;

BEGIN
MIG_PV_VAL_DUMMY_G_FUNC_NAME := 'insert_fnd_data_change_logs_t' ;

MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( 'SAD', 'bas_lookup_misc_pkg', 'g_pkg_name', MIG_PV_VAL_DUMMY_G_PKG_NAME ) ;
MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( 'SAD', 'bas_lookup_misc_pkg', 'g_func_name', MIG_PV_VAL_DUMMY_G_FUNC_NAME ) ;

EXCEPTION
WHEN OTHERS THEN
po_error_msg := 'Others Exception raise in ' || SAD.bas_lookup_misc_pkg#func_name() || ' ' ||
SQLERRM ;

END ;
/
```

Input - Package Body with no procedure and functions

In case package body does not have any logic, for example, procedures and functions, DSC needs to remove all code from the same package. The output is basically blank.

```
CREATE OR REPLACE PACKAGE BODY SAD.bas_subtype_pkg IS
BEGIN
NULL;
END bas_subtype_pkg;
/
```

Input - SUBTYPE

With the SUBTYPE statement, PL/SQL allows you to define your own subtypes or aliases of predefined datatypes, sometimes referred to as abstract datatypes.

```
CREATE OR REPLACE PACKAGE "SAD"."BAS_SUBTYPE_PKG" IS
SUBTYPE CURRENCY IS BAS_PRICE_LIST_T.CURRENCY%TYPE;
END bas_subtype_pkg;
/
CREATE OR REPLACE PACKAGE BODY "SAD"."BAS_SUBTYPE_PKG" IS
BEGIN
NULL;
END bas_subtype_pkg;
/
--*****
CREATE OR REPLACE PACKAGE BODY SAD.bas_lookup_misc_pkg IS
FUNCTION get_currency(pi_price_type IN NUMBER) RETURN VARCHAR2 IS
v_currency bas_subtype_pkg.currency;
BEGIN
g_func_name := 'get_currency';
FOR rec_currency IN (SELECT currency FROM sad_price_type_v WHERE price_type_code = pi_price_type)
LOOP
v_currency := rec_currency.currency;
END LOOP;
```

```

RETURN v_currency;
END get_currency;
END SAD.bas_lookup_misc_pkg;
/

```

Output

"SAD"."BAS_SUBTYPE_PKG" package will be blank after migration.

```

CREATE OR REPLACE FUNCTION SAD.bas_lookup_misc_pk#get_currency(pi_price_type IN NUMBER)
RETURN VARCHAR2 IS
    v_currency BAS_PRICE_LIST_T.CURRENCY%TYPE;
BEGIN
    g_func_name := 'get_currency';
    FOR rec_currency IN (SELECT currency FROM sad_price_type_v WHERE price_type_code = pi_price_type)
    LOOP
        v_currency := rec_currency.currency;
    END LOOP;
    RETURN v_currency;
END ;
/

```

NOTE

As the SUBTYPE not supported in GaussDB, the SUBTYPE variable used needs to be replaced with the actual type.

Input - sys.dbms_job

The DBMS_JOB package schedules and manages jobs in the job queue.

```

CREATE OR replace PACKAGE BODY "SAD"."EIP_HTM_INTEGRATION_PKG"
IS
    PROCEDURE Greate_import_instruction_job
    IS
        v_jobid NUMBER;
    BEGIN
        IF
            bas_lookup_misc_pkg.Exits_run_job('eip_htm_integration_pkg.import_instruction_job') = 'N' THEN
                sys.dbms_job.Submit(job => v_jobid,
                                    what => 'begin
                                                eip_htm_integration_pkg.import_instruction_job;
                                                end;',
                                    next_date => SYSDATE);

        COMMIT;
    END IF;
    ---
END greate_import_instruction_job;
END eip_htm_integration_pkg;

```

Output

```

CREATE OR replace PROCEDURE
sad.Eip_htm_integration_pkg#greate_import_instruction_job
IS
    v_jobid NUMBER;
BEGIN
    IF Bas_lookup_misc_pkg#exits_run_job (
        'eip_htm_integration_pkg.import_instruction_job') = 'N' THEN
        dbms_job.Submit(job => v_jobid,
                        what => 'begin
                                    eip_htm_integration_pkg.import_instruction_job;
                                    end;',
                        next_date => SYSDATE);

        /* COMMIT; */
        NULL;
    END IF;

```

```
---  
END;
```

NOTE

Remove the SYS schema while calling the package.

Input - Procedure/Function variable

The NULL constraint is not supported on variable declaration by Gauss, so it is recommended to comment the NULL keyword.

```
CREATE OR REPLACE PACKAGE BODY SAD.sad_lookup_contract_pkg IS  
FUNCTION CONTRACT_DISTRIBUTE_STATUS_S2(PI_CONTRACT_NUMBER IN VARCHAR2)  
RETURN VARCHAR2 IS  
L_CONTRACT_DISTRIBUTE_STATUS VARCHAR2(10) NULL;  
  
BEGIN  
IF CUR_CONTRACT.CONTRACT_STATUS = 0 THEN  
L_CONTRACT_DISTRIBUTE_STATUS := 'Cancel';  
ELSE  
L_CONTRACT_DISTRIBUTE_STATUS := 'Active';  
END IF;  
  
RETURN L_CONTRACT_DISTRIBUTE_STATUS;  
  
EXCEPTION  
WHEN OTHERS THEN  
L_CONTRACT_DISTRIBUTE_STATUS := NULL;  
  
END CONTRACT_DISTRIBUTE_STATUS_S2;  
END sad_lookup_contract_pkg;  
/
```

Output

```
CREATE OR REPLACE FUNCTION sad_lookup_contract_pkg.Contract_distribute_status_s2  
( pi_contract_number IN VARCHAR2 )  
RETURN VARCHAR2  
IS  
L_contract_distribute_status varchar2 ( 10 )  
/* NULL */  
;  
BEGIN  
IF cur_contract.contract_status = 0 THEN  
L_contract_distribute_status := 'Cancel' ;  
ELSE  
L_contract_distribute_status := 'Active' ;  
END IF ;  
RETURN L_contract_distribute_status ;  
EXCEPTION  
WHEN OTHERS THEN  
L_contract_distribute_status := NULL ;  
END ;/
```

Input - Configuration parameter addPackageNameList = true

Hint to access objects from specific schema by system.

```
CREATE OR REPLACE PACKAGE BODY IC_STAGE.PKG_REVN_ARPU  
AS  
-----  
-----  
END PKG_REVN_ARPU;  
/
```

Output

```
SET package_name_list = 'PKG_REVN_ARPU' ;  
-----
```

```
-----  
reset package_name_list ;
```

Input - Configuration parameter addPackageNameList = false

Hint to access objects from specific schema by system.

```
CREATE OR REPLACE PACKAGE BODY IC_STAGE.PKG_REVN_ARPU  
AS  
-----  
-----  
END PKG_REVN_ARPU;  
/
```

Output

```
SET SEARCH_PATH=PKG_REVN_ARPU,PUBLIC;
```

Input -PACKAGE

Hint that procedure and functions belongs to a package.

```
CREATE OR REPLACE PACKAGE BODY SAD.sad_lookup_contract_pkg  
IS  
FUNCTION CONTRACT_DISTRIBUTE_STATUS_S2(PI_CONTRACT_NUMBER IN VARCHAR2)  
RETURN VARCHAR2 IS  
L_CONTRACT_DISTRIBUTE_STATUS VARCHAR2(10) ;  
  
BEGIN  
IF CUR_CONTRACT.CONTRACT_STATUS = 0 THEN  
L_CONTRACT_DISTRIBUTE_STATUS := 'Cancel';  
ELSE  
L_CONTRACT_DISTRIBUTE_STATUS := 'Active';  
END IF;  
  
RETURN L_CONTRACT_DISTRIBUTE_STATUS;  
  
EXCEPTION  
WHEN OTHERS THEN  
L_CONTRACT_DISTRIBUTE_STATUS := NULL;  
  
END CONTRACT_DISTRIBUTE_STATUS_S2;  
END sad_lookup_contract_pkg;  
/
```

Output

```
CREATE OR replace FUNCTION sad_lookup_contract_pkg.Contract_distribute_status_s2  
( pi_contract_number IN VARCHAR2 )  
RETURN VARCHAR2  
PACKAGE  
IS  
L_contract_distribute_statusvarchar2 ( 10 ) ;  
BEGIN  
IF cur_contract.contract_status = 0 THEN  
L_contract_distribute_status := 'Cancel' ;  
ELSE  
L_contract_distribute_status := 'Active' ;  
END IF ;  
RETURN L_contract_distribute_status ;  
EXCEPTION  
WHEN OTHERS THEN  
L_contract_distribute_status := NULL ;  
END ;  
/
```

NOTE

You need to put the PACKAGE keyword while creating any procedure and function in front of the IS/AS statement.

Input -Nested Procedure

Creating a procedure inside a procedure is known as a nested procedure. The nested procedure is private and belongs to the parent procedure.

```
CREATE OR REPLACE PROCEDURE refresh_sw_product_amount(pi_stage_id IN NUMBER)
IS
    v_product_amount      sad_sw_product_amount_t.product_amount%TYPE;
    FUNCTION get_sw_no
    RETURN VARCHAR2
    IS
        v_xh      NUMBER;
    BEGIN
        BEGIN
            SELECT nvl(to_number(substrb(MAX(sw_no), 3, 4)), 0)
            INTO v_xh
            FROM sad.sad_sw_product_amount_t
            WHERE pi_stage_id = pi_stage_id;
        EXCEPTION WHEN OTHERS THEN
            v_xh := 0;
        END;

        RETURN 'SW' || lpad(to_char(v_xh + 1), 4, '0') || 'Y';
    END get_sw_no;

    BEGIN

        FOR rec_pu IN (SELECT t.*, sh.header_id
            FROM asms.ht_stages t, asms.ht, sad.sad_distribution_headers_t sh
            WHERE t.hth = ht.hth
            AND sh.contract_number = t.hth
            AND sh.stage_id = t.stage_id
            AND ht.sw_track_flag = 'Y'
            AND to_char(t.category_id) IN
                (SELECT code
                 FROM asms.asms_lookup_values
                 WHERE type_code = 'CATEGORY_ID_EQUIPMENT'
                 AND enabled_flag = 'Y')
            AND nvl(t.status, '-1') <> '0'
            AND t.stage_id = pi_stage_id)

        LOOP
            SELECT nvl(SUM(nvl(product_amount, 0)), 0)
            INTO v_product_amount
            FROM sad.sad_products_t sp
            WHERE sp.header_id = rec_pu.header_id
            AND sp.sw_flag = 'Y';

        END LOOP;

    END refresh_sw_product_amount;
```

Output

```
CREATE OR REPLACE FUNCTION get_sw_no(pi_stage_id IN NUMBER)
RETURN VARCHAR2 IS
    v_xh      NUMBER;
    BEGIN
        BEGIN
            SELECT nvl(to_number(substrb(MAX(sw_no), 3, 4)), 0)
            INTO v_xh
            FROM sad.sad_sw_product_amount_t
            WHERE pi_stage_id = pi_stage_id;
        EXCEPTION WHEN OTHERS THEN
            v_xh := 0;
        END;
```

```
RETURN 'SW' || lpad(to_char(v_xh + 1), 4, '0') || 'Y';
END ;
/

_*****
CREATE OR REPLACE PROCEDURE refresh_sw_product_amount(pi_stage_id IN NUMBER)
IS
    v_product_amount      sad_sw_product_amount_t.product_amount%TYPE;

BEGIN
    FOR rec_pu IN (SELECT t.*, sh.header_id
                   FROM asms.ht_stages t, asms.ht, sad.sad_distribution_headers_t sh
                   WHERE t.hth = ht.hth
                       AND sh.contract_number = t.hth
                       AND sh.stage_id = t.stage_id
                       AND ht.sw_track_flag = 'Y'
                       AND to_char(t.category_id) IN
                           (SELECT code
                            FROM asms.asms_lookup_values
                            WHERE type_code = 'CATEGORY_ID_EQUIPMENT'
                                AND enabled_flag = 'Y')
                       AND nvl(t.status, '-1') <> '0'
                       AND t.stage_id = pi_stage_id)

    LOOP
        SELECT nvl(SUM(nvl(product_amount, 0)), 0)
            INTO v_product_amount
            FROM sad.sad_products_t sp
            WHERE sp.header_id = rec_pu.header_id
                AND sp.sw_flag = 'Y';

    END LOOP;

END;
/
```

NOTE

When nested procedures/functions are implemented, the package variables in all procedures/functions must be processed.

After migrating sub-procedures/functions, migrate the parent procedure/function.

if pkgSchemaNaming = false

if **pkgSchemaNaming** is set to **false**, PL RECORD migration should not have package name in the type name as its schema.

Input

```
CREATE OR REPLACE PACKAGE BODY SAD.sad_dml_product_pkg IS

    PROCEDURE save_sad_product_line_amount(pi_stage_id      IN NUMBER,
                                           pi_product_line_code IN VARCHAR2,
                                           po_error_msg      OUT VARCHAR2) IS

        TYPE t_line IS RECORD(
            product_line VARCHAR2(30),
            product_amount NUMBER);
        TYPE tab_line IS TABLE OF t_line INDEX BY BINARY_INTEGER;
        rec_line      tab_line;
        v_product_line_arr VARCHAR2(5000);
        v_product_line VARCHAR2(30);
        v_count         INTEGER;
        v_start         INTEGER;
        v_pos           INTEGER;


```



```
BEGIN
  v_count := 0;
  v_start := 1;

  v_product_line_arr := pi_product_line_code;
LOOP
  v_pos := instr(v_product_line_arr, ',', v_start);
  IF v_pos <= 0
  THEN
  EXIT;
  END IF;
  v_product_line := substr(v_product_line_arr, v_start, v_pos - 1);
  v_count := v_count + 1;
  rec_line(v_count).product_line := v_product_line;
  rec_line(v_count).product_amount := 0;
  v_product_line_arr := substr(v_product_line_arr, v_pos + 1, length(v_product_line_arr));

END LOOP;

FOR v_count IN 1 .. rec_line.count
LOOP
UPDATE sad_product_line_amount_t spl
  SET spl.product_line_amount = rec_line(v_count).product_amount
  WHERE spl.stage_id = pi_stage_id
  AND spl.product_line_code = rec_line(v_count).product_line;
IF SQL%NOTFOUND
THEN
  INSERT INTO sad_product_line_amount_t
    (stage_id, product_line_code, product_line_amount)
  VALUES (pi_stage_id, rec_line(v_count).product_line, rec_line(v_count).product_amount);
END IF;
END LOOP;

EXCEPTION
  WHEN OTHERS THEN
    po_error_msg := 'Others Exception raise in ' || func_name || ' ' || SQLERRM;
END save_sad_product_line_amount;

END sad_dml_product_pkg;
/
```

Output

```
CREATE TYPE SAD.sad_dml_product_pkg#t_line AS
( product_line VARCHAR2 ( 30 )
, product_amount NUMBER );

CREATE OR REPLACE PROCEDURE SAD.sad_dml_product_pkg#save_sad_product_line_amount
( pi_stage_id IN NUMBER
, pi_product_line_code IN VARCHAR2
, po_error_msg OUT VARCHAR2 )
PACKAGE
IS
TYPE tab_line IS VARRAY ( 10240 ) OF SAD.sad_dml_product_pkg#t_line ;
  rec_line tab_line ;
  v_product_line_arr VARCHAR2 ( 5000 ) ;
  v_product_line VARCHAR2 ( 30 ) ;
  v_count INTEGER ;
  v_start INTEGER ;
  v_pos INTEGER ;
BEGIN
  v_count := 0 ;
  v_start := 1 ;
  v_product_line_arr := pi_product_line_code ;

  LOOP
    v_pos := instr( v_product_line_arr ,',' ,v_start ) ;

    IF v_pos <= 0 THEN
      EXIT ;
```

```
END IF ;

v_product_line := SUBSTR( v_product_line_arr ,v_start ,v_pos - 1 ) ;
v_count := v_count + 1 ;
rec_line ( v_count ).product_line := v_product_line ;
rec_line ( v_count ).product_amount := 0 ;
v_product_line_arr := SUBSTR( v_product_line_arr ,v_pos + 1 ,length( v_product_line_arr ) ) ;

END LOOP ;

FOR v_count IN 1.. rec_line.count
LOOP
UPDATE sad_product_line_amount_t spl
SET spl.product_line_amount = rec_line ( v_count ).product_amount
WHERE spl.stage_id = pi_stage_id
AND spl.product_line_code = rec_line ( v_count ).product_line ;

IF SQL%NOTFOUND THEN
INSERT INTO sad_product_line_amount_t
( stage_id, product_line_code, product_line_amount )
VALUES ( pi_stage_id, rec_line ( v_count ).product_line
, rec_line ( v_count ).product_amount ) ;

END IF ;

END LOOP ;

EXCEPTION
WHEN OTHERS THEN
po_error_msg := 'Others Exception raise in ' || func_name || ',' || SQLERRM ;

END ;
/
```

6.9.16.2 Package Variables

Package variables are available in Oracle packages that allow variables to retain all the functions and procedures in the package. DSC uses customized functions to help GaussDB(DWS) support package variables.

NOTE

Prerequisites

- Create and use the **MIG_ORA_EXT** schema.
- Copy the contents of the custom script and execute the script in all target databases for which migration is to be performed. For details, see [Migration Process](#).

If there is a space between a schema name and a package name, or either the package specification or body has quotes, the output may not be the same as expected.

Input - Package variables

```
CREATE
OR REPLACE PACKAGE scott.pkg_adm_util IS un_stand_value long := '';
defaultdate date := sysdate ;
g_pkgname CONSTANT VARCHAR2 ( 255 ) DEFAULT 'pkg_adm_util' ;
procedure p1 ;
END pkg_adm_util ;
/

CREATE
OR REPLACE PACKAGE BODY scott.pkg_adm_util AS defaulttime timestamp := systimestamp ;
PROCEDURE P1 AS BEGIN
scott.pkg_adm_util.un_stand_value := 'A' ;
pkg_adm_util.un_stand_value := 'B' ;
un_stand_value := 'C' ;
DBMS_OUTPUT.PUT_LINE ( pkg_adm_util.defaultdate ) ;
```

```
DBMS_OUTPUT.PUT_LINE ( defaulttime );
DBMS_OUTPUT.PUT_LINE ( scott.pkg_adm_util.un_stand_value );
DBMS_OUTPUT.PUT_LINE ( pkg_adm_util.un_stand_value );
DBMS_OUTPUT.PUT_LINE ( un_stand_value );
END ;
END ;
/
```

Output

```
SCHEMA pkg_adm_util
;
BEGIN
INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES
( SCHEMA_NAME ,PACKAGE_NAME ,SPEC_OR_BODY ,VARIABLE_NAME
,VARIABLE_TYPE ,CONSTANT_
I ,DEFAULT_VALUE ,EXPRESSION_I )
VALUES
( UPPER( 'scott' ) ,UPPER( 'pkg_adm_util' ) ,'S' ,UPPER(
'un_stand_value' ) ,UPPE
R( 'TEXT' ) ,false ,' ' ,false ) ;
INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES
( SCHEMA_NAME ,PACKAGE_NAME ,SPEC_OR_BODY ,VARIABLE_NAME
,VARIABLE_TYPE ,CONSTANT_
I ,DEFAULT_VALUE ,EXPRESSION_I )
VALUES
( UPPER( 'scott' ) ,UPPER( 'pkg_adm_util' ) ,'S' ,UPPER(
'defaultdate' ) ,UPPER( '
date' ) ,false ,$$sysdate$$ ,true ) ;
INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES
( SCHEMA_NAME ,PACKAGE_NAME ,SPEC_OR_BODY ,VARIABLE_NAME
,VARIABLE_TYPE ,CONSTANT_
I ,DEFAULT_VALUE ,EXPRESSION_I )
VALUES
( UPPER( 'scott' ) ,UPPER( 'pkg_adm_util' ) ,'S' ,UPPER(
'g_pkgname' ) ,UPPER( 'VA
RCHAR2 ( 255 )' ) ,true ,'pkg_adm_util' ,false ) ;
END ;
/
BEGIN
INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES
( SCHEMA_NAME ,PACKAGE_NAME ,SPEC_OR_BODY ,VARIABLE_NAME
,VARIABLE_TYPE ,CONSTANT_
I ,DEFAULT_VALUE ,EXPRESSION_I )
VALUES
( UPPER( 'scott' ) ,UPPER( 'pkg_adm_util' ) ,'B' ,UPPER(
'defaulttime' ) ,UPPER( '
timestamp' ) ,false ,$$CURRENT_TIMESTAMP$$ ,true ) ;
END ;
/
CREATE
OR REPLACE PROCEDURE pkg_adm_util.P1 AS
BEGIN
MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE ( current_schema ( )
,'pkg_adm_util' ,'un_stand_value' ,( 'A' ) ::TEXT ) ;
MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE ( current_schema ( )
,'pkg_adm_util' ,'un_stand_value' ,( 'B' ) ::TEXT ) ;
MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE ( current_schema ( )
,'pkg_adm_util' ,'un_stand_value' ,( 'C' ) ::TEXT ) ;

DBMS_OUTPUT.PUT_LINE ( MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( 'scott' ,'pkg_adm_util' ,'defaultdate' ) :: date ) ;
DBMS_OUTPUT.PUT_LINE ( MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE(
'scott' ,'pkg_adm_util' ,'defaulttime' ) :: timestamp ) ;
DBMS_OUTPUT.PUT_LINE ( MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE(
'scott' ,'pkg_adm_util' ,'un_stand_value' ) :: TEXT ) ;
DBMS_OUTPUT.PUT_LINE ( MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE(
'scott' ,'pkg_adm_util' ,'un_stand_value' ) :: TEXT ) ;
DBMS_OUTPUT.PUT_LINE ( MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE(
'scott' ,'pkg_adm_util' ,'un_stand_value' ) :: TEXT ) ;
```

```
END ;  
/
```

NOTE

If `pkgSchemaNaming` is true.

- Oracle supports package variables for multiple schemas. If different schemas have the same package and variable names, such as:
 - `schema1.mypackage.myvariable`
 - `schema2.mypackage.myvariable`

After migration, the schema names will not be used to differentiate the two package variables. Because schema names are ignored, the last data type declaration or operation for `[any_schema].mypackage.myvariable` will overwrite the type and value for `schema1.mypackage.myvariable` and `schema2.mypackage.myvariable`.

Input-Package variable with default value declared in one package by using **CONSTANT** keyword and used in another package

The global variable declared in the package specification is accessed in the same or another package.

```
PACKAGE "SAD"."BAS_SUBTYPE_PKG" : (Declaring global variable)  
-----  
g_header_waiting_split_status CONSTANT VARCHAR2(20) := 'Waiting_Distribute';  
  
PACKAGE SAD.sad_lookup_stage_pkg: (Used global variable)  
-----  
PROCEDURE calc_product_price(pi_contract_no IN VARCHAR2 DEFAULT NULL,  
                             pi_stage_id   IN NUMBER DEFAULT NULL,  
                             pi_calc_category IN VARCHAR2 DEFAULT 'all',  
                             pi_op_code    IN NUMBER,  
                             po_error_msg  OUT VARCHAR2)  
  
IS  
  
CURSOR cur_contract IS  
  SELECT DISTINCT sdh.contract_number, sdh.stage_id  
  FROM sad_distribution_headers_t sdh  
  WHERE sdh.status = bas_subtype_pkg.g_header_waiting_split_status  
  AND sdh.contract_number = nvl(pi_contract_no, sdh.contract_number)  
  AND sdh.stage_id = nvl(pi_stage_id, sdh.stage_id);  
  
v_ras_flag VARCHAR2 ( 1 ) ;  
BEGIN  
...  
...  
END calc_product_price;  
/
```

Output

```
PROCEDURE calc_product_price(pi_contract_no IN VARCHAR2 DEFAULT NULL,  
                             pi_stage_id   IN NUMBER DEFAULT NULL,  
                             pi_calc_category IN VARCHAR2 DEFAULT 'all',  
                             pi_op_code    IN NUMBER,  
                             po_error_msg  OUT VARCHAR2)  
  
IS  
  
MIG_PV_VAL_DUMMY_G_HEADER_WAITING_SPLIT_STATUS VARCHAR2 ( 20 ) :=  
MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE  
( 'SAD', 'bas_subtype_pkg', 'g_header_waiting_split_status' ) ::VARCHAR2 ( 20 ) ;  
  
CURSOR cur_contract IS  
  SELECT DISTINCT sdh.contract_number, sdh.stage_id  
  FROM sad_distribution_headers_t sdh  
  WHERE sdh.status = MIG_PV_VAL_DUMMY_G_HEADER_WAITING_SPLIT_STATUS  
  AND sdh.contract_number = nvl(pi_contract_no, sdh.contract_number)
```

```
AND sdh.stage_id = nvl(pi_stage_id, sdh.stage_id);  
v_ras_flag VARCHAR2 ( 1 ) ;  
BEGIN  
..  
...  
END;  
/
```

NOTE

Package variables need to be declared before CURSOR declaration.

Input-Variable of type EXCEPTION

A package variable is a kind of global variable, which can be used in the entire package after being declared once.

```
CREATE OR REPLACE PACKAGE BODY SAD.sad_lookup_stage_pkg IS  
  
    ex_prog_error EXCEPTION;  
  
    PROCEDURE assert_null ( pi_value IN VARCHAR2 )  
    IS  
    BEGIN  
        IF pi_value IS NOT NULL THEN  
            RAISE ex_prog_error ;  
  
        END IF ;  
  
    END assert_null;  
  
END SAD.sad_lookup_stage_pkg  
/
```

Output

```
CREATE  
    OR REPLACE PROCEDURE SAD.sad_lookup_stage_pkg#assert_null  
    ( pi_value IN VARCHAR2 )  
PACKAGE  
IS  
    ex_prog_error EXCEPTION;  
BEGIN  
    IF pi_value IS NOT NULL THEN  
        RAISE ex_prog_error ;  
  
    END IF ;  
  
END ;  
/
```

NOTE

As GaussDB does not have the software package functions, the package variable needs to be declared in the procedure or function.

Input - If the configuration parameter pkgSchemaNaming is set to false

A package variable is a kind of global variable, which can be used in the entire package after being declared once.

```
CREATE OR REPLACE PACKAGE BODY SAD.bas_lookup_misc_pkg IS  
  
    g_pkg_name CONSTANT VARCHAR2(30) := 'bas_lookup_misc_pkg';  
    g_func_name VARCHAR2(30);  
  
    FUNCTION func_name RETURN VARCHAR2 IS
```

```
l_func_name VARCHAR2(100);
BEGIN
  l_func_name := g_pkg_name || '.' || g_func_name;
  RETURN l_func_name;
END;
END SAD.bas_lookup_misc_pkg;
/
```

Output

```
INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES (
  PACKAGE_NAME
  ,SPEC_OR_BODY
  ,VARIABLE_NAME
  ,VARIABLE_TYPE
  ,CONSTANT_I
  ,DEFAULT_VALUE
  ,RUNTIME_EXEC_I
)
VALUES ( UPPER( 'bas_lookup_misc_pkg' )
  ,'B'
  ,UPPER( 'g_func_name' )
  ,UPPER( 'VARCHAR2(30)' )
  ,FALSE
  ,NULL
  ,FALSE );

END ;
/
-----
CREATE
  OR REPLACE FUNCTION SAD.bas_lookup_misc_pkg#func_name
  RETURN VARCHAR2
PACKAGE
IS
  l_func_name VARCHAR2 ( 100 ) ;
  MIG_PV_VAL_DUMMY_G_PKG_NAME VARCHAR2 ( 30 ) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( 'SAD' , 'bas_lookup_misc_pkg' , 'g_pkg_name' ) ::VARCHAR2 ( 30 ) ;
  MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2 ( 30 ) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( 'SAD' , 'bas_lookup_misc_pkg' , 'g_func_name' ) ::VARCHAR2 ( 30 ) ;

BEGIN
  l_func_name := MIG_PV_VAL_DUMMY_G_PKG_NAME || '.' || MIG_PV_VAL_DUMMY_G_FUNC_NAME ;

  MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( 'SAD' , 'bas_lookup_misc_pkg' , 'g_pkg_name' , MIG_PV_VAL_DUMMY_G_PKG_NAME ) ;
  MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( 'SAD' , 'bas_lookup_misc_pkg' , 'g_func_name' , MIG_PV_VAL_DUMMY_G_FUNC_NAME ) ;

  RETURN l_func_name ;

END ;
/
```

NOTE

If the configuration parameter **pkgSchemaNaming** is set to **false**, package variable migration is not happening properly in some places (for example, GET to fetch default value and SET to assign final value are not added). This setting is not recommended by the kernel team. Please check with Kernel team.

Input-Package variable declared with data type as table column %TYPE

If a data type is declared as table column %TYPE for a variable, the data type which is defined on table creation level is considered to be the corresponding column.

```
CREATE OR REPLACE PACKAGE BODY SAD.bas_lookup_misc_pkg IS
    v_emp_name emp.ename%TYPE;
PROCEDURE save_emp_dtls ( v_empno IN VARCHAR2 )
IS
BEGIN
    IF v_emp_name IS NULL THEN
        v_emp_name := 'test';
    END IF ;
END save_emp_dtls;
END bas_lookup_misc_pkg
/
```

Output

```
BEGIN
    INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES (
        PACKAGE_NAME
        ,SPEC_OR_BODY
        ,VARIABLE_NAME
        ,VARIABLE_TYPE
        ,CONSTANT_I
        ,DEFAULT_VALUE
        ,RUNTIME_EXEC_I
    )
    VALUES ( UPPER( 'bas_lookup_misc_pkg' )
        , 'B'
        ,UPPER( 'v_emp_name' )
        ,UPPER( 'VARCHAR2(30)' )
        ,FALSE
        ,NULL
        ,FALSE ) ;
END ;
/
_*****
CREATE
    OR REPLACE PROCEDURE SAD.bas_lookup_misc_pkg#save_emp_dtls ( v_empno IN VARCHAR2 )
PACKAGE
IS
    MIG_PV_VAL_DUMMY_EMP_NAME VARCHAR2 ( 30 ) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( 'SAD' , 'bas_lookup_misc_pkg' , 'v_emp_name' ) ::VARCHAR2 ( 30 ) ;
BEGIN
    IF MIG_PV_VAL_DUMMY_EMP_NAME IS NULL THEN
        MIG_PV_VAL_DUMMY_EMP_NAME := 'test';
    END IF ;
END ;
/
```

NOTE

While migrating a package variable with a data type as table column %TYPE, take the actual data type from a table and use it while declaring a variable, rather than using %TYPE.

Input - If the configuration parameter "pkgSchemaNaming" is set to false

If the PACKAGE name is specified along with the SCHEMA name, use the SCHEMA name on GET() to fetch the default value and SET() to assign the final value .

```
CREATE OR REPLACE PACKAGE BODY SAD.bas_lookup_misc_pkg IS
    g_pkg_name CONSTANT VARCHAR2(30) := 'bas_lookup_misc_pkg';
```

```

g_func_name VARCHAR2(30);

FUNCTION func_name RETURN VARCHAR2 IS
  l_func_name VARCHAR2(100);
BEGIN
  l_func_name := g_pkg_name || '.' || g_func_name;
  RETURN l_func_name;
END;
END SAD.bas_lookup_misc_pkg;
/

```

Output

```

BEGIN
  INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES (
    PACKAGE_NAME
    ,SPEC_OR_BODY
    ,VARIABLE_NAME
    ,VARIABLE_TYPE
    ,CONSTANT_I
    ,DEFAULT_VALUE
    ,RUNTIME_EXEC_I
  )
  VALUES ( UPPER( 'bas_lookup_misc_pkg' )
    ,'B'
    ,UPPER( 'g_pkg_name' )
    ,UPPER( 'VARCHAR2(30)' )
    ,TRUE
    ,'bas_lookup_misc_pkg'
    ,FALSE );

  INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES (
    PACKAGE_NAME
    ,SPEC_OR_BODY
    ,VARIABLE_NAME
    ,VARIABLE_TYPE
    ,CONSTANT_I
    ,DEFAULT_VALUE
    ,RUNTIME_EXEC_I
  )
  VALUES ( UPPER( 'bas_lookup_misc_pkg' )
    ,'B'
    ,UPPER( 'g_func_name' )
    ,UPPER( 'VARCHAR2(30)' )
    ,FALSE
    ,NULL
    ,FALSE );

END ;
/
--*****
CREATE
  OR REPLACE FUNCTION SAD.bas_lookup_misc_pkg#func_name
  RETURN VARCHAR2
  PACKAGE
  IS
    l_func_name VARCHAR2 ( 100 ) ;
    MIG_PV_VAL_DUMMY_G_PKG_NAME VARCHAR2 ( 30 ) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( 'SAD' , 'bas_lookup_misc_pkg' , 'g_pkg_name' ) ::VARCHAR2 ( 30 ) ;
    MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2 ( 30 ) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( 'SAD' , 'bas_lookup_misc_pkg' , 'g_func_name' ) ::VARCHAR2 ( 30 ) ;

  BEGIN
    l_func_name := MIG_PV_VAL_DUMMY_G_PKG_NAME || '.' || MIG_PV_VAL_DUMMY_G_FUNC_NAME ;

    MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( 'SAD' , 'bas_lookup_misc_pkg' , 'g_pkg_name' , MIG_PV_VAL_DUMMY_G_PKG_NAME ) ;
    MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( 'SAD' , 'bas_lookup_misc_pkg' , 'g_func_name' , MIG_PV_VAL_DUMMY_G_FUNC_NAME ) ;

```



```
RETURN l_func_name ;  
  
END ;  
/
```

Input - If the configuration parameter pkgSchemaNaming is set to false

If the configuration parameter **pkgSchemaNaming** is set to **false**.

```
CREATE OR REPLACE PACKAGE BODY bas_lookup_misc_pkg IS  
  
g_pkg_name CONSTANT VARCHAR2(30) := 'bas_lookup_misc_pkg';  
g_func_name VARCHAR2(30);  
  
FUNCTION func_name RETURN VARCHAR2 IS  
l_func_name VARCHAR2(100);  
BEGIN  
l_func_name := g_pkg_name || '.' || g_func_name;  
RETURN l_func_name;  
END;  
END SAD.bas_lookup_misc_pkg;  
/
```

Output

```
BEGIN  
INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES (  
PACKAGE_NAME  
,SPEC_OR_BODY  
,VARIABLE_NAME  
,VARIABLE_TYPE  
,CONSTANT_I  
,DEFAULT_VALUE  
,RUNTIME_EXEC_I  
)  
VALUES ( UPPER( 'bas_lookup_misc_pkg' )  
, 'B'  
, UPPER( 'g_pkg_name' )  
, UPPER( 'VARCHAR2(30)' )  
, TRUE  
, 'bas_lookup_misc_pkg'  
, FALSE ) ;  
  
INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES (  
PACKAGE_NAME  
,SPEC_OR_BODY  
,VARIABLE_NAME  
,VARIABLE_TYPE  
,CONSTANT_I  
,DEFAULT_VALUE  
,RUNTIME_EXEC_I  
)  
VALUES ( UPPER( 'bas_lookup_misc_pkg' )  
, 'B'  
, UPPER( 'g_func_name' )  
, UPPER( 'VARCHAR2(30)' )  
, FALSE  
, NULL  
, FALSE ) ;  
  
END ;  
/  
--*****  
CREATE  
OR REPLACE FUNCTION bas_lookup_misc_pkg#func_name  
RETURN VARCHAR2  
PACKAGE  
IS  
l_func_name VARCHAR2 ( 100 ) ;
```

```
MIG_PV_VAL_DUMMY_G_PKG_NAME VARCHAR2 ( 30 ) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( CURRENT_SCHEMA(), 'bas_lookup_misc_pkg', 'g_pkg_name' ) ::VARCHAR2 ( 30 ) ;
MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2 ( 30 ) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( CURRENT_SCHEMA(), 'bas_lookup_misc_pkg', 'g_func_name' ) ::VARCHAR2 ( 30 ) ;

BEGIN
  l_func_name := MIG_PV_VAL_DUMMY_G_PKG_NAME || '.' || MIG_PV_VAL_DUMMY_G_FUNC_NAME ;

MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( CURRENT_SCHEMA(), 'bas_lookup_misc_pkg', 'g_pkg_name', MIG_PV_VAL_DUMMY_G_PKG_NAME ) ;
MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( CURRENT_SCHEMA(), 'bas_lookup_misc_pkg', 'g_func_name', MIG_PV_VAL_DUMMY_G_FUNC_NAME ) ;

  RETURN l_func_name ;

END ;
/
```

Input : if pkgSchemaNaming is set to false, package variable

The global variable is not correctly converted during package conversion, and an error is reported during compilation. If the configuration parameter **pkgSchemaNaming** is set to **false**, package variable migration is not happening properly in some places. This setting is not recommended by Kernel team. Please check with Kernel team.

```
CREATE OR REPLACE PACKAGE BODY SAD.bas_dml_lookup_pkg IS
  g_pkg_name CONSTANT VARCHAR2(30) := 'bas_dml_ic_price_rule_pkg' ;
  g_func_name VARCHAR2 (100);

  FUNCTION func_name
  RETURN VARCHAR2
  IS
    l_func_name VARCHAR2(100) ;
  BEGIN
    l_func_name := g_pkg_name || '.' || g_func_name ;
    RETURN l_func_name ;

  END ;

END bas_dml_lookup_pkg ;
/
```

Output

```
BEGIN
  INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES (
    USER_NAME, PACKAGE_NAME, SPEC_OR_BODY
    , VARIABLE_NAME, VARIABLE_TYPE
    , CONSTANT_I, DEFAULT_VALUE, RUNTIME_EXEC_I
  )
  VALUES ( 'SAD', UPPER( 'bas_dml_lookup_pkg' ), 'B'
    , UPPER( 'g_pkg_name' ), UPPER( 'VARCHAR2 ( 30 )' )
    , TRUE, 'bas_dml_ic_price_rule_pkg', FALSE ) ;

  INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES (
    USER_NAME, PACKAGE_NAME, SPEC_OR_BODY
    , VARIABLE_NAME, VARIABLE_TYPE
    , CONSTANT_I, DEFAULT_VALUE, RUNTIME_EXEC_I
  )
  VALUES ( 'SAD', UPPER( 'bas_dml_lookup_pkg' ), 'B'
    , UPPER( 'g_func_name' ), UPPER( 'VARCHAR2(100)' )
    , FALSE, NULL, FALSE ) ;

END ;
/

CREATE OR REPLACE FUNCTION SAD.bas_dml_lookup_pkg#func_name
```

```
RETURN VARCHAR2
IS
  MIG_PV_VAL_DUMMY_G_PKG_NAME VARCHAR2(30) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
('SAD', 'BAS_DML_LOOKUP_PKG', 'G_PKG_NAME')::VARCHAR2(30) ;
  MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2(100) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
('SAD', 'BAS_DML_LOOKUP_PKG', 'G_FUNC_NAME')::VARCHAR2(100) ;
  l_func_name VARCHAR2(100) ;
BEGIN
  l_func_name := MIG_PV_VAL_DUMMY_G_PKG_NAME || '.' || MIG_PV_VAL_DUMMY_G_FUNC_NAME ;
  RETURN l_func_name ;
END ;
/
```

Input: table field type definition in the (%type) table

During package conversion, the schema definition is not added to the table field type definition in the (%type) table. An error is reported during compilation.

```
CREATE TABLE CTP_BRANCH
( ID          VARCHAR2(10)
, NAME        VARCHAR2(100)
, DESCRIPTION VARCHAR2(500)
);

CREATE OR REPLACE PACKAGE BODY SAD.bas_dml_lookup_pkg IS
  g_pkg_name CONSTANT VARCHAR2(30) := 'bas_dml_ic_price_rule_pkg' ;
  g_func_name CTP_BRANCH.NAME%TYPE;

  FUNCTION func_name
  RETURN VARCHAR2
  IS
    l_func_name VARCHAR2(100) ;
  BEGIN
    l_func_name := g_pkg_name || '.' || g_func_name ;
    RETURN l_func_name ;
  END ;

END bas_dml_lookup_pkg ;
/
```

Output

```
BEGIN
  INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES (
    USER_NAME, PACKAGE_NAME, SPEC_OR_BODY
  , VARIABLE_NAME, VARIABLE_TYPE
  , CONSTANT_I, DEFAULT_VALUE, RUNTIME_EXEC_I
  )
  VALUES ( 'SAD', UPPER( 'bas_dml_lookup_pkg' ), 'B'
    , UPPER( 'g_pkg_name' ), UPPER( 'VARCHAR2 ( 30 )' )
    , TRUE, 'bas_dml_ic_price_rule_pkg', FALSE ) ;

  INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES (
    USER_NAME, PACKAGE_NAME, SPEC_OR_BODY
  , VARIABLE_NAME, VARIABLE_TYPE
  , CONSTANT_I, DEFAULT_VALUE, RUNTIME_EXEC_I
  )
  VALUES ( 'SAD', UPPER( 'bas_dml_lookup_pkg' ), 'B'
    , UPPER( 'g_func_name' ), UPPER( 'VARCHAR2(100)' )
    , FALSE, NULL, FALSE ) ;

END ;
/
CREATE OR REPLACE FUNCTION SAD.bas_dml_lookup_pkg#func_name
RETURN VARCHAR2
IS
  MIG_PV_VAL_DUMMY_G_PKG_NAME VARCHAR2(30) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
('SAD', 'BAS_DML_LOOKUP_PKG', 'G_PKG_NAME')::VARCHAR2(30) ;
```

```
MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2(100) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
('SAD', 'BAS_DML_LOOKUP_PKG', 'G_FUNC_NAME')::VARCHAR2(100);
  l_func_name VARCHAR2(100);
BEGIN
  l_func_name := MIG_PV_VAL_DUMMY_G_PKG_NAME || '.' || MIG_PV_VAL_DUMMY_G_FUNC_NAME;
  RETURN l_func_name;
END;
/
```

EXCEPTION

Package variables can be declared as EXCEPTION, which is not supported in GaussDB.

Input

```
CREATE OR REPLACE PACKAGE BODY product_pkg IS

  ex_prog_error EXCEPTION;

  PROCEDURE assert_null(pi_value IN VARCHAR2) IS
  BEGIN
    IF pi_value IS NOT NULL
    THEN
      RAISE ex_prog_error;
    END IF;
  EXCEPTION
    WHEN ex_prog_error THEN
      RAISE ex_prog_error;

  END assert_null;
END product_pkg;
/
```

Output

```
CREATE OR REPLACE PROCEDURE product_pkg.Assert_null (pi_value IN VARCHAR2)
IS
  ex_prog_error EXCEPTION;
BEGIN
  IF pi_value IS NOT NULL THEN
    RAISE ex_prog_error;
  END IF;
EXCEPTION
  WHEN ex_prog_error THEN
    RAISE ex_prog_error;
END;
/
```

Default Value

function is specified as a default value for a package variable.

Input

```
BEGIN
  INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES (
    PACKAGE_NAME
    ,SPEC_OR_BODY
    ,VARIABLE_NAME
    ,VARIABLE_TYPE
    ,CONSTANT_I
    ,DEFAULT_VALUE
    ,RUNTIME_EXEC_I
  )
  VALUES ( UPPER( 'PKG_REVN_ARPU' )
    , 'B'
```

```
,UPPER( 'imodel' )
,UPPER( 'log_table.ds_exec%TYPE' )
,FALSE
,pkg_etl.proc_set_chain ( 'DAILY ARPU' )
,FALSE );

END ;
/
gSQL:PKG_REVN_ARPU_04.SQL:23: ERROR: function pkg_etl.proc_set_chain(unknown) does not exist
LINE 15:      ,pkg_etl.proc_set_chain ( 'DAILY ARPU' )
              ^
HINT: No function matches the given name and argument types. You might need to add explicit type casts.

CREATE OR REPLACE PACKAGE BODY IC_STAGE.PKG_REVN_ARPU
AS
  imodel log_table.ds_exec%TYPE := pkg_etl.proc_set_chain ('DAILY ARPU');
  PROCEDURE AGGR_X_AGG00_REVN_DEALER (p_date PLS_INTEGER,
                                     p_days PLS_INTEGER)
  AS
    v_start_date PLS_INTEGER;
    v_curr_date PLS_INTEGER;
    v_imodel VARCHAR2(100);
  BEGIN
    pkg_etl.proc_start (p_date, 'AGGR_X_AGG00_REVN_DEALER ');

    v_start_date :=
      TO_CHAR (TO_DATE (p_date, 'yyyymmdd') - (p_days - 1), 'yyyymmdd');
    v_curr_date := p_date;
    v_imodel := imodel;

  END;
END PKG_REVN_ARPU;
/
```

Output

```
SET
  package_name_list = 'PKG_REVN_ARPU' ;

BEGIN
  INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES (
    PACKAGE_NAME
    ,SPEC_OR_BODY
    ,VARIABLE_NAME
    ,VARIABLE_TYPE
    ,CONSTANT_I
    ,DEFAULT_VALUE
    ,RUNTIME_EXEC_I
  )
  VALUES ( UPPER( 'PKG_REVN_ARPU' )
    ,'B'
    ,UPPER( 'imodel' )
    ,UPPER( 'log_table.ds_exec%TYPE' )
    ,FALSE
    ,$$pkg_etl.proc_set_chain ('DAILY ARPU')$$
    ,TRUE );

END ;
/
CREATE
  OR REPLACE PROCEDURE PKG_REVN_ARPU.AGGR_X_AGG00_REVN_DEALER ( p_date INTEGER
    ,p_days INTEGER )
  AS
  MIG_PV_VAL_DUMMY_IMODEL log_table.ds_exec%TYPE := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
  ( CURRENT_USER,'PKG_REVN_ARPU','imodel' ) ::log_table.ds_exec%TYPE ;
  v_start_date INTEGER ;
  v_curr_date INTEGER ;
  v_imodel VARCHAR2 ( 100 ) ;
```

```
BEGIN
  pkg_etl.proc_start ( p_date , 'AGGR_X_AGG00_REVN_DEALER ' ) ;
  v_start_date := TO_CHAR( TO_DATE( p_date , 'yyyymmdd' ) - ( p_days - 1 ) , 'yyyymmdd' ) ;
  v_curr_date := p_date ;
  v_imodel := MIG_PV_VAL_DUMMY_IMODEL ;
  MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( CURRENT_USER , 'PKG_REVN_ARPU' , 'imodel' , MIG_PV_VAL_DUMMY_IMODEL ) ;

END ;
/
reset package_name_list ;
```

PLS_INTEGER

A PLS_INTEGER datatype is not converted into INTEGER for package variables but it is working fine for other local variables. Therefore, it should be converted to INTEGER, such as, variable1 PLS_INTEGER ==> variable1 INTEGER

SCRIPTS: SAD_CALC_BPART_PRICE_PKG.sql, SAD_CALC_ITEM_PKG_TEST_OB.sql,
SAD_CALC_ITEM_PRICE_TEST_OB.sql, SAD_CALC_ITEM_PRI_TEST_OB.sql,
SAD_CALC_ITEM_TEST_OB.sql

INPUT :

```
CREATE OR REPLACE PACKAGE BODY "SAD"."SAD_CALC_BPART_PRICE_PKG" IS
  g_max_number_of_entities PLS_INTEGER := 100;
  FUNCTION split_warning(pi_contract_number IN VARCHAR2,
    pi_stage_id      IN NUMBER,
    pi_quotation_id  IN NUMBER,
    pi_cfg_instance_id IN NUMBER) RETURN VARCHAR2 IS
  BEGIN
    ---
    l_item_list := items_no_cost(pi_contract_number      => pi_contract_number,
      pi_stage_id      => pi_stage_id,
      pi_quotation_id  => pi_quotation_id,
      pi_cfg_instance_id => pi_cfg_instance_id,
      pi_max_number_of_entities => g_max_number_of_entities,
      pi_sep_char      => g_item_sep_char,
      po_error_msg     => po_error_msg);
    ---
  END split_warning;
END SAD_CALC_BPART_PRICE_PKG;
```

OUTPUT :

```
BEGIN
  ---
  INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES (
    PACKAGE_NAME
  ,SPEC_OR_BODY
  ,VARIABLE_NAME
  ,VARIABLE_TYPE
  ,CONSTANT_I
  ,DEFAULT_VALUE
  ,RUNTIME_EXEC_I
  )
  VALUES ( UPPER( 'SAD_CALC_BPART_PRICE_PKG' )
  , 'B'
  , UPPER( 'g_max_number_of_entities' )
  , UPPER( 'PLS_INTEGER' )
  , FALSE
  , 100
  , FALSE ) ;
  ---
END;
/
CREATE
```

```
OR REPLACE FUNCTION SAD.SAD_CALC_BPART_PRICE_PKG#split_warning ( pi_contract_number IN
VARCHAR2
,pi_stage_id IN NUMBER
,pi_quotation_id IN NUMBER
,pi_cfg_instance_id IN NUMBER )
RETURN VARCHAR2 IS
---
MIG_PV_VAL_DUMMY_G_MAX_NUMBER_OF_ENTITIES PLS_INTEGER :=
MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE ( current_schema ( )
,'SAD_CALC_BPART_PRICE_PKG'
,'g_max_number_of_entities' ) ::PLS_INTEGER ;
---
l_item_list := SAD.SAD_CALC_BPART_PRICE_PKG#items_no_cost ( pi_contract_number =>
pi_contract_number ,
pi_stage_id => pi_stage_id ,
pi_quotation_id => pi_quotation_id ,
pi_cfg_instance_id => pi_cfg_instance_id ,
pi_max_number_of_entities => MIG_PV_VAL_DUMMY_G_MAX_NUMBER_OF_ENTITIES ,
pi_sep_char => MIG_PV_VAL_DUMMY_G_ITEM_SEP_CHAR ,
po_error_msg => po_error_msg ) ;
---
END;
```

Input

PLS_INTEGER datatype not converted into INTEGER for package variables but it's working fine for other local variables therefore for package variables also PLS_INTEGER should be converted to INTEGER datatype i.e variable1 PLS_INTEGER ==> variable1 INTEGER

SCRIPTS : SAD_CALC_BPART_PRICE_PKG.SQL, SAD_CALC_ITEM_PKG_TEST_OB.SQL,
SAD_CALC_ITEM_PRICE_TEST_OB.SQL, SAD_CALC_ITEM_PRI_TEST_OB.SQL, SAD_CALC_ITEM_TEST_OB.SQL

INPUT :

```
CREATE OR REPLACE PACKAGE BODY "SAD"."SAD_CALC_BPART_PRICE_PKG" IS
```

```
g_max_number_of_entities PLS_INTEGER := 100;
```

```
FUNCTION split_warning(pi_contract_number IN VARCHAR2,
pi_stage_id IN NUMBER,
pi_quotation_id IN NUMBER,
pi_cfg_instance_id IN NUMBER) RETURN VARCHAR2 IS
```

```
BEGIN
```

```
---
```

```
l_item_list := items_no_cost(pi_contract_number => pi_contract_number,
pi_stage_id => pi_stage_id,
pi_quotation_id => pi_quotation_id,
pi_cfg_instance_id => pi_cfg_instance_id,
pi_max_number_of_entities => g_max_number_of_entities,
pi_sep_char => g_item_sep_char,
po_error_msg => po_error_msg);
```

```
---
```

```
END split_warning;
```

```
END SAD_CALC_BPART_PRICE_PKG;
```

OUTPUT :

```
BEGIN
```

```
---
```

```
INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES (
PACKAGE_NAME
,SPEC_OR_BODY
,VARIABLE_NAME
```

```
,VARIABLE_TYPE
,CONSTANT_I
,DEFAULT_VALUE
,RUNTIME_EXEC_I
)
VALUES ( UPPER( 'SAD_CALC_BPART_PRICE_PKG' )
,'B'
,UPPER( 'g_max_number_of_entities' )
,UPPER( 'PLS_INTEGER' )
,FALSE
,100
,FALSE );
---
END;
/

CREATE
OR REPLACE FUNCTION SAD.SAD_CALC_BPART_PRICE_PKG#split_warning ( pi_contract_number IN
VARCHAR2
,pi_stage_id IN NUMBER
,pi_quotation_id IN NUMBER
,pi_cfg_instance_id IN NUMBER )
RETURN VARCHAR2 IS
---
MIG_PV_VAL_DUMMY_G_MAX_NUMBER_OF_ENTITIES PLS_INTEGER :=
MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE ( current_schema ( )
,'SAD_CALC_BPART_PRICE_PKG'
,'g_max_number_of_entities' ) ::PLS_INTEGER ;
---
l_item_list := SAD.SAD_CALC_BPART_PRICE_PKG#items_no_cost ( pi_contract_number =>
pi_contract_number ,
pi_stage_id => pi_stage_id ,
pi_quotation_id => pi_quotation_id ,
pi_cfg_instance_id => pi_cfg_instance_id ,
pi_max_number_of_entities => MIG_PV_VAL_DUMMY_G_MAX_NUMBER_OF_ENTITIES ,
pi_sep_char => MIG_PV_VAL_DUMMY_G_ITEM_SEP_CHAR ,
po_error_msg => po_error_msg ) ;
---
END;
```

Output

```
BEGIN
INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES
( PACKAGE_NAME, SPEC_OR_BODY, VARIABLE_NAME
, VARIABLE_TYPE, CONSTANT_I, DEFAULT_VALUE
, RUNTIME_EXEC_I )
VALUES ( UPPER('SAD_CALC_BPART_PRICE_PKG')
,'B', UPPER( 'g_max_number_of_entities' )
, UPPER( 'INTEGER' ),FALSE,100
,FALSE );
END ;
/

CREATE OR REPLACE FUNCTION SAD.SAD_CALC_BPART_PRICE_PKG#split_warning
( pi_contract_number IN VARCHAR2
, pi_stage_id IN NUMBER )
RETURN VARCHAR2
PACKAGE
IS
MIG_PV_VAL_DUMMY_G_MAX_NUMBER_OF_ENTITIES INTEGER :=
MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE('SAD', 'SAD_CALC_BPART_PRICE_PKG',
'g_max_number_of_entities') ::INTEGER ;
po_error_msg sad_products_t.exception_description%TYPE ;
```



```
BEGIN
  l_item_list := items_no_cost ( pi_contract_number => pi_contract_number ,pi_stage_id => pi_stage_id
    , pi_max_number_of_entities => MIG_PV_VAL_DUMMY_G_MAX_NUMBER_OF_ENTITIES
    , po_error_msg => po_error_msg ) ;
  MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
('SAD' , 'SAD_CALC_BPART_PRICE_PKG' , 'g_max_number_of_entities' ,MIG_PV_VAL_DUMMY_G_MAX_NUMBER
_OF_ENTITIES);

  RETURN po_error_msg ;

EXCEPTION
  WHEN OTHERS THEN
    po_error_msg := 'Program Others abnormal, Fail to obtain the warning information.' || SQLERRM ;
    MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( 'SAD' , 'SAD_CALC_BPART_PRICE_PKG' , 'g_max_number_of_entities' ,MIG_PV_VAL_DUMMY_G_MAX_NUMBE
R_OF_ENTITIES ) ;

  RETURN po_error_msg ;

END ;
/
```

Cursor With Package Variable

The cursor declared in SAD.sad_calc_product_price_pkg#calc_product_price contains package variables and needs to be handled.

Input

```
CREATE OR REPLACE PACKAGE SAD.bas_subtype_pkg IS
  g_header_waiting_split_status CONSTANT VARCHAR2(20) := 'Waiting_Distribute';
  SUBTYPE error_msg IS sad_products_t.exception_description%TYPE;
END bas_subtype_pkg;
/

CREATE OR REPLACE PACKAGE BODY SAD.sad_calc_product_price_pkg IS
  PROCEDURE calc_product_price(pi_contract_no IN VARCHAR2 DEFAULT NULL,
    pi_stage_id IN NUMBER DEFAULT NULL,
    po_error_msg OUT VARCHAR2) IS
  CURSOR cur_contract IS
    SELECT DISTINCT sdh.contract_number, sdh.stage_id
    FROM sad_distribution_headers_t sdh
    WHERE sdh.status = bas_subtype_pkg.g_header_waiting_split_status
    AND sdh.contract_number = nvl(pi_contract_no, sdh.contract_number)
    AND sdh.stage_id = nvl(pi_stage_id, sdh.stage_id);

  lv_error_msg bas_subtype_pkg.error_msg;
BEGIN
  FOR rec_contract IN cur_contract
  LOOP

    validate_process_status(rec_contract.contract_number,
      rec_contract.stage_id,
      lv_error_msg);

  END LOOP;

  po_error_msg := lv_error_msg;
END calc_product_price;

END sad_calc_product_price_pkg;
/
```

Output

```
BEGIN
  INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES
  ( PACKAGE_NAME,SPEC_OR_BODY,VARIABLE_NAME
  , VARIABLE_TYPE,CONSTANT_I,DEFAULT_VALUE
```

```
, RUNTIME_EXEC_I )
VALUES ( UPPER('bas_subtype_pkg'), 'S', UPPER('g_header_waiting_split_status')
, UPPER( 'VARCHAR2(20)' ), TRUE, 'Waiting_Distribute'
, FALSE );
END ;
/

CREATE OR REPLACE PROCEDURE SAD.sad_calc_product_price_pkg#calc_product_price
( pi_contract_no IN VARCHAR2 DEFAULT NULL
, pi_stage_id IN NUMBER DEFAULT NULL
, po_error_msg OUT VARCHAR2 )
PACKAGE
IS
MIG_PV_VAL_DUMMY_G_HEADER_WAITING_SPLIT_STATUS VARCHAR2 ( 20 ) :=
MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE ( 'SAD' , 'bas_subtype_pkg'
, 'g_header_waiting_split_status' ) ::VARCHAR2 ( 20 ) ;

CURSOR cur_contract IS
SELECT DISTINCT sdh.contract_number, sdh.stage_id
FROM sad_distribution_headers_t sdh
WHERE sdh.status = MIG_PV_VAL_DUMMY_G_HEADER_WAITING_SPLIT_STATUS
AND sdh.contract_number = nvl( pi_contract_no ,sdh.contract_number )
AND sdh.stage_id = nvl( pi_stage_id ,sdh.stage_id ) ;

lv_error_msg sad_products_t.exception_description%TYPE ;
BEGIN
FOR rec_contract IN cur_contract
LOOP
validate_process_status ( rec_contract.contract_number ,rec_contract.stage_id ,lv_error_msg ) ;

END LOOP ;
po_error_msg := lv_error_msg ;
MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( 'SAD' , 'bas_subtype_pkg' , 'g_header_waiting_split_status' , MIG_PV_VAL_DUMMY_G_HEADER_WAITING_SPLIT_STATUS ) ;
END ;
/
```

SET VARIABLE function after the RETURN

SET VARIABLE function should be called before the RETURN statements in the procedure and function.

Input

```
CREATE OR REPLACE PACKAGE BODY SAD.bas_dml_lookup_pkg IS
g_pkg_name CONSTANT VARCHAR2(30) := 'bas_dml_lookup_pkg' ;
g_func_name VARCHAR2(100);

FUNCTION func_name
RETURN VARCHAR2
IS
l_func_name VARCHAR2(100) ;
BEGIN
g_func_name := 'func_name';
l_func_name := g_pkg_name || '.' || g_func_name ;
RETURN l_func_name ;

END;

PROCEDURE data_change_logs ( pi_table_name IN VARCHAR2
, pi_table_key_columns IN VARCHAR2
, po_error_msg OUT VARCHAR2
)
IS
BEGIN
g_func_name := 'data_change_logs';
```

```
IF pi_table_name IS NULL
THEN
RETURN;
END IF;

INSERT INTO fnd_data_change_logs_t
(logid, table_name, table_key_columns )
VALUES
(fnd_data_change_logs_t_s.NEXTVAL
, pi_table_name, pi_table_key_columns );
EXCEPTION
WHEN OTHERS THEN
po_error_msg := 'Others Exception raise in ' || func_name || ',' || SQLERRM;
END data_change_logs;

END bas_dml_lookup_pkg;
/
```

Output

```
BEGIN
INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES
(PACKAGE_NAME,SPEC_OR_BODY,VARIABLE_NAME
,VARIABLE_TYPE,CONSTANT_I,DEFAULT_VALUE
,RUNTIME_EXEC_I )
VALUES ( UPPER('bas_dml_lookup_pkg'), 'B', UPPER('g_pkg_name')
, UPPER( 'VARCHAR2(30)' ), TRUE, 'bas_dml_lookup_pkg'
, FALSE );

INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES
(PACKAGE_NAME,SPEC_OR_BODY,VARIABLE_NAME
,VARIABLE_TYPE,CONSTANT_I,DEFAULT_VALUE
,RUNTIME_EXEC_I )
VALUES ( UPPER('bas_dml_lookup_pkg'), 'B', UPPER('g_func_name')
, UPPER( 'VARCHAR2(100)' ), FALSE, NULL, FALSE );

END ;
/
CREATE OR REPLACE FUNCTION SAD.bas_dml_lookup_pkg#func_name
RETURN VARCHAR2
PACKAGE
IS
MIG_PV_VAL_DUMMY_G_PKG_NAME VARCHAR2 ( 30 ) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( 'SAD', 'bas_dml_lookup_pkg', 'g_pkg_name' ) ::VARCHAR2 ( 30 ) ;
MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2 ( 100 ) :=
MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE ( 'SAD', 'bas_dml_lookup_pkg', 'g_func_name' ) ::VARCHAR2
( 100 ) ;
l_func_name VARCHAR2 ( 100 ) ;

BEGIN
MIG_PV_VAL_DUMMY_G_FUNC_NAME := 'func_name' ;
l_func_name := MIG_PV_VAL_DUMMY_G_PKG_NAME || '.' || MIG_PV_VAL_DUMMY_G_FUNC_NAME ;
MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( 'SAD', 'bas_dml_lookup_pkg', 'g_func_name', MIG_PV_VAL_DUMMY_G_FUNC_NAME ) ;
MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( 'SAD', 'bas_dml_lookup_pkg', 'g_pkg_name', MIG_PV_VAL_DUMMY_G_PKG_NAME ) ;

RETURN l_func_name ;
END ;
/

CREATE OR REPLACE PROCEDURE SAD.bas_dml_lookup_pkg#data_change_logs
(pi_table_name IN VARCHAR2
, pi_table_key_columns IN VARCHAR2
, po_error_msg OUT VARCHAR2 )
PACKAGE
IS
MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2 ( 100 ) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
( 'SAD', 'bas_dml_lookup_pkg', 'g_func_name' ) ::VARCHAR2 ( 100 ) ;
BEGIN
```

```
MIG_PV_VAL_DUMMY_G_FUNC_NAME := 'data_change_logs' ;

IF pi_table_name IS NULL THEN
    MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
    ( 'SAD', 'bas_dml_lookup_pkg', 'g_func_name', MIG_PV_VAL_DUMMY_G_FUNC_NAME ) ;
RETURN ;
END IF ;

INSERT INTO fnd_data_change_logs_t ( logid, table_name, table_key_columns )
VALUES ( NEXTVAL ( 'fnd_data_change_logs_t_s' ), pi_table_name, pi_table_key_columns ) ;

MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( 'SAD', 'bas_dml_lookup_pkg', 'g_func_name', MIG_PV_VAL_DUMMY_G_FUNC_NAME ) ;

EXCEPTION
    WHEN OTHERS THEN
        po_error_msg := 'Others Exception raise in ' || SAD.bas_dml_lookup_pkg#func_name ( ) || ',' ||
SQLERRM ;
    MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
    ( 'SAD', 'bas_dml_lookup_pkg', 'g_func_name', MIG_PV_VAL_DUMMY_G_FUNC_NAME ) ;
END ;
/
```

Empty Package

Empty package bodies do not need to be migrated.

Input

```
CREATE OR REPLACE PACKAGE BODY SAD.bas_subtype_pkg IS
BEGIN
    NULL;
END bas_subtype_pkg;
/
```

Output will be an empty file.

6.9.16.3 Splitting Packages

The package specification is migrated as a schema named after the package and the procedures and functions in the package body is migrated as **Packagename.procedurename** and **Packagename.funtionname**.

Migration can be performed after **pkgSchemaNaming** is set to **true**.

Input – PACKAGE1.FUNC1

```
CREATE OR REPLACE PACKAGE BODY pack AS
FUNCTION get_fullname(n_emp_id NUMBER) RETURN VARCHAR2 IS
    v_fullname VARCHAR2(46);
BEGIN
    SELECT first_name || ',' || last_name
    INTO v_fullname
    FROM employees
    WHERE employee_id = n_emp_id;
    RETURN v_fullname;
END get_fullname;

PROCEDURE get_salary(n_emp_id NUMBER) RETURN NUMBER IS
    n_salary NUMBER(8,2);
BEGIN
    SELECT salary
    INTO n_salary
    FROM employees
    WHERE employee_id = n_emp_id;
    END get_salary;
END pack;
/
```

Output

```
CREATE
OR REPLACE FUNCTION pack.get_fullname ( n_emp_id NUMBER )
RETURN VARCHAR2 IS v_fullname VARCHAR2 ( 46 ) ;
BEGIN
    SELECT
        first_name || ',' || last_name INTO v_fullname
    FROM
        employees
    WHERE
        employee_id = n_emp_id ;
    RETURN v_fullname ;
END ;
/
CREATE
OR REPLACE FUNCTION pack.get_salary ( n_emp_id NUMBER )
RETURN NUMBER IS n_salary NUMBER ( 8,2 ) ;
BEGIN
    SELECT
        salary INTO n_salary
    FROM
        employees
    WHERE
        employee_id = n_emp_id ;
    RETURN n_salary ;
END ;
/
```

If `pkgSchemaNaming` is set to `false`, packages can be split.

When `bas_lookup_misc_pkg` is calling `insert_fnd_data_change_logs`, `insert_fnd_data_change_logs` will be not migrated.

Input

```
CREATE OR REPLACE PACKAGE BODY SAD.bas_dml_lookup_pkg IS
g_pkg_name CONSTANT VARCHAR2(30) := 'bas_dml_ic_price_rule_pkg' ;
g_func_name VARCHAR2(100);

FUNCTION func_name
RETURN VARCHAR2
IS
    l_func_name VARCHAR2(100) ;
BEGIN
    l_func_name := g_pkg_name || '.' || g_func_name ;
    RETURN l_func_name ;

END ;

PROCEDURE data_change_logs ( pi_table_name      IN VARCHAR2
                            , pi_table_key_columns IN VARCHAR2
                            , po_error_msg      OUT VARCHAR2
                        )
IS
BEGIN
    g_func_name := 'insert_fnd_data_change_logs_t';

    INSERT INTO fnd_data_change_logs_t
    ( logid, table_name, table_key_columns )
    VALUES
    ( fnd_data_change_logs_t_s.NEXTVAL
    , pi_table_name, pi_table_key_columns );
EXCEPTION
    WHEN OTHERS THEN
        po_error_msg := 'Others Exception raise in ' || func_name || ' ' || SQLERRM;
END data_change_logs;

END bas_dml_lookup_pkg;
/
```

Output

```
CREATE OR REPLACE FUNCTION SAD.bas_dml_lookup_pkg#func_name
RETURN VARCHAR2
IS
    MIG_PV_VAL_DUMMY_G_PKG_NAME VARCHAR2(30) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
('SAD', 'BAS_DML_LOOKUP_PKG', 'G_PKG_NAME')::VARCHAR2(30);
    MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2(100) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
('SAD', 'BAS_DML_LOOKUP_PKG', 'G_FUNC_NAME')::VARCHAR2(100);
    l_func_name VARCHAR2(100);
BEGIN
    l_func_name := MIG_PV_VAL_DUMMY_G_PKG_NAME || '.' || MIG_PV_VAL_DUMMY_G_FUNC_NAME;
    RETURN l_func_name;

END;
/
CREATE OR REPLACE PROCEDURE SAD.bas_dml_lookup_pkg#data_change_logs ( pi_table_name IN
VARCHAR2
, pi_table_key_columns IN VARCHAR2
, po_error_msg OUT VARCHAR2 )
IS
MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2(30) := MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE
('SAD', 'BAS_DML_LOOKUP_PKG', 'G_FUNC_NAME')::VARCHAR2(30);
BEGIN
    MIG_PV_VAL_DUMMY_G_FUNC_NAME := 'insert_fnd_data_change_logs_t';

    INSERT INTO fnd_data_change_logs_t (
        logid, table_name, table_key_columns )
    VALUES ( NEXTVAL ( 'fnd_data_change_logs_t_s' )
        , pi_table_name, pi_table_key_columns );

    MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE ( 'SAD', 'BAS_DML_LOOKUP_PKG', 'G_FUNC_NAME',
MIG_PV_VAL_DUMMY_G_FUNC_NAME );

    EXCEPTION
        WHEN OTHERS THEN
            po_error_msg := 'Others Exception raise in ' || SAD.bas_dml_lookup_pkg#func_name() || ',' ||
SQLERRM;
            MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE ( 'SAD', 'BAS_DML_LOOKUP_PKG', 'G_FUNC_NAME',
MIG_PV_VAL_DUMMY_G_FUNC_NAME );

END;
/
```

PACKAGE Keyword

The kernel needs to add the package tag to the functions and stored procedures converted from the package.

Input

```
CREATE OR REPLACE PACKAGE BODY SAD.bas_dml_lookup_pkg IS

    FUNCTION func_name
    RETURN VARCHAR2
    IS
        l_func_name VARCHAR2(100);
    BEGIN
        l_func_name := 'bas_dml_lookup_pkg' || '.' || 'func_name';
        RETURN l_func_name;

    END;

END bas_dml_lookup_pkg;
/
```

Output

```
CREATE OR REPLACE FUNCTION func_name
RETURN VARCHAR2
```

```
PACKAGE
IS
  l_func_name VARCHAR2(100) ;
BEGIN
  l_func_name := 'bas_dml_lookup_pkg' || '.' || 'func_name' ;
  RETURN l_func_name ;
END ;
/
```

6.9.16.4 REF CURSOR

REF Cursor is a data type that can store the database cursor values and is used to return query results. DSC supports migration of REF CURSOR. The example below shows how the DSC migrates **lref_strong_emptyt** (local REF CURSOR) and **ref_strong_emptyt** (package-level REF CURSOR).

Input - REF CURSOR in PL/SQL Package (Package Specification and Body)

```
# Package specification
CREATE OR REPLACE PACKAGE pkg_refcur
IS
  TYPE ref_variable IS REF CURSOR;
  TYPE ref_strong_emptyt IS REF CURSOR RETURN emp_o%ROWTYPE;
  PROCEDURE p_get_employees ( v_id IN INTEGER ,po_results OUT ref_strong_emptyt );
END pkg_refcur ;
/

# Package body
CREATE OR REPLACE PACKAGE BODY pkg_refcur
IS
  TYPE lref_strong_emptyt IS REF CURSOR RETURN emp_o%ROWTYPE ;
  var_num NUMBER ;

  PROCEDURE p_get_employees ( v_id IN INTEGER, po_results OUT ref_strong_emptyt )
  is
    vemp_rc lref_strong_emptyt ;
  Begin
    OPEN po_results for
    SELECT * FROM emp_o e
    WHERE e.id = v_id;

  EXCEPTION
    WHEN OTHERS THEN
      RAISE;
  END p_get_employees;
END pkg_refcur;
/
```

Output

```
BEGIN
  INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES
  ( SCHEMA_NAME ,PACKAGE_NAME ,SPEC_OR_BODY ,VARIABLE_NAME ,VARIABLE_TYPE ,CONSTANT_I ,DEFA
  ULT_VALUE ,EXPRESSION_I )
  VALUES ( UPPER( current_schema
  ) ) ,UPPER( 'pkg_refcur' ) , 'B' ,UPPER( 'var_num' ) ,UPPER( 'NUMBER' ) ,false ,NULL ,false ) ;
END ;
/

CREATE
  OR REPLACE PROCEDURE pkg_refcur#p_get_employees ( v_id IN INTEGER ,po_results OUT
  SYS_REFCURSOR ) is vemp_rc SYS_REFCURSOR ;
  Begin
    OPEN po_results for SELECT
    *
    FROM
```

```
emp_o e
WHERE
  e.id = v_id ;
EXCEPTION WHEN OTHERS
THEN RAISE ;
END ;
/
```

6.9.16.5 Creating a Schema for Package

The package declaration is migrated as a schema named after the package. The migration can be performed after **pkgSchemaNaming** is set to **false**.

Input – Create schema for Package

```
CREATE OR REPLACE EDITIONABLE PACKAGE "PACK_DEMO"."PACKAGE_GET_NOVA_INFO" AS

  TYPE novalistcur is REF CURSOR;
  PROCEDURE getNovalInfo (
    i_appEnShortName IN VARCHAR2,
    o_flag OUT VARCHAR2,
    o_errormsg OUT VARCHAR2,
    o_novalist OUT novalistcur
  );
```

Output

```
/*~~~PACKAGE_GET_NOVA_INFO~~~*/
CREATE
  SCHEMA PACKAGE_GET_NOVA_INFO
;
```

6.9.17 VARRAY

REF CURSOR is defined as a return parameter.

It can be migrated after **plsSqlCollection** is set to **varray**.

Input - VARRAY

```
CREATE
OR REPLACE TYPE TYPE_RMTS_ARRAYTYPE IS TABLE
OF VARCHAR2 (30000);

CREATE OR REPLACE PACKAGE BODY SCMS_STRING_UTILS
As
FUNCTION END_WITH (SRCSTRING VARCHAR2, --Source character string
ENDCHAR VARCHAR2, --End character string
IGNORECASE BOOLEAN --Ignore Case
)
RETURN BOOLEAN IS SRCLEN NUMBER (20) := LENGTH(SRCSTRING);
ENDLEN NUMBER (20) := LENGTH(ENDCHAR);
V_TOKEN_ARRAY TYPE_RMTS_ARRAYTYPE := TYPE_RMTS_ARRAYTYPE ();
V_TOKEN_ARRAY1 TYPE_RMTS_ARRAYTYPE := TYPE_RMTS_ARRAYTYPE ();
I NUMBER (20) := 1;
TMP_CHAR VARCHAR(1);
TMP_CHAR1 VARCHAR(1);
BEGIN
...
END;
END;
/
```

Output


```
CREATE
OR REPLACE FUNCTION SCMS_STRING_UTILS.END_WITH (SRCSTRING VARCHAR2 /* source character
string */
, ENDCHAR VARCHAR2 /* End character string */
, IGNORECASE BOOLEAN /* Ignore case */
)
RETURN BOOLEAN IS SRCLEN NUMBER (20) := LENGTH(SRCSTRING);
ENDLEN NUMBER (20) := LENGTH(ENDCHAR);
TYPE TYPE_RMTS_ARRAYTYPE IS VARRAY (1024) OF VARCHAR2 (30000);
V_TOKEN_ARRAY TYPE_RMTS_ARRAYTYPE /*:= TYPE_RMTS_ARRAYTYPE()*/
;
V_TOKEN_ARRAY1 TYPE_RMTS_ARRAYTYPE /*:= TYPE_RMTS_ARRAYTYPE()*/
;
I NUMBER (20) := 1;
TMP_CHAR VARCHAR(1);
TMP_CHAR1 VARCHAR(1);
BEGIN
END;
```

6.9.18 Granting Execution Permissions

This feature is used to give privileges to users for specific packages. As GaussDB does not support packages, all the procedures and functions defined in the specific packages will be granted the execution permission.

Input

```
GRANT EXECUTE ON SAD.BAS_LOOKUP_MISC_PKG TO EIP_SAD;
```

Output

```
GRANT EXECUTE ON procedure_name TO EIP_SAD;
GRANT EXECUTE ON function1_name TO EIP_SAD;
```

NOTE

Both procedure _name and function1_name must belong to SAD.BAS_LOOKUP_MISC_PKG.

The execution permission

The last authorization of the package is not converted.

```
--GRANT
```

Input

```
Below should be created as 1spec/t603.SQL
CREATE OR REPLACE PACKAGE SAD.bas_dml_lookup_pkg IS
FUNCTION func_name RETURN VARCHAR2;
PROCEDURE data_change_logs ( pi_table_name      IN VARCHAR2
, pi_table_key_columns IN VARCHAR2
, po_error_msg        OUT VARCHAR2
);
END bas_dml_lookup_pkg;
/
GRANT EXECUTE ON SAD.bas_dml_lookup_pkg TO eip_sad;
=====
Below should be created as 2body/t603.SQL
CREATE OR REPLACE PACKAGE BODY SAD.bas_dml_lookup_pkg IS
g_pkg_name CONSTANT VARCHAR2(30) := 'bas_dml_ic_price_rule_pkg' ;
g_func_name VARCHAR2(100);

FUNCTION func_name
RETURN VARCHAR2
IS
l_func_name VARCHAR2(100) ;
BEGIN
l_func_name := g_pkg_name || '.' || g_func_name ;
```

```
        RETURN l_func_name ;

    END func_name;

    PROCEDURE data_change_logs ( pi_table_name      IN VARCHAR2
                                , pi_table_key_columns IN VARCHAR2
                                , po_error_msg      OUT VARCHAR2
                                )
    IS
    BEGIN
    ...
    END data_change_logs;

END bas_dml_lookup_pkg;
/
```

Output

```
BEGIN
  INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES
  ( PACKAGE_NAME,SPEC_OR_BODY,VARIABLE_NAME
  , VARIABLE_TYPE,CONSTANT_I,DEFAULT_VALUE
  , RUNTIME_EXEC_I )
  VALUES ( UPPER('bas_dml_lookup_pkg'), 'B', UPPER('g_pkg_name')
  , UPPER( 'VARCHAR2(30)' ),TRUE,'bas_dml_ic_price_rule_pkg'
  , FALSE );

  INSERT INTO MIG_ORA_EXT.MIG_PKG_VARIABLES
  ( PACKAGE_NAME,SPEC_OR_BODY,VARIABLE_NAME
  , VARIABLE_TYPE,CONSTANT_I,DEFAULT_VALUE
  , RUNTIME_EXEC_I )
  VALUES ( UPPER('bas_dml_lookup_pkg'), 'B', UPPER( 'g_func_name' )
  , UPPER( 'VARCHAR2(100)' ),FALSE,NULL
  , FALSE );

END ;
/

CREATE OR REPLACE FUNCTION SAD.bas_dml_lookup_pkg#bas_dml_lookup_pkg#func_name
RETURN VARCHAR2
PACKAGE
IS
  MIG_PV_VAL_DUMMY_G_PKG_NAME VARCHAR2(30) :=
MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE( 'SAD' ,'bas_dml_lookup_pkg' ,'g_pkg_name' )::VARCHAR2(30);
  MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2(100) :=
MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE( 'SAD' ,'bas_dml_lookup_pkg' ,'g_func_name' )::VARCHAR2(100);
  l_func_name VARCHAR2 ( 100 ) ;

BEGIN
  l_func_name := MIG_PV_VAL_DUMMY_G_PKG_NAME || '.' || MIG_PV_VAL_DUMMY_G_FUNC_NAME ;
  MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( 'SAD' ,'bas_dml_lookup_pkg' ,'g_func_name' ,MIG_PV_VAL_DUMMY_G_FUNC_NAME ) ;
  MIG_ORA_EXT.MIG_FN_SET_PKG_VARIABLE
( 'SAD' ,'bas_dml_lookup_pkg' ,'g_pkg_name' ,MIG_PV_VAL_DUMMY_G_PKG_NAME ) ;

  RETURN l_func_name ;
END ;
/

CREATE OR REPLACE PROCEDURE SAD.bas_dml_lookup_pkg#data_change_logs
( pi_table_name IN VARCHAR2
  , pi_table_key_columns IN VARCHAR2
  , po_error_msg OUT VARCHAR2 )
PACKAGE
IS
BEGIN
...
END ;
/
```

```
GRANT EXECUTE ON FUNCTION SAD.bas_dml_lookup_pkg#bas_dml_lookup_pkg#func_name() TO eip_sad;  
GRANT EXECUTE ON FUNCTION SAD.bas_dml_lookup_pkg#data_change_logs(VARCHAR2, VARCHAR2) TO  
eip_sad;
```

6.9.19 Package Name List

Enable & Disable

Set package_name_list to bas_lookup_misc_pkg.

Enable and disable the function based on configuration parameters.

Input

If this parameter is enabled, the below line should be added before creating package objects.

```
SET  
package_name_list = '<<package name>>';  
If it is not enabled, this line should not be added
```

Output

If this parameter is enabled, the below line should be added before creating package objects.

```
SET  
package_name_list = '<<package name>>';  
If it is not enabled, this line should not be added.
```

6.9.20 Data Type

Subtype

The customized type in the package cannot be converted.

```
SUBTYPE error_msg IS sad_products_t.exception_description%TYPE;
```

```
SUBTYPE AR_FLAG IS SAD_RA_LINES_TI.AR_FLAG%TYPE;
```

```
SUBTYPE LOCK_FLAG IS SAD_SHIPMENT_BATCHES_T.LOCK_FLAG%TYPE;
```

```
bas_subtype_pkg.error_msg
```

Input:

```
CREATE OR REPLACE PACKAGE SAD.bas_subtype_pkg IS  
  SUBTYPE func_name IS sad_products_t.func_name%TYPE;  
END bas_subtype_pkg;  
/  
CREATE OR REPLACE PACKAGE BODY SAD.bas_subtype_pkg IS  
BEGIN  
  NULL;  
END bas_subtype_pkg;  
/
```

Output:

```
CREATE OR REPLACE PACKAGE BODY SAD.bas_dml_lookup_pkg IS  
  g_pkg_name CONSTANT VARCHAR2(30) := 'bas_dml_ic_price_rule_pkg' ;  
  g_func_name VARCHAR2(100);  
  
  FUNCTION func_name  
  RETURN VARCHAR2  
  IS  
    l_func_name bas_subtype_pkg.func_name;;  
  BEGIN  
    l_func_name := g_pkg_name || '.' || g_func_name ;  
    RETURN l_func_name ;  
  
  END func_name;
```

```
END bas_dml_lookup_pkg;  
/
```

%ROWTYPE

The package procedure/function contains %ROWTYPE attribute in IN/OUT parameter and this is not supported

Scripts: BAS_DML_SERVIECE_PKG.sql, BAS_LOOKUP_MISC_PKG.sql

INPUT

```
CREATE OR REPLACE PACKAGE BODY "SAD"."BAS_DML_SERVIECE_PKG" IS  
PROCEDURE save_split_ou(pi_split_ou IN split_ou%ROWTYPE,  
po_error_msg OUT VARCHAR2) IS  
---  
BEGIN  
---  
end save_split_ou;  
end BAS_DML_SERVIECE_PKG;
```

OUTPUT

```
CREATE  
OR REPLACE PROCEDURE SAD.BAS_DML_SERVIECE_PKG#save_split_ou ( pi_split_ou IN split_ou%ROWTYPE  
,po_error_msg OUT VARCHAR2 ) IS MIG_PV_VAL_DUMMY_G_FUNC_NAME VARCHAR2 ( 30 ) :=  
MIG_ORA_EXT.MIG_FN_GET_PKG_VARIABLE ( current_schema ( )  
, 'BAS_DML_SERVIECE_PKG'  
, 'g_func_name' ) ::VARCHAR2 ( 30 ) ;  
ex_data_error  
EXCEPTION ;  
ex_prog_error  
EXCEPTION ;  
---  
BEGIN  
---  
END;
```

Input

```
CREATE OR REPLACE PACKAGE BODY SAD.BAS_DML_SERVIECE_PKG IS  
PROCEDURE save_split_ou(pi_split_ou IN split_ou%ROWTYPE,  
po_error_msg OUT VARCHAR2) IS  
BEGIN  
UPDATE split_ou so  
SET so.auto_balance_flag = pi_split_ou.auto_balance_flag,  
so.balance_start_date = pi_split_ou.balance_start_date,  
so.balance_source = pi_split_ou.balance_source  
WHERE so.dept_code = pi_split_ou.dept_code;  
EXCEPTION  
WHEN OTHERS THEN  
po_error_msg := 'Others Exception raise in ' || g_func_name || ' ' ; ||  
SQLERRM;  
END save_split_ou;  
END bas_dml_serviece_pkg;  
/
```

Output

```
CREATE TYPE mig_typ_split_ou AS ...;  
  
CREATE OR REPLACE PROCEDURE SAD.BAS_DML_SERVIECE_PKG#save_split_ou  
( pi_split_ou IN mig_typ_split_ou  
,po_error_msg OUT VARCHAR2 )  
PACKAGE  
IS  
BEGIN
```

```
UPDATE split_ou so
SET so.auto_balance_flag = pi_split_ou.auto_balance_flag
,so.balance_start_date = pi_split_ou.balance_start_date
,so.balance_source = pi_split_ou.balance_source
WHERE so.dept_code = pi_split_ou.dept_code ;

EXCEPTION
WHEN OTHERS THEN
    po_error_msg := 'Others Exception raise in ' || g_func_name || ',' || SQLERRM ;
END ;
/
```

6.9.21 Chinese Character Support

Input-Chinese (

```
create table test11(a int,b int)/*create table test11(a int,b int)*;/
```

Output

```
CREATE TABLE test11 (a INT,b INT)/*create table test11(a int,b int)*;/
```

Input-Chinese)

```
create table test11(a int,b int)/*create table test11(a int,b int)*;/
```

Output

```
CREATE TABLE test11 (a INT,b INT)/*create table test11(a int,b int)*;/
```

Input-Chinese,

```
create table test11(a int,b int)/*create table test11(a int,b int)*;/
```

Output

```
CREATE TABLE test11 (a INT,b INT)/*create table test11(a int,b int)*;/
```

Input-Support Chinese SPACE

```
create table test11(a int,b int)/*create table test11(a int,b int)*;/
```

Output

```
CREATE TABLE test11 (a INT,b INT)/*create table test11(a int,b int)*;/
```

6.10 Netezza Syntax Migration

- **Tables**
 - **Distribution Key**
 - **ORGANIZE ON**
- **PROCEDURE with RETURNS**
 - **Qualifying Language**
 - **Process Compilation Specification**
 - **DECLARE Keyword to Declare the Local Variables**

6.10.1 Tables

Distribution Key

DISTRIBUTE ON (column) should be migrated to DISTRIBUTE BY HASH (column).

Netezza Syntax	Syntax After Migration
<pre>CREATE TABLE N_AG_AMT_H (AG_NO national character varying(50) not null, AG_CATEG_CD national character varying(12) not null, AMT_TYPE_CD national character varying(12) not null, DATA_START_DT date not null, CCY_CD national character varying(3) not null, DATA_END_DT date) DISTRIBUTE ON (AG_NO, AG_CATEG_CD, AMT_TYPE_CD) ORGANIZE ON (AG_CATEG_CD, AMT_TYPE_CD, DATA_END_DT) ;</pre>	<pre>CREATE TABLE N_AG_AMT_H (AG_NO national character varying(50) not null, AG_CATEG_CD national character varying(12) not null, AMT_TYPE_CD national character varying(12) not null, DATA_START_DT date not null, CCY_CD national character varying(3) not null, DATA_END_DT date) WITH(ORIENTATION=COLUMN) DISTRIBUTE BY HASH (AG_NO, AG_CATEG_CD, AMT_TYPE_CD) /* ORGANIZE ON (AG_CATEG_CD, AMT_TYPE_CD, DATA_END_DT) */ ;</pre>

ORGANIZE ON

ORGANIZE ON will be commented out.

Netezza Syntax	Syntax After Migration
<pre>CREATE TABLE N_AG_AMT_H (AG_NO national character varying(50) not null, AG_CATEG_CD national character varying(12) not null, AMT_TYPE_CD national character varying(12) not null, DATA_START_DT date not null, CCY_CD national character varying(3) not null, DATA_END_DT date) DISTRIBUTE ON (AG_NO, AG_CATEG_CD, AMT_TYPE_CD) ORGANIZE ON (AG_CATEG_CD, AMT_TYPE_CD, DATA_END_DT) ;</pre>	<pre>CREATE TABLE N_AG_AMT_H (AG_NO national character varying(50) not null, AG_CATEG_CD national character varying(12) not null, AMT_TYPE_CD national character varying(12) not null, DATA_START_DT date not null, CCY_CD national character varying(3) not null, DATA_END_DT date) WITH(ORIENTATION=COLUMN) DISTRIBUTE BY HASH (AG_NO, AG_CATEG_CD, AMT_TYPE_CD) /* ORGANIZE ON (AG_CATEG_CD, AMT_TYPE_CD, DATA_END_DT)*/ ;</pre>

Large Field Type

The row-store supports BLOB and CLOB. Column storage does not support BLOB, but it supports CLOB.

Netezza Syntax	Syntax After Migration
<pre>CREATE TABLE prod (prod_no number(6) not null, prod_name national character varying(32) not null, prod_desc clob, prod_image blob) DISTRIBUTE ON (prod_no, prod_name) ORGANIZE ON (prod_no, prod_name) ;</pre>	<pre>CREATE TABLE prod (prod_no number(6) not null, prod_name national character varying(32) not null, prod_desc clob, prod_image bytea) WITH(ORIENTATION=COLUMN) DISTRIBUTE BY HASH (prod_no, prod_name) /* ORGANIZE ON (prod_no, prod_name) */ ;</pre>

6.10.2 PROCEDURE with RETURNS

PROCEDURE with RETURNS will be modified to FUNCTION with RETURN.

Netezza Syntax	Syntax After Migration
<pre>CREATE OR REPLACE PROCEDURE "DWDB"."EDW"."SP_O_HXYW_LNSACCTINFO_H"(C HARACTER VARYING(8)) RETURNS INTEGER LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE V_PAR_DAY ALIAS for \$1; V_PRCNAME NVARCHAR(50):= 'SP_O_HXYW_LNSACCTINFO_H'; V_CNT INTEGER; V_STEP_INFO NVARCHAR(500); D_TIME_START TIMESTAMP:= CURRENT_TIMESTAMP; O_RETURN INTEGER; BEGIN O_RETURN := 0; --Writes logs and starts the recording process. CALL SP_LOG_EXEC(V_PRCNAME,V_PAR_DAY,D_TIME_ST ART,0,0,'The process running ',' '); V_STEP_INFO := '1.Initialization'; BEGIN --1.1 SELECT COUNT(*) INTO V_CNT FROM information_schema.columns WHERE TABLE_NAME='TMPO_HXYW_LNSACCTINFO_H1'; if V_CNT>0 then EXECUTE IMMEDIATE 'DROP TABLE TMPO_HXYW_LNSACCTINFO_H1'; end if; END; RETURN O_RETURN; END; END_PROC;</pre>	<pre>CREATE OR REPLACE FUNCTION "EDW"."SP_O_HXYW_LNSACCTINFO_H"(CHARACT ER VARYING(8)) RETURN INTEGER AS V_PAR_DAY ALIAS for \$1; V_PRCNAME NCHAR VARYING(50):= 'SP_O_HXYW_LNSACCTINFO_H'; V_CNT INTEGER; V_STEP_INFO NCHAR VARYING(500); D_TIME_START TIMESTAMP:= CURRENT_TIMESTAMP; O_RETURN INTEGER; BEGIN O_RETURN := 0; /* Writes logs and starts the recording process. */ SP_LOG_EXEC(V_PRCNAME,V_PAR_DAY,D_TIME_ST ART,0,0,'The process running',' '); V_STEP_INFO := '1.Initialization'; BEGIN /* 1.1 */ SELECT COUNT(*) INTO V_CNT FROM information_schema.columns WHERE TABLE_NAME=lower('TMPO_HXYW_LNSACCTINFO _H1'); if V_CNT>0 then EXECUTE IMMEDIATE 'DROP TABLE TMPO_HXYW_LNSACCTINFO_H1'; end if; END; RETURN O_RETURN; END; /</pre>

Qualifying Language

Migrate the nzplSQL language to the plpgSQL language or delete the language.

Netezza Syntax	Syntax After Migration
<pre>CREATE OR REPLACE PROCEDURE "DWDB"."EDW"."SP_O_HXYW_LNSACCTINFO_H"(C HARACTER VARYING(8)) RETURNS INTEGER LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE V_PAR_DAY ALIAS for \$1; V_PRCNAME NVARCHAR(50):= 'SP_O_HXYW_LNSACCTINFO_H'; V_CNT INTEGER; V_STEP_INFO NVARCHAR(500); D_TIME_START TIMESTAMP:= CURRENT_TIMESTAMP; O_RETURN INTEGER; BEGIN O_RETURN := 0; --Writes logs and starts the recording process. CALL SP_LOG_EXEC(V_PRCNAME,V_PAR_DAY,D_TIME_ST ART,0,0,'The process running ',' '); V_STEP_INFO := '1.Initialization'; BEGIN --1.1 SELECT COUNT(*) INTO V_CNT FROM information_schema.columns WHERE TABLE_NAME='TMPO_HXYW_LNSACCTINFO_H1'; if V_CNT>0 then EXECUTE IMMEDIATE 'DROP TABLE TMPO_HXYW_LNSACCTINFO_H1'; end if; END; RETURN O_RETURN; END; END_PROC;</pre>	<pre>CREATE OR REPLACE FUNCTION "EDW"."SP_O_HXYW_LNSACCTINFO_H"(CHARACT ER VARYING(8)) RETURN INTEGER AS V_PAR_DAY ALIAS for \$1; V_PRCNAME NCHAR VARYING(50):= 'SP_O_HXYW_LNSACCTINFO_H'; V_CNT INTEGER; V_STEP_INFO NCHAR VARYING(500); D_TIME_START TIMESTAMP:= CURRENT_TIMESTAMP; O_RETURN INTEGER; BEGIN O_RETURN := 0; /* Writes logs and starts the recording process. */ SP_LOG_EXEC(V_PRCNAME,V_PAR_DAY,D_TIME_ST ART,0,0,'The process running',' '); V_STEP_INFO := '1.Initialization'; BEGIN /* 1.1 */ SELECT COUNT(*) INTO V_CNT FROM information_schema.columns WHERE TABLE_NAME=lower('TMPO_HXYW_LNSACCTINFO _H1'); if V_CNT>0 then EXECUTE IMMEDIATE 'DROP TABLE TMPO_HXYW_LNSACCTINFO_H1'; end if; END; RETURN O_RETURN; END; /</pre>

Process Compilation Specification

The process which is started with **Begin_PROC** and ended with **END_PROC** should be removed.

Netezza Syntax	Syntax After Migration
<pre> CREATE OR REPLACE PROCEDURE "DWDB"."EDW"."SP_O_HXYW_LNSACCTINFO_H"(C HARACTER VARYING(8)) RETURNS INTEGER LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE V_PAR_DAY ALIAS for \$1; V_PRCNAME NVARCHAR(50):= 'SP_O_HXYW_LNSACCTINFO_H'; V_CNT INTEGER; V_STEP_INFO NVARCHAR(500); D_TIME_START TIMESTAMP:= CURRENT_TIMESTAMP; O_RETURN INTEGER; BEGIN O_RETURN := 0; --Writes logs and starts the recording process. CALL SP_LOG_EXEC(V_PRCNAME,V_PAR_DAY,D_TIME_ST ART,0,0,'The process running ',' '); V_STEP_INFO := '1.Initialization'; BEGIN --1.1 SELECT COUNT(*) INTO V_CNT FROM information_schema.columns WHERE TABLE_NAME='TMPO_HXYW_LNSACCTINFO_H1'; if V_CNT>0 then EXECUTE IMMEDIATE 'DROP TABLE TMPO_HXYW_LNSACCTINFO_H1'; end if; END; RETURN O_RETURN; END; END_PROC; </pre>	<pre> CREATE OR REPLACE FUNCTION "EDW"."SP_O_HXYW_LNSACCTINFO_H"(CHARACT ER VARYING(8)) RETURN INTEGER AS V_PAR_DAY ALIAS for \$1; V_PRCNAME NCHAR VARYING(50):= 'SP_O_HXYW_LNSACCTINFO_H'; V_CNT INTEGER; V_STEP_INFO NCHAR VARYING(500); D_TIME_START TIMESTAMP:= CURRENT_TIMESTAMP; O_RETURN INTEGER; BEGIN O_RETURN := 0; /* Writes logs and starts the recording process. */ SP_LOG_EXEC(V_PRCNAME,V_PAR_DAY,D_TIME_ST ART,0,0,'The process running',' '); V_STEP_INFO := '1.Initialization'; BEGIN /* 1.1 */ SELECT COUNT(*) INTO V_CNT FROM information_schema.columns WHERE TABLE_NAME=lower('TMPO_HXYW_LNSACCTINFO _H1'); if V_CNT>0 then EXECUTE IMMEDIATE 'DROP TABLE TMPO_HXYW_LNSACCTINFO_H1'; end if; END; RETURN O_RETURN; END; / </pre>

DECLARE Keyword to Declare the Local Variables

DECLARE should be modified to AS.

Netezza Syntax	Syntax After Migration
<pre> CREATE OR REPLACE PROCEDURE "DWDB"."EDW"."SP_O_HXYW_LNSACCTINFO_H"(C HARACTER VARYING(8)) RETURNS INTEGER LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE V_PAR_DAY ALIAS for \$1; V_PRCNAME NVARCHAR(50):= 'SP_O_HXYW_LNSACCTINFO_H'; V_CNT INTEGER; V_STEP_INFO NVARCHAR(500); D_TIME_START TIMESTAMP:= CURRENT_TIMESTAMP; O_RETURN INTEGER; BEGIN O_RETURN := 0; --Writes logs and starts the recording process. CALL SP_LOG_EXEC(V_PRCNAME,V_PAR_DAY,D_TIME_ST ART,0,0,'The process running ',' '); V_STEP_INFO := '1.Initialization'; BEGIN --1.1 SELECT COUNT(*) INTO V_CNT FROM information_schema.columns WHERE TABLE_NAME='TMPO_HXYW_LNSACCTINFO_H1'; if V_CNT>0 then EXECUTE IMMEDIATE 'DROP TABLE TMPO_HXYW_LNSACCTINFO_H1'; end if; END; RETURN O_RETURN; END; END_PROC; </pre>	<pre> CREATE OR REPLACE FUNCTION "EDW"."SP_O_HXYW_LNSACCTINFO_H"(CHARACT ER VARYING(8)) RETURN INTEGER AS V_PAR_DAY ALIAS for \$1; V_PRCNAME NCHAR VARYING(50):= 'SP_O_HXYW_LNSACCTINFO_H'; V_CNT INTEGER; V_STEP_INFO NCHAR VARYING(500); D_TIME_START TIMESTAMP:= CURRENT_TIMESTAMP; O_RETURN INTEGER; BEGIN O_RETURN := 0; /* Writes logs and starts the recording process. */ SP_LOG_EXEC(V_PRCNAME,V_PAR_DAY,D_TIME_ST ART,0,0,'The process running',' '); V_STEP_INFO := '1.Initialization'; BEGIN /* 1.1 */ SELECT COUNT(*) INTO V_CNT FROM information_schema.columns WHERE TABLE_NAME=lower('TMPO_HXYW_LNSACCTINFO _H1'); if V_CNT>0 then EXECUTE IMMEDIATE 'DROP TABLE TMPO_HXYW_LNSACCTINFO_H1'; end if; END; RETURN O_RETURN; END; / </pre>

6.10.3 Procedure

Variable Data Type

NVARCHAR changed to NCHAR VARYING.

Netezza Syntax	Syntax After Migration
<pre>CREATE OR REPLACE PROCEDURE "NTZDB"."EDW"."SP_NTZ_NVARCHAR" (CHARACTER VARYING(8)) RETURNS INTEGER LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE V_PAR_DAY ALIAS for \$1; V_PRCNAME NVARCHAR(50):= 'SP_O_HXYW_LNSACCTINFO_H'; V_CNT INTEGER; V_STEP_INFO NVARCHAR(500); D_TIME_START TIMESTAMP:= CURRENT_TIMESTAMP; O_RETURN INTEGER; BEGIN O_RETURN := 0; --Writes logs and starts the recording process. CALL SP_LOG_EXEC(V_PRCNAME,V_PAR_DAY,D_TIME_ST ART,0,0,'The process running ',' '); V_STEP_INFO := '1.Initialization'; RETURN O_RETURN; END; END_PROC;</pre>	<pre>CREATE OR REPLACE FUNCTION "EDW"."SP_NTZ_NVARCHAR" (CHARACTER VARYING(8)) RETURN INTEGER AS V_PAR_DAY ALIAS for \$1; V_PRCNAME NCHAR VARYING(50):= 'SP_O_HXYW_LNSACCTINFO_H'; V_CNT INTEGER; V_STEP_INFO NCHAR VARYING(500); D_TIME_START TIMESTAMP:= CURRENT_TIMESTAMP; O_RETURN INTEGER; BEGIN O_RETURN := 0; /* Writes logs and starts the recording process. */ SP_LOG_EXEC(V_PRCNAME,V_PAR_DAY,D_TIME_ST ART,0,0,'The process running',' '); V_STEP_INFO := '1.Initialization'; RETURN O_RETURN; END; /</pre>

row counts

The **row_count** function is supported for affected row counting.

Netezza Syntax	Syntax After Migration
<pre>CREATE OR REPLACE PROCEDURE "NTZDB"."EDW"."SP_NTZ_ROWCOUNT" (CHARACTER VARYING(8)) RETURNS INTEGER LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE V_PAR_DAY ALIAS for \$1; O_RETURN INTEGER; BEGIN O_RETURN := 0; EXECUTE IMMEDIATE 'INSERT INTO TMPO_HXYW_LNSACCTINFO_H1 (ACCTNO, ACCTYPE, SUBCTRLCODE, CCY, NAME) SELECT ACCTNO, ACCTYPE, SUBCTRLCODE, CCY, NAME FROM O_HXYW_LNSACCTINFO T WHERE NOT EXISTS (SELECT 1 FROM O_HXYW_LNSACCT T1 WHERE T1.DATA_START_DT<=" V_PAR_DAY "' AND T.MD5_VAL=T1.MD5_VAL)'; O_RETURN := ROW_COUNT; RETURN O_RETURN; END; END_PROC;</pre>	<pre>CREATE OR REPLACE FUNCTION "EDW"."SP_NTZ_ROWCOUNT" (CHARACTER VARYING(8)) RETURN INTEGER AS V_PAR_DAY ALIAS for \$1; O_RETURN INTEGER; BEGIN O_RETURN := 0; EXECUTE IMMEDIATE 'INSERT INTO TMPO_HXYW_LNSACCTINFO_H1 (ACCTNO, ACCTYPE, SUBCTRLCODE, CCY, NAME) SELECT ACCTNO, ACCTYPE, SUBCTRLCODE, CCY, NAME FROM O_HXYW_LNSACCTINFO T WHERE NOT EXISTS (SELECT 1 FROM O_HXYW_LNSACCT T1 WHERE T1.DATA_START_DT<=" V_PAR_DAY "' AND T.MD5_VAL=T1.MD5_VAL)'; O_RETURN := SQL%ROWCOUNT; RETURN O_RETURN; END; /</pre>

 NOTE

ROW_COUNT identifies the number of rows associated with the previous SQL statement. If the previous SQL statement is a DELETE, INSERT, or UPDATE statement, ROW_COUNT identifies the number of rows that qualified for the operation.

System Tables

System **tables _V_SYS_COLUMNS** is replaced with **information_schema.columns**.

Netezza Syntax	Syntax After Migration
<pre>BEGIN SELECT COUNT(*) INTO V_CNT FROM _V_SYS_COLUMNS WHERE table_schem = 'SCOTT' AND TABLE_NAME='TMPO_HXYW_LNSACCTINFO_H1'; if V_CNT>0 then EXECUTE IMMEDIATE 'DROP TABLE TMPO_HXYW_LNSACCTINFO_H1'; end if; END;</pre>	<pre>BEGIN SELECT COUNT(*) INTO V_CNT FROM information_schema.columns WHERE table_schem = lower('SCOTT') AND table_name = lower('TMPO_HXYW_LNSACCTINFO_H1'); if V_CNT>0 then EXECUTE IMMEDIATE 'DROP TABLE TMPO_HXYW_LNSACCTINFO_H1'; end if; END;</pre>

 **NOTE**

Column mapping:

- table_schem => table_schema
- table_name => table_name
- column_name => column_name
- ordinal_position => ordinal_position
- type_name => data_type
- is_nullable => is_nullable

For date subtraction, the corresponding Integer should be returned

Return value should be integer for date subtraction.

Netezza Syntax	Syntax After Migration
<pre>SELECT CAST(T1.Buyback_Mature_Dt - CAST('\$ {gsTXDate}' AS DATE) AS CHAR(5)) FROM tab1 T1 WHERE T1.col1 > 10; ----- SELECT CURRENT_DATE - DATE '2019-03-30';</pre>	<pre>SELECT CAST(EXTRACT('DAY' FROM (T1.Buyback_Mature_Dt - CAST('\${gsTXDate}' AS DATE))) AS CHAR(5)) FROM tab1 T1 WHERE T1.col1 > 10; ----- SELECT EXTRACT('DAY' FROM (CURRENT_DATE - CAST('2019-03-30' AS DATE)));</pre>

Support of TRANSLATE Function

The SQL TRANSLATE() function replaces a sequence of characters in a string with another sequence of characters. The function replaces a single character at a time.

Netezza Syntax	Syntax After Migration
<pre>TRANSLATE(param1) TRANSLATE(1st param, 2nd param, 3rd param) TRANSLATE(1st param, 2nd param, 3rd param, 4th param)</pre>	<pre>UPPER(param1) TRANSLATE(1st param, 3rd param, RPAD(2nd param, LENGTH(3rd param), ' ')) TRANSLATE(1st param, 3rd param, RPAD(2nd param, LENGTH(3rd param), 4th param))</pre>

 **NOTE**

If it contains a single parameter, just excute the UPPER.

UPPER(param1)

If it contains two parameters, throw error.

If it contains three parameters, TRANSLATE(1st param, 3rd param, RPAD(2nd param, LENGTH(3rd param), ' ')).

If it contains four parameters, TRANSLATE(1st param, 3rd param, RPAD(2nd param, LENGTH(3rd param), 4th param)).

Data Type

NATIONAL CHARACTER VARYING (ANY)

Netezza Syntax	Syntax After Migration
<pre>CREATE OR REPLACE PROCEDURE sp_ntz_nchar_with_any (NATIONAL CHARACTER VARYING(10) , NATIONAL CHARACTER VARYING(ANY)) RETURN NATIONAL CHARACTER VARYING(ANY) LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE I_LOAD_DT ALIAS FOR \$1 ; -- ETL Date V_TASK_ID ALIAS FOR \$2 ; BEGIN RETURN I_LOAD_DT ',' V_TASK_ID; END; END_PROC;</pre>	<pre>CREATE OR REPLACE FUNCTION sp_ntz_nchar_with_any (NATIONAL CHARACTER VARYING(10) , NATIONAL CHARACTER VARYING) RETURN NATIONAL CHARACTER VARYING AS I_LOAD_DT ALIAS FOR \$1 ; /* ETL Date */ V_TASK_ID ALIAS FOR \$2 ; BEGIN RETURN I_LOAD_DT ',' V_TASK_ID; END; /</pre>

CHARACTER VARYING (ANY)

Netezza Syntax	Syntax After Migration
<pre>CREATE OR REPLACE PROCEDURE sp_ntz_char_with_any (NATIONAL CHARACTER VARYING(10) , CHARACTER VARYING(ANY)) RETURN CHARACTER VARYING(ANY) LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE I_LOAD_DT ALIAS FOR \$1 ; -- ETL Date V_TASK_ID ALIAS FOR \$2 ; BEGIN RETURN I_LOAD_DT ',' V_TASK_ID; END; END_PROC;</pre>	<pre>CREATE OR REPLACE FUNCTION sp_ntz_char_with_any (NATIONAL CHARACTER VARYING(10) , CHARACTER VARYING) RETURN CHARACTER VARYING AS I_LOAD_DT ALIAS FOR \$1 ; /* ETL Date */ V_TASK_ID ALIAS FOR \$2 ; BEGIN RETURN I_LOAD_DT ',' V_TASK_ID; END; /</pre>

Numeric (ANY)

Netezza Syntax	Syntax After Migration
<pre>CREATE or replace PROCEDURE sp_ntz_numeric_with_any (NUMERIC(ANY) , NUMERIC(ANY)) RETURNS NATIONAL CHARACTER VARYING(ANY) LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE ERROR_INFO NVARCHAR(2000) := ''; V_VC_YCBZ NVARCHAR(1) := 'N'; V_VC_SUCCESS NVARCHAR(10) := 'SUCCESS'; p_L_begindate ALIAS FOR \$1; p_L_enddate ALIAS FOR \$2; BEGIN ERROR_INFO := CRHSP_CRH_ETL_EXCHDATE(p_L_begindate,p_L_end date); if ERROR_INFO != V_VC_SUCCESS then V_VC_YCBZ := 'C'; end if; RETURN V_VC_SUCCESS; END; END_PROC;</pre>	<pre>CREATE or replace FUNCTION sp_ntz_numeric_with_any (NUMERIC , NUMERIC) RETURN NATIONAL CHARACTER VARYING AS ERROR_INFO NCHAR VARYING(2000) := ''; V_VC_YCBZ NCHAR VARYING(1) := 'N'; V_VC_SUCCESS NCHAR VARYING(10) := 'SUCCESS'; p_L_begindate ALIAS FOR \$1; p_L_enddate ALIAS FOR \$2; BEGIN ERROR_INFO := CRHSP_CRH_ETL_EXCHDATE(p_L_begindate,p_L_end date); if ERROR_INFO != V_VC_SUCCESS then V_VC_YCBZ := 'C'; end if; RETURN V_VC_SUCCESS; END; /</pre>

Exception

TRANSACTION_ABORTED

Netezza Syntax	Syntax After Migration
<pre>CREATE OR REPLACE PROCEDURE sp_ntz_transaction_aborted (NUMERIC(ANY) , NUMERIC(ANY)) RETURNS NATIONAL CHARACTER VARYING(ANY) LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE ERROR_INFO NVARCHAR(2000) := ""; p_l_begindate ALIAS FOR \$1; p_l_enddate ALIAS FOR \$2; BEGIN ERROR_INFO := CRHSP_CRH_ETL_EXCHDATE(p_l_begindate,p_l_end date); RETURN ERROR_INFO; EXCEPTION WHEN TRANSACTION_ABORTED THEN ROLLBACK; BEGIN ERROR_INFO := SQLERRM ' sp_o_transaction_aborted:'; RETURN ERROR_INFO; END; WHEN OTHERS THEN BEGIN ERROR_INFO := SQLERRM ' sp_o_transaction_aborted:'; RETURN ERROR_INFO; END; END; END_PROC;</pre>	<pre>CREATE or replace FUNCTION sp_ntz_transaction_aborted (NUMERIC , NUMERIC) RETURN NATIONAL CHARACTER VARYING AS ERROR_INFO NCHAR VARYING(2000) := ""; p_l_begindate ALIAS FOR \$1; p_l_enddate ALIAS FOR \$2; BEGIN ERROR_INFO := CRHSP_CRH_ETL_EXCHDATE(p_l_begindate,p_l_end date); RETURN ERROR_INFO; EXCEPTION WHEN INVALID_TRANSACTION_TERMINATION THEN ROLLBACK; BEGIN ERROR_INFO := SQLERRM ' sp_o_transaction_aborted:'; RETURN ERROR_INFO; END; WHEN OTHERS THEN BEGIN ERROR_INFO := SQLERRM ' sp_o_transaction_aborted:'; RETURN ERROR_INFO; END; END; /</pre>

END statement is specified without semicolon (;)

END statement specified without semicolon (;) is migrated as follows:

END /

Netezza Syntax	Syntax After Migration
<pre>CREATE or replace PROCEDURE sp_ntz_end_wo_semicolon (NATIONAL CHARACTER VARYING(10)) RETURNS CHARACTER VARYING(ANY) LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE v_B64 Varchar(64) := 'ABCDEFGHIIKLMNOPQR- STUVWXYZabcdefghijklmnopqrstuvw- xyz0123456789+!'; v_I int := 0; v_J int := 0; v_K int := 0; v_N int := 0; v_out Numeric(38,0) := 0; I_LOAD_DT ALIAS FOR \$1; BEGIN v_N:=Length(v_B64); FOR v_I In Reverse 1..Length(IN_base64) LOOP v_J:=Instr(v_B64,Substr(IN_base64,v_I,1))-1; If v_J <0 Then RETURN -1; End If; V_Out:=V_Out+v_J*(v_N**v_K); v_K:=v_K+1; END LOOP; RETURN V_Out; END END_PROC;</pre>	<pre>CREATE or replace FUNCTION sp_ntz_end_wo_semicolon (NATIONAL CHARACTER VARYING(10)) RETURN CHARACTER VARYING AS v_B64 Varchar(64) := 'ABCDEFGHIIKLMNOPQR- STUVWXYZabcdefghijklmnopqrstuvw- xyz0123456789+!'; v_I int := 0; v_J int := 0; v_K int := 0; v_N int := 0; v_out Numeric(38,0) := 0; I_LOAD_DT ALIAS FOR \$1; BEGIN v_N:=Length(v_B64); FOR v_I In Reverse 1..Length(IN_base64) LOOP v_J:=Instr(v_B64,Substr(IN_base64,v_I,1))-1; If v_J <0 Then RETURN -1; End If; V_Out:=V_Out+v_J*(v_N**v_K); v_K:=v_K+1; END LOOP; RETURN V_Out; END; /</pre>

LOOP

Netezza Syntax	Syntax After Migration
<pre>CREATE OR REPLACE PROCEDURE sp_ntz_for_loop_with_more_dots (INTEGER) RETURNS CHARACTER VARYING(ANY) LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE p_abc INTEGER; p_bcd INTEGER; p_var1 ALIAS FOR \$1; BEGIN p_bcd := ISNULL(p_var1, 10); RAISE NOTICE 'p_bcd=%', p_bcd; FOR p_abc IN 0...(p_bcd) LOOP RAISE NOTICE 'hello world %', p_abc; END LOOP; END; END_PROC;</pre>	<pre>CREATE OR replace FUNCTION sp_ntz_for_loop_with_more_dots (INTEGER) RETURN CHARACTER VARYING AS p_abc INTEGER ; p_bcd INTEGER; p_var1 ALIAS FOR \$1; BEGIN p_bcd := NVL(p_var1, 10); RAISE NOTICE 'p_bcd=%', p_bcd; FOR p_abc IN 0...(p_bcd) LOOP RAISE NOTICE 'hello world %', p_abc; END LOOP; END; /</pre>

Gauss keyword

CURSOR

Netezza Syntax	Syntax After Migration
<pre>CREATE OR REPLACE PROCEDURE sp_ntz_keyword_cursor() RETURNS INTEGER LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE tablename NVARCHAR(100); cursor RECORD; BEGIN FOR cursor IN SELECT t.TABLENAME FROM _V_TABLE t WHERE TABLENAME LIKE 'T_ODS_CRM%' LOOP tablename := cursor.TABLENAME; END LOOP; END; END_PROC;</pre>	<pre>CREATE OR REPLACE FUNCTION sp_ntz_keyword_cursor() RETURN INTEGER AS tablename NCHAR VARYING(100); mig_cursor RECORD; BEGIN FOR mig_cursor IN (SELECT t.TABLENAME FROM _V_TABLE t WHERE TABLENAME LIKE 'T_ODS_CRM%') LOOP tablename := mig_cursor.TABLENAME; END LOOP; END; /</pre>

DECLARE

Netezza Syntax	Syntax After Migration
<pre> CREATE OR REPLACE PROCEDURE sp_ntz_declare_inside_begin (NATIONAL CHARACTER VARYING(10)) RETURNS INTEGER LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE I_LOAD_DT ALIAS FOR \$1; BEGIN DECLARE MYCUR RECORD; VIEWSQL1 NVARCHAR(4000); BEGIN FOR MYCUR IN (SELECT VIEWNAME,VIEWSQL FROM T_DDW_AUTO_F5_VIEW_DEFINE WHERE OWNER = 'ODS_PROD') LOOP VIEWSQL1 := MYCUR.VIEWSQL; WHILE INSTR(VIEWSQL1,'v_p_etldate') > 0 LOOP VIEWSQL1 := SUBSTR(VIEWSQL1,1,INSTR(VIEWSQL1,'v_p_etldat e') - 1) '' I_LOAD_DT '' SUBSTR(VIEWSQL1,INSTR(VIEWSQL1,'v_p_etldate') + 11); END LOOP; EXECUTE IMMEDIATE VIEWSQL1; END LOOP; END; RETURN 0; END; END_PROC; </pre>	<pre> CREATE OR REPLACE FUNCTION sp_ntz_declare_inside_begin (NATIONAL CHARACTER VARYING(10)) RETURN INTEGER AS I_LOAD_DT ALIAS FOR \$1; BEGIN DECLARE MYCUR RECORD; VIEWSQL1 NCHAR VARYING(4000); BEGIN FOR MYCUR IN (SELECT VIEWNAME,VIEWSQL FROM T_DDW_AUTO_F5_VIEW_DEFINE WHERE OWNER = 'ODS_PROD') LOOP VIEWSQL1 := MYCUR.VIEWSQL; WHILE INSTR(VIEWSQL1,'v_p_etldate') > 0 LOOP VIEWSQL1 := SUBSTR(VIEWSQL1,1,INSTR(VIEWSQL1,'v_p_etldat e') - 1) '' I_LOAD_DT '' SUBSTR(VIEWSQL1,INSTR(VIEWSQL1,'v_p_etldate') + 11); END LOOP; EXECUTE IMMEDIATE VIEWSQL1; END LOOP; END; RETURN 0; END; / </pre>

EXECUTE AS CALLER

Netezza Syntax	Syntax After Migration
<pre>CREATE or replace PROCEDURE sp_ntz_exec_as_caller (CHARACTER VARYING(512)) RETURNS INTEGER LANGUAGE NZPLSQL EXECUTE AS CALLER AS BEGIN_PROC DECLARE SQL ALIAS FOR \$1; BEGIN EXECUTE IMMEDIATE SQL; RETURN 0; END; END_PROC; ----- CREATE or replace PROCEDURE sp_ntz_exec_as_owner (CHARACTER VARYING(512)) RETURNS INTEGER LANGUAGE NZPLSQL EXECUTE AS OWNER AS BEGIN_PROC DECLARE SQL ALIAS FOR \$1; BEGIN EXECUTE IMMEDIATE SQL; RETURN 0; END; END_PROC;</pre>	<pre>CREATE OR REPLACE FUNCTION sp_ntz_exec_as_caller (CHARACTER VARYING(512)) RETURN INTEGER SECURITY INVOKER AS SQL ALIAS FOR \$1; BEGIN EXECUTE IMMEDIATE SQL; RETURN 0; END; / ----- CREATE OR REPLACE FUNCTION sp_ntz_exec_as_owner (CHARACTER VARYING(512)) RETURN INTEGER SECURITY DEFINER AS SQL ALIAS FOR \$1; BEGIN EXECUTE IMMEDIATE SQL; RETURN 0; END; /</pre>

Expression

SELECT result assign into variable.

Netezza Syntax	Syntax After Migration
<pre>CREATE OR REPLACE PROCEDURE sp_sel_res_to_var (NATIONAL CHARACTER VARYING(10)) RETURNS CHARACTER VARYING(ANY) LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE counts INTEGER := 0 ; I_LOAD_DT ALIAS FOR \$1 ; BEGIN COUNTS := SELECT COUNT(*) FROM tb_sel_res_to_var WHERE ETLDATE = I_LOAD_DT; EXECUTE IMMEDIATE 'insert into TABLES_COUNTS values("tb_sel_res_to_var", "" I_LOAD_DT "", ' COUNTS ')'; RETURN '0' ; END; END_PROC;</pre>	<pre>CREATE OR REPLACE FUNCTION sp_sel_res_to_var (NATIONAL CHARACTER VARYING(10)) RETURN CHARACTER VARYING AS counts INTEGER := 0 ; I_LOAD_DT ALIAS FOR \$1 ; BEGIN SELECT COUNT(*) INTO COUNTS FROM tb_sel_res_to_var WHERE ETLDATE = I_LOAD_DT; EXECUTE IMMEDIATE 'insert into TABLES_COUNTS values("tb_sel_res_to_var", "" I_LOAD_DT "", ' COUNTS ')'; RETURN '0' ; END; /</pre>

6.10.4 System Functions

ISNULL()

Netezza Syntax	Syntax After Migration
<pre>SELECT A.ETL_DATE, A.BRANCH_CODE, A.CUST_NO , ISNULL (B.RES_STOCK,0) AS RES_STOCK , ISNULL (B.ZY_VOL ,0) AS ZY_VOL , ISNULL (B.ZJ_VOL,0) AS ZJ_VOL FROM tab123;</pre>	<pre>SELECT A.ETL_DATE, A.BRANCH_CODE, A.CUST_NO , NVL (B.RES_STOCK,0) AS RES_STOCK , NVL (B.ZY_VOL ,0) AS ZY_VOL , NVL (B.ZJ_VOL,0) AS ZJ_VOL FROM tab123;</pre>

NVL

Second parameter is missing.

Netezza Syntax	Syntax After Migration
<pre>SELECT NVL(SUM(A3.DA_CPTL_BAL_YEAR) / NULLIF(V_YEAR_DAYS, 0)) AS CPTL_BAL_AVE_YR , NVL(NVL(SUM (CASE WHEN A3.OPENACT_DT >= V_YEAR_START THEN A3.DA_CPTL_BAL_YEAR END) / NULLIF(V_YEAR_DAYS, 0)), 0) AS CPTL_BAL_AVE_YR_OP , NVL(SUM(A3.DA_CPTL_BAL) / NULLIF(V_YEAR_DAYS, 0)) AS CPTL_BAL_AVE FROM tab1 A3;</pre>	<pre>ELECT NVL(SUM(A3.DA_CPTL_BAL_YEAR) / NULLIF(V_YEAR_DAYS, 0), NULL) AS CPTL_BAL_AVE_YR , NVL(NVL(SUM (CASE WHEN A3.OPENACT_DT >= V_YEAR_START THEN A3.DA_CPTL_BAL_YEAR END) / NULLIF(V_YEAR_DAYS, 0), NULL), 0) AS CPTL_BAL_AVE_YR_OP , NVL(SUM(A3.DA_CPTL_BAL) / NULLIF(V_YEAR_DAYS, 0), NULL) AS CPTL_BAL_AVE FROM tab1 A3;</pre>

DATE

Casting the data type.

Netezza Syntax	Syntax After Migration
<pre>SELECT A1.ETL_DATE, A1.MARKET_CODE , A1.DECLARATION_DT , ROW_NUMBER() OVER(PARTITION BY A1.MARKET_CODE, A1.STOCK_CODE, DATE_PART('YEAR', DATE(A1.DECLARATION_DT)) ORDER BY A1.DECLARATION_DT DESC) AS RN FROM tb_date_type_casting A1;</pre> <pre>SELECT A1.ETL_DATE, A1.MARKET_CODE , A1.DECLARATION_DT , ROW_NUMBER() OVER(PARTITION BY A1.MARKET_CODE, A1.STOCK_CODE, DATE_PART('YEAR', DATE(A1.DECLARATION_DT)) ORDER BY A1.DECLARATION_DT DESC) AS RN FROM tb_date_type_casting A1;</pre>	<pre>SELECT A1.ETL_DATE, A1.MARKET_CODE , A1.DECLARATION_DT , ROW_NUMBER() OVER(PARTITION BY A1.MARKET_CODE, A1.STOCK_CODE, DATE_PART('YEAR', CAST(A1.DECLARATION_DT AS DATE))) ORDER BY A1.DECLARATION_DT DESC) AS RN FROM tb_date_type_casting A1;</pre>

analytic_function

Netezza Syntax	Syntax After Migration
<pre>SELECT COALESCE(NULLIF(GROUP_CONCAT(a.column_name), ''), '*') FROM (SELECT a.column_name FROM tb_ntz_group_concat a WHERE UPPER(a.table_name) = 'EMP' ORDER BY a.column_pos) a; ----- SELECT admin.group_concat(''top' lpad(a.table_name,2,'0') '':{ a.column_name }') topofund_data FROM (SELECT a.table_name, a.column_name FROM tb_ntz_group_concat a WHERE UPPER(a.table_name) = 'EMP' ORDER BY a.column_pos) a;</pre>	<pre>SELECT COALESCE(NULLIF(STRING_AGG(a.column_name, '), ''), '*') FROM (SELECT a.column_name FROM tb_ntz_group_concat a WHERE UPPER(a.table_name) = 'EMP' ORDER BY a.column_pos) a; ----- SELECT STRING_AGG(''top' lpad(a.table_name, 3,'0') '':{ a.column_name }', ',') topofund_data FROM (SELECT a.table_name, a.column_name FROM tb_ntz_group_concat a WHERE UPPER(a.table_name) = 'EMP' ORDER BY a.column_pos) a;</pre>

Stored Procedure

Netezza Syntax	Syntax After Migration
<pre>CREATE OR REPLACE PROCEDURE sp_ntz_proc_call (CHARACTER VARYING(8)) RETURNS INTEGER LANGUAGE NZPLSQL AS BEGIN_PROC DECLARE V_PAR_DAY ALIAS for \$1; V_PRCNAME NVARCHAR(50):= 'SP_O_HXYW_LNSACCTINFO_H'; D_TIME_START TIMESTAMP:= CURRENT_TIMESTAMP; O_RETURN INTEGER; BEGIN O_RETURN := 0; CALL SP_LOG_EXEC(V_PRCNAME,V_PAR_DAY,D_TIME_ST ART,0,0); RETURN O_RETURN; END; END_PROC;</pre>	<pre>CREATE OR REPLACE FUNCTION sp_ntz_proc_call (CHARACTER VARYING(8)) RETURN INTEGER AS V_PAR_DAY ALIAS for \$1; V_PRCNAME NCHAR VARYING(50):= 'SP_O_HXYW_LNSACCTINFO_H'; D_TIME_START TIMESTAMP:= CURRENT_TIMESTAMP; O_RETURN INTEGER; BEGIN O_RETURN := 0; SP_LOG_EXEC(V_PRCNAME,V_PAR_DAY,D_TIME_ST ART,0,0); RETURN O_RETURN; END; /</pre>

6.10.5 Operator

**

Netezza Syntax	Syntax After Migration
<pre>V_Out := V_Out + v_J * (v_N ** v_K);</pre>	<pre>V_Out := V_Out + v_J * (v_N ^ v_K);</pre>

NOTNULL and ISNULL

Netezza Syntax	Syntax After Migration
<pre>CASE WHEN ((A1.EXCEPT_OFF_SEQU_NO NOTNULL) AND (A2.LOG_SEQU_NO ISNULL)) THEN 0 ELSE 1 END AS FLG</pre>	<pre>CASE WHEN ((A1.EXCEPT_OFF_SEQU_NO NOTNULL) AND (A2.LOG_SEQU_NO ISNULL)) THEN 0 ELSE 1 END AS FLG</pre>

6.10.6 DML

Gauss keyword: SOURCE specified as column-alias without AS keyword

Netezza Syntax	Syntax After Migration
<pre>SELECT SUBSTR(OP_SOURCE ,1 ,4) SOURCE , ONLINE_FLAG, 'TRD' AS SRC_SYS , CURRENT_TIMESTAMP AS ETL_LOAD_TIME FROM tb_keyword_source;</pre>	<pre>SELECT SUBSTR(OP_SOURCE ,1 ,4) AS SOURCE , ONLINE_FLAG, 'TRD' AS SRC_SYS , CURRENT_TIMESTAMP AS ETL_LOAD_TIME FROM tb_keyword_source;</pre>

FREEZE

Netezza Syntax	Syntax After Migration
<pre>INSERT INTO tmp_tb_keyword_freeze (BRANCH_CODE, FREEZE, UNFREEZE, BRAN_JYSMD) SELECT BRANCH_CODE, FREEZE, UNFREEZE, BRAN_JYSMD FROM tb_keyword_freeze;</pre>	<pre>INSERT INTO tmp_tb_keyword_freeze (BRANCH_CODE, "FREEZE", UNFREEZE, BRAN_JYSMD) SELECT BRANCH_CODE, "FREEZE", UNFREEZE, BRAN_JYSMD FROM tb_keyword_freeze;</pre>

NOTE

A new configuration parameter "keywords_addressed_using_doublequote" should be introduced with the below value:

```
keywords_addressed_using_doublequote=freeze
```

```
keywords_addressed_using_as=owner,attribute,source,freeze
```

```
create table t12 (c1 int, FREEZE varchar(10)); ==> create table t12 (c1 int, "freeze"
varchar(10));
```

```
select c1, Freeze from t12; ==> select c1, "freeze" from t12;
```

```
select c1 freeze from t12; ==> select c1 as freeze from t12;
```

OWNER (AS should be specified)

Netezza Syntax	Syntax After Migration
<pre>SELECT username owner FROM tb_ntz_keyword_owner;</pre>	<pre>SELECT username AS owner FROM tb_ntz_keyword_owner;</pre>

ATTRIBUTE (AS should be specified)

Netezza Syntax	Syntax After Migration
<pre>SELECT t1.etl_date, substr(t1.attribute,1,1) attribute , t1.cust_no, t1.branch_code FROM (SELECT etl_date,attribute,cust_no,branch_code FROM tb_ntz_keyword_attribute WHERE etl_date = CURRENT_DATE) t1;</pre>	<pre>SELECT t1.etl_date, substr(t1.attribute,1,1) AS attribute , t1.cust_no, t1.branch_code FROM (SELECT etl_date,attribute,cust_no,branch_code FROM tb_ntz_keyword_attribute WHERE etl_date = CURRENT_DATE) t1;</pre>

6.10.7 Index

Unique Index

Netezza Syntax	Syntax After Migration
<pre> CREATE TABLE prod (prod_no number(6) not null unique, prod_name national character varying(32) not null, prod_desc clob) DISTRIBUTE ON (prod_no) ORGANIZE ON (prod_no, prod_name) ; ----- CREATE TABLE prod (prod_no number(6) not null CONSTRAINT UQ_prod unique, prod_name national character varying(32) not null, prod_desc clob) DISTRIBUTE ON (prod_no) ORGANIZE ON (prod_no, prod_name) ; ----- CREATE TABLE prod (prod_no number(6) not null PRIMARY KEY, prod_name national character varying(32) not null, prod_desc clob) DISTRIBUTE ON (prod_no) ORGANIZE ON (prod_no, prod_name) ; ----- CREATE TABLE prod (prod_no number(6) not null, prod_name national character varying(32) not null, prod_desc clob, constraint uq_prod UNIQUE (prod_no)) DISTRIBUTE ON (prod_no) ORGANIZE ON (prod_no, prod_name) ; ----- CREATE TABLE prod (prod_no number(6) not null, prod_name national character varying(32) not null, prod_desc clob) DISTRIBUTE ON (prod_no) ORGANIZE ON (prod_no, prod_name) ; ALTER TABLE prod ADD constraint uq_prod UNIQUE (prod_no); </pre>	<pre> CREATE TABLE prod (prod_no number(6) not null /* unique */, prod_name national character varying(32) not null, prod_desc clob) WITH(ORIENTATION=COLUMN) DISTRIBUTE BY HASH (prod_no) /* ORGANIZE ON (prod_no, prod_name) */ ; ----- CREATE TABLE prod (prod_no number(6) not null /* CONSTRAINT UQ_prod unique */, prod_name national character varying(32) not null, prod_desc clob) WITH(ORIENTATION=COLUMN) DISTRIBUTE BY HASH (prod_no) /* ORGANIZE ON (prod_no, prod_name) */ ; ----- CREATE TABLE prod (prod_no number(6) not null /* PRIMARY KEY */, prod_name national character varying(32) not null, prod_desc clob) WITH(ORIENTATION=COLUMN) DISTRIBUTE BY HASH (prod_no) /* ORGANIZE ON (prod_no, prod_name) */ ; ----- CREATE TABLE prod (prod_no number(6) not null, prod_name national character varying(32) not null, prod_desc clob /*, constraint uq_prod UNIQUE (prod_no) */) WITH(ORIENTATION=COLUMN) DISTRIBUTE BY HASH (prod_no) /* ORGANIZE ON (prod_no, prod_name)*/ ; ----- CREATE TABLE prod (prod_no number(6) not null, prod_name national character varying(32) not null, prod_desc clob) DISTRIBUTE BY HASH (prod_no) /*ORGANIZE ON (prod_no, prod_name)*/ ; /* ALTER TABLE prod ADD constraint uq_prod UNIQUE (prod_no); */ </pre>

 NOTE

This feature is applicable only for COLUMN store. For ROW store, Unique Index should not be commented.

6.11 MySQL Syntax Migration

This section lists the MySQL syntax features supported by the syntax migration tool, and provides the MySQL syntax and the equivalent GaussDB(DWS) syntax for each feature. The syntax listed in this section illustrates the internal logic for migrating MySQL scripts.

This section is also a reference for the database migration team and for the on-site verification of MySQL script migration.

6.11.1 Basic Data Types

Overview

MySQL supports a number of basic data types, including numeric, date/time, string (character), LOB, set, binary, and Boolean types. GaussDB(DWS) does not support some basic MySQL data types, precision settings of some MySQL data types, or some MySQL keywords such as **UNSIGNED** and **ZEROFILL**. DSC performs migration based on GaussDB support.

A data type is a basic data attribute. Occupied storage space and allowed operations vary according to data types. In a database, data is stored in tables, in which a data type is specified for each column. Data in the column must be of its allowed data type. For details of each types description, see [Table 6-20](#)

Table 6-20 Basic description of data types

Data Types	Basic Description
Numeric Types	For details, see Numeric Types .
Date/Time Types	This document describes the following date/time types: DATETIME , TIME , TIMESTAMP , and YEAR . GaussDB(DWS) does not support these types, and DSC will convert them. For details, see Date/Time Types .
String Types	MySQL interprets length specifications in character column definitions in character units. This applies to the CHAR, VARCHAR, and TEXT types. For details, see String Types .
Spatial Data Types	MySQL has spatial data types corresponding to the OpenGIS class. For details, see Spatial Data Types .

Data Types	Basic Description
LOB Types	A BLOB is a binary large object that can hold a variable amount of data. The four BLOB types are TINYBLOB, BLOB, MEDIUMBLOB, and LONGBLOB. The only difference between these four types is the maximum length of the values they can contain. For details, see LOB Types .
Set Types	<ol style="list-style-type: none"> 1. In MySQL, an ENUM is a string object with a value chosen from a list of permitted values that are enumerated explicitly in the column specification at table creation. 2. A SET is a string object that can have zero or more values, each of which must be chosen from a list of permitted values specified when the table is created. For details, see Set Types.
Boolean Types	MySQL supports both BOOL and BOOLEAN. For details, see Boolean Types .
Binary Types	<ol style="list-style-type: none"> 1. In MySQL, the BIT data type is used to store bit values. A type of BIT(<i>M</i>) enables storage of <i>M</i>-bit values. <i>M</i> can range from 1 to 64. 2. MySQL BINARY and VARBINARY types are similar to CHAR and VARCHAR, except that they contain binary strings rather than non-binary strings. For details, see Binary Types.

Numeric Types

Table 6-21 Numeric type mapping

MySQL Numeric Type	MySQL Input	GaussDB(DWS) Output
DEC	DEC DEC[(M[,D])] [UNSIGNED] [ZEROFILL]	DECIMAL DECIMAL[(M[,D])]
DECIMAL	DECIMAL[(M[,D])] [UNSIGNED] [ZEROFILL]	DECIMAL[(M[,D])]
DOUBLE PRECISION	DOUBLE PRECISION DOUBLE PRECISION [(M[,D])] [UNSIGNED] [ZEROFILL]	FLOAT FLOAT[(M)]
DOUBLE	DOUBLE[(M[,D])] [UNSIGNED] [ZEROFILL]	FLOAT[(M)]

MySQL Numeric Type	MySQL Input	GaussDB(DWS) Output
FIXED	FIXED FIXED[(M[,D])] [UNSIGNED] [ZEROFILL]	DECIMAL DECIMAL[(M[,D])]
FLOAT	FLOAT FLOAT [(M[,D])] [UNSIGNED] [ZEROFILL] FLOAT(p) [UNSIGNED] [ZEROFILL]	FLOAT FLOAT[(M)] FLOAT(p)
INT	INT INT(p) [UNSIGNED] [ZEROFILL]	INTEGER INTEGER(p)
INTEGER	INTEGER INTEGER(p) [UNSIGNED] [ZEROFILL]	INTEGER INTEGER(p)
MEDIUMINT	MEDIUMINT MEDIUMINT(p) [UNSIGNED] [ZEROFILL]	INTEGER INTEGER(p)
NUMERIC	NUMERIC NUMERIC [(M[,D])] [UNSIGNED] [ZEROFILL]	DECIMAL DECIMAL[(M[,D])]
REAL	REAL[(M[,D])]	FLOAT[(M)]
SMALLINT	SMALLINT SMALLINT(p) [UNSIGNED] [ZEROFILL]	SMALLINT
TINYINT	TINYINT TINYINT(n) TINYINT(n) ZEROFILL TINYINT(n) UNSIGNED ZEROFILL	TINYINT TINYINT TINYINT SMALLINT

Input: TINYINT

```
CREATE TABLE IF NOT EXISTS `runoob_dataType_test` (
  `dataType_1` TINYINT,
  `dataType_2` TINYINT(0),
  `dataType_3` TINYINT(255),
  `dataType_4` TINYINT(255) UNSIGNED ZEROFILL,
  `dataType_5` TINYINT(255) ZEROFILL
);
```

Output

```
CREATE TABLE "public"."runoob_datatype_test"
(
  "datatype_1" TINYINT,
  "datatype_2" TINYINT,
  "datatype_3" TINYINT,
  "datatype_4" SMALLINT,
  "datatype_5" TINYINT
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype_1");
```

Date/Time Types

Table 6-22 Date/Time type mapping

MySQL Date/Time Type	MySQL Input	GaussDB(DWS) Output
DATETIME	DATETIME[(fsp)]	TIMESTAMP[(fsp)] WITHOUT TIME ZONE
TIME	TIME[(fsp)]	TIME[(fsp)] WITHOUT TIME ZONE
TIMESTAMP	TIMESTAMP[(fsp)]	TIMESTAMP[(fsp)] WITH TIME ZONE
YEAR	YEAR[(4)]	VARCHAR(4)

NOTE

The value of *fsp* must be in the range [0, 6]. Value **0** indicates no decimal. If this parameter is omitted, the default precision will be 0.

Input: DATETIME

```
CREATE TABLE IF NOT EXISTS `runoob_dataType_test`(
  `dataType_1` DATETIME,
  `dataType_2` DATETIME(0),
  `dataType_3` DATETIME(6),
  `dataType_4` DATETIME DEFAULT NULL,
  `dataType_5` DATETIME DEFAULT '2018-10-12 15:27:33.999999'
);
```

Output

```
CREATE TABLE "public"."runoob_datatype_test"
(
  "datatype_1" TIMESTAMP WITHOUT TIME ZONE,
  "datatype_2" TIMESTAMP(0) WITHOUT TIME ZONE,
  "datatype_3" TIMESTAMP(6) WITHOUT TIME ZONE,
  "datatype_4" TIMESTAMP WITHOUT TIME ZONE DEFAULT NULL,
  "datatype_5" TIMESTAMP WITHOUT TIME ZONE DEFAULT '2018-10-12 15:27:33.999999'
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype_1");
```

Input: TIME

```
CREATE TABLE IF NOT EXISTS `runoob_dataType_test` (  
  `dataType_1` TIME DEFAULT '20:58:10',  
  `dataType_2` TIME(3) DEFAULT '20:58:10',  
  `dataType_3` TIME(6) DEFAULT '20:58:10',  
  `dataType_4` TIME(6) DEFAULT '2018-10-11 20:00:00',  
  `dataType_5` TIME(6) DEFAULT '20:58:10.01234',  
  `dataType_6` TIME(6) DEFAULT '2018-10-11 20:00:00.01234',  
  `dataType_7` TIME DEFAULT NULL,  
  `dataType_8` TIME(6) DEFAULT NULL,  
  PRIMARY KEY (dataType_1)  
);
```

Output

```
CREATE TABLE "public"."runoob_datatype_test"  
(  
  "datatype_1" TIME WITHOUT TIME ZONE DEFAULT '20:58:10',  
  "datatype_2" TIME(3) WITHOUT TIME ZONE DEFAULT '20:58:10',  
  "datatype_3" TIME(6) WITHOUT TIME ZONE DEFAULT '20:58:10',  
  "datatype_4" TIME(6) WITHOUT TIME ZONE DEFAULT '2018-10-11 20:00:00',  
  "datatype_5" TIME(6) WITHOUT TIME ZONE DEFAULT '20:58:10.01234',  
  "datatype_6" TIME(6) WITHOUT TIME ZONE DEFAULT '2018-10-11 20:00:00.01234',  
  "datatype_7" TIME WITHOUT TIME ZONE DEFAULT NULL,  
  "datatype_8" TIME(6) WITHOUT TIME ZONE DEFAULT NULL,  
  PRIMARY KEY ("datatype_1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype_1");
```

Input: TIMESTAMP

```
CREATE TABLE IF NOT EXISTS `runoob_dataType_test` (  
  `dataType_1` TIMESTAMP,  
  `dateType_4` TIMESTAMP DEFAULT '2018-10-12 15:27:33',  
  `dateType_5` TIMESTAMP DEFAULT '2018-10-12 15:27:33.999999',  
  `dateType_6` TIMESTAMP DEFAULT '2018-10-12 15:27:33',  
  `dateType_7` TIMESTAMP DEFAULT '2018-10-12 15:27:33',  
  `dataType_8` TIMESTAMP(0) DEFAULT '2018-10-12 15:27:33',  
  `dateType_9` TIMESTAMP(6) DEFAULT '2018-10-12 15:27:33'  
);
```

Output

```
CREATE TABLE "public"."runoob_datatype_test"  
(  
  "datatype_1" TIMESTAMP WITH TIME ZONE,  
  "datatype_4" TIMESTAMP WITH TIME ZONE DEFAULT '2018-10-12 15:27:33',  
  "datatype_5" TIMESTAMP WITH TIME ZONE DEFAULT '2018-10-12 15:27:33.999999',  
  "datatype_6" TIMESTAMP WITH TIME ZONE DEFAULT '2018-10-12 15:27:33',  
  "datatype_7" TIMESTAMP WITH TIME ZONE DEFAULT '2018-10-12 15:27:33',  
  "datatype_8" TIMESTAMP(0) WITH TIME ZONE DEFAULT '2018-10-12 15:27:33',  
  "datatype_9" TIMESTAMP(6) WITH TIME ZONE DEFAULT '2018-10-12 15:27:33'  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype_1");
```

Input: YEAR

```
CREATE TABLE IF NOT EXISTS `runoob_dataType_test` (  
  `dataType_1` YEAR,  
  `dataType_2` YEAR(4),  
  `dataType_3` YEAR DEFAULT '2018',  
  `dataType_4` TIME DEFAULT NULL  
);
```

Output

```
CREATE TABLE "public"."runoob_datatype_test"
(
  "datatype_1" VARCHAR(4),
  "datatype_2" VARCHAR(4),
  "datatype_3" VARCHAR(4) DEFAULT '2018',
  "datatype_4" TIME WITHOUT TIME ZONE DEFAULT NULL
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype_1");
```

String Types

Table 6-23 String type mapping

MySQL String Type	MySQL Input	GaussDB(DWS) Output
CHAR	CHAR[(0)]	CHAR[(1)]
LONGTEXT	LONGTEXT	TEXT
MEDIUMTEXT	MEDIUMTEXT	TEXT
TEXT	TEXT	TEXT
TINYTEXT	TINYTEXT	TEXT
VARCHAR	VARCHAR[(0)]	VARCHAR[(1)]

Input: CHAR

In MySQL, the length of a CHAR column is fixed to the length that you declare when you create the table. The length can be any value from 0 to 255. When CHAR values are stored, they are right-padded with spaces to the specified length.

```
CREATE TABLE IF NOT EXISTS `runoob_dataType_test`(
  `dataType_1` CHAR NOT NULL,
  `dataType_2` CHAR(0) NOT NULL,
  `dataType_3` CHAR(255) NOT NULL
);
```

Output

```
CREATE TABLE "public"."runoob_datatype_test"
(
  "datatype_1" CHAR NOT NULL,
  "datatype_2" CHAR(1) NOT NULL,
  "datatype_3" CHAR(255) NOT NULL
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype_1");
```

Input: [LONG|MEDIUM|TINY]TEXT

```
CREATE TABLE IF NOT EXISTS `runoob_dataType_test`(
  `dataType_1` LONGTEXT,
  `dataType_2` MEDIUMTEXT,
```

```
`dataType_3` TEXT,
`dataType_4` TINYTEXT
);
```

Output

```
CREATE TABLE "public"."runoob_datatype_test"
(
  "datatype_1" TEXT,
  "datatype_2" TEXT,
  "datatype_3" TEXT,
  "datatype_4" TEXT
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype_1");
```

Input: VARCHAR

In MySQL, values in VARCHAR columns are variable-length strings. The length can be any value from 0 to 65,535.

```
CREATE TABLE IF NOT EXISTS `runoob_dataType_test` (
  `dataType_1` VARCHAR(0),
  `dataType_2` VARCHAR(1845)
);
```

Output

```
CREATE TABLE "public"."runoob_datatype_test"
(
  "datatype_1" VARCHAR(1),
  "datatype_2" VARCHAR(1845)
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype_1");
```

Spatial Data Types

Table 6-24 Spatial type mapping

MySQL Spatial Type	MySQL Input	GaussDB(DWS) Output
GEOMETRY	GEOMETRY	CIRCLE
POINT	POINT	POINT
LINestring	LINestring	POLYGON
POLYGON	POLYGON	POLYGON
MULTIPOINT	MULTIPOINT	BOX
MULTILINestring	MULTILINestring	BOX
MULTIPOLYGON	MULTIPOLYGON	POLYGON
GEOMETRYCOLLECTION	GEOMETRYCOLLECTION	CIRCLE

- GEOMETRY can store geometry values of any type. The other single-value types (POINT, LINESTRING, and POLYGON) restrict their values to a particular geometry type.
- GEOMETRYCOLLECTION can store a collection of objects of any type. The other collection types (MULTIPOINT, MULTILINESTRING, MULTIPOLYGON, and GEOMETRYCOLLECTION) restrict collection members to those having a particular geometry type.

Input

```
CREATE TABLE `t_geo_test2` (
  `id` int(11) NOT NULL,
  `name` varchar(255),
  `geometry_1` geometry NOT NULL,
  `point_1` point NOT NULL,
  `linestring_1` linestring NOT NULL,
  `polygon_1` polygon NOT NULL,
  `multipoint_1` multipoint NOT NULL,
  `multilinestring_1` multilinestring NOT NULL,
  `multipolygon_1` multipolygon NOT NULL,
  `geometrycollection_1` geometrycollection NOT NULL,
  PRIMARY KEY (`id`) USING BTREE
) ENGINE = InnoDB;
```

Output

```
CREATE TABLE "public"."t_geo_test2"
(
  "id" INTEGER(11) NOT NULL,
  "name" VARCHAR(255),
  "geometry_1" CIRCLE NOT NULL,
  "point_1" POINT NOT NULL,
  "linestring_1" POLYGON NOT NULL,
  "polygon_1" POLYGON NOT NULL,
  "multipoint_1" BOX NOT NULL,
  "multilinestring_1" BOX NOT NULL,
  "multipolygon_1" POLYGON NOT NULL,
  "geometrycollection_1" CIRCLE NOT NULL,
  PRIMARY KEY ("id")
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("id");
```

LOB Types

Table 6-25 LOB type mapping

MySQL LOB Type	MySQL Input	GaussDB(DWS) Output
TINYBLOB	TINYBLOB	BLOB
BLOB	BLOB	BLOB
MEDIUMBLOB	MEDIUMBLOB	BLOB
LONGBLOB	LONGBLOB	BLOB

Input: [TINY|MEDIUM|LONG]BLOB

```
CREATE TABLE IF NOT EXISTS `runoob_dataType_test`(
  `dataType_1` BIGINT,
  `dataType_2` TINYBLOB,
```

```
`dataType_3` BLOB,
`dataType_4` MEDIUMBLOB,
`dataType_5` LONGBLOB
);
```

Output

```
CREATE TABLE "public"."runoob_datatype_test"
(
  "datatype_1" BIGINT,
  "datatype_2" BLOB,
  "datatype_3" BLOB,
  "datatype_4" BLOB,
  "datatype_5" BLOB
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype_1");
```

Set Types

Table 6-26 Set type mapping

MySQL Set Type	MySQL Input	GaussDB(DWS) Output
ENUM	ENUM	VARCHAR(14)
SET	SET	VARCHAR(14)

Input: ENUM

```
CREATE TABLE IF NOT EXISTS `runoob_dataType_test`(
  id int(2) PRIMARY KEY,
  `dataType_17` ENUM('dws-1', 'dws-2', 'dws-3')
);
```

Output

```
CREATE TABLE "public"."runoob_datatype_test"
(
  "id" INTEGER(2) PRIMARY KEY,
  "datatype_17" VARCHAR(14)
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("id");
```

Input: SET

```
CREATE TABLE IF NOT EXISTS `runoob_tbl_test`(
  `dataType_18` SET('dws-1', 'dws-2', 'dws-3')
);
```

Output

```
CREATE TABLE "public"."runoob_tbl_test"
(
  "datatype_18" VARCHAR(14)
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype_18");
```

Boolean Types

Input: BOOL/BOOLEAN

```
CREATE TABLE IF NOT EXISTS `runoob_dataType_test` (
  `dataType_1` INT,
  `dataType_2` BOOL,
  `dataType_3` BOOLEAN
);
```

Output

```
CREATE TABLE "public"."runoob_datatype_test"
(
  "datatype_1" INTEGER,
  "datatype_2" BOOLEAN,
  "datatype_3" BOOLEAN
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype_1");
```

Binary Types

Table 6-27 Binary type mapping

MySQL Binary Type	MySQL Input	GaussDB(DWS) Output
BIT[(M)]	BIT[(M)]	BIT[(M)]
BINARY[(M)]	BINARY[(M)]	BYTEA
VARBINARY[(M)]	VARBINARY[(M)]	BYTEA

Input: BIT

```
CREATE TABLE IF NOT EXISTS `runoob_dataType_test` (
  `dataType_1` INT,
  `dataType_2` BIT(1),
  `dataType_3` BIT(64)
);
```

Output

```
CREATE TABLE "public"."runoob_datatype_test"
(
  "datatype_1" INTEGER,
  "datatype_2" BIT(1),
  "datatype_3" BIT(64)
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype_1");
```

Input: [VAR]BINARY

```
CREATE TABLE IF NOT EXISTS `runoob_dataType_test` (
  `dataType_1` INT,
  `dataType_2` BINARY,
  `dataType_3` BINARY(0),
  `dataType_4` BINARY(255),
  `dataType_5` VARBINARY(0),
  `dataType_6` VARBINARY(6553)
);
```

Output

```
CREATE TABLE "public"."runoob_datatype_test"
(
  "datatype_1" INTEGER,
  "datatype_2" BYTEA,
  "datatype_3" BYTEA,
  "datatype_4" BYTEA,
  "datatype_5" BYTEA,
  "datatype_6" BYTEA
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype_1");
```

6.11.2 Table (Optional)

This section describes the migration syntax of MySQL tables (optional parameter). The migration syntax determines how the keywords and features are migrated. GaussDB(DWS) does not support table migration. Currently, all table migration methods are temporary.

AUTO_INCREMENT

In database application, unique numbers that increase automatically are needed to identify records. In MySQL, the **AUTO_INCREMENT** attribute of a data column can be used to automatically generate the numbers. When creating a table, you can use **AUTO_INCREMENT=*n*** to specify a start value. You can also use the **ALTER TABLE *TABLE_NAME* AUTO_INCREMENT=*n*** command to reset the start value. GaussDB(DWS) does not support this attribute, which will be converted to **SERIAL** and deleted by DSC during migration.

Input

```
CREATE TABLE `public`.`job_instance` (
  `job_sche_id` int(11) NOT NULL AUTO_INCREMENT,
  `task_name` varchar(100) NOT NULL DEFAULT "",
  PRIMARY KEY (`job_sche_id`)
) ENGINE=InnoDB AUTO_INCREMENT=219 DEFAULT CHARSET=utf8;
```

Output

```
CREATE TABLE "public"."job_instance"
(
  "job_sche_id" SERIAL NOT NULL,
  "task_name" VARCHAR(100) NOT NULL DEFAULT "",
  PRIMARY KEY ("job_sche_id")
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("job_sche_id");
```

In addition, GaussDB(DWS) does not support table definition modification using the **AUTO_INCREMENT** attribute. DSC will delete the attribute after migration.

Input

```
CREATE TABLE IF NOT EXISTS `public`.`runoob_alter_test` (
  `dataType1` int NOT NULL AUTO_INCREMENT,
  `dataType2` FLOAT(10,2),
  PRIMARY KEY(`dataType1`)
);

ALTER TABLE runoob_alter_test AUTO_INCREMENT 100;
ALTER TABLE runoob_alter_test AUTO_INCREMENT=100;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"
(
  "datatype1" SERIAL NOT NULL,
  "datatype2" FLOAT(10),
  PRIMARY KEY ("datatype1")
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype1");
```

AVG_ROW_LENGTH

Input

```
CREATE TABLE `public`.`runoob_tbl_test` (
  `runoob_id` VARCHAR(30),
  `runoob_title` VARCHAR(100) NOT NULL,
  `runoob_author` VARCHAR(40) NOT NULL,
  `submission_date` VARCHAR(30)
)AVG_ROW_LENGTH=10000;
```

Output

```
CREATE TABLE "public"."runoob_tbl_test"
(
  "runoob_id" VARCHAR(30),
  "runoob_title" VARCHAR(100) NOT NULL,
  "runoob_author" VARCHAR(40) NOT NULL,
  "submission_date" VARCHAR(30)
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("runoob_id");
```

In addition, GaussDB(DWS) does not support table definition modification using the **AUTO_INCREMENT** attribute. This attribute will be deleted after migration using DSC.

Input

```
CREATE TABLE IF NOT EXISTS `public`.`runoob_alter_test` (
  `dataType1` int NOT NULL AUTO_INCREMENT,
  `dataType2` FLOAT(10,2),
  PRIMARY KEY(`dataType1`)
);

ALTER TABLE runoob_alter_test AUTO_INCREMENT 100;
ALTER TABLE runoob_alter_test AUTO_INCREMENT=100;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"
(
  "datatype1" SERIAL NOT NULL,
  "datatype2" FLOAT(10),
  PRIMARY KEY ("datatype1")
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype1");
```

CHARSET

CHARSET specifies the default character set for a table. GaussDB(DWS) does not support table definition modification using this attribute. DSC will delete the keyword during migration.

Input

```
CREATE TABLE `public`.`runoob_tbl_test`(  
  `runoob_id` VARCHAR(30),  
  `runoob_title` VARCHAR(100) NOT NULL,  
  `runoob_author` VARCHAR(40) NOT NULL,  
  `submission_date` VARCHAR(30)  
)DEFAULT CHARSET=utf8;
```

Output

```
CREATE TABLE "public"."runoob_tbl_test"  
(  
  "runoob_id" VARCHAR(30),  
  "runoob_title" VARCHAR(100) NOT NULL,  
  "runoob_author" VARCHAR(40) NOT NULL,  
  "submission_date" VARCHAR(30)  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("runoob_id");
```

CHECKSUM

In MySQL, **CHECKSUM** maintains a live checksum for all rows. GaussDB(DWS) does not support table definition modification using this attribute. DSC will delete the keyword during migration.

Input

```
CREATE TABLE `public`.`runoob_alter_test`(  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` FLOAT(10,2),  
  `dataType3` DOUBLE(20,8),  
  PRIMARY KEY(`dataType1`)  
) CHECKSUM=1;  
  
ALTER TABLE runoob_alter_test CHECKSUM 0;  
ALTER TABLE runoob_alter_test CHECKSUM=0;  
  
ALTER TABLE runoob_alter_test CHECKSUM 1;  
ALTER TABLE runoob_alter_test CHECKSUM=1;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"  
(  
  "datatype1" SERIAL NOT NULL,  
  "datatype2" FLOAT(10),  
  "datatype3" FLOAT(20),  
  PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");
```

COLLATE

In MySQL, **COLLATE** specifies a default database sorting rule. GaussDB(DWS) does not support table definition modification using this attribute. DSC will delete the keyword during migration.

Input

```
CREATE TABLE `public`.`runoob_tbl_test`(  
  `runoob_id` VARCHAR(30),  
  `runoob_title` VARCHAR(100) NOT NULL,  
  `runoob_author` VARCHAR(40) NOT NULL,  
  `submission_date` VARCHAR(30)  
) COLLATE=utf8_general_ci;  
  
ALTER TABLE `public`.`runoob_tbl_test` COLLATE=utf8mb4_bin;
```

Output

```
CREATE TABLE "public"."runoob_tbl_test"  
(  
  "runoob_id" VARCHAR(30),  
  "runoob_title" VARCHAR(100) NOT NULL,  
  "runoob_author" VARCHAR(40) NOT NULL,  
  "submission_date" VARCHAR(30)  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("runoob_id");
```

COMMENT

In MySQL, **COMMENT** is a comment for a table. GaussDB(DWS) does not support table definition modification using this attribute. DSC will delete the attribute during migration.

Input

```
CREATE TABLE `public`.`runoob_alter_test`(  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` FLOAT(10,2),  
  PRIMARY KEY(`dataType1`)  
) comment='table comment';  
  
ALTER TABLE `public`.`runoob_alter_test` COMMENT 'table comment after modification';
```

Output

```
CREATE TABLE "public"."runoob_alter_test"  
(  
  "datatype1" SERIAL NOT NULL,  
  "datatype2" FLOAT(10),  
  PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");
```

CONNECTION

GaussDB(DWS) does not support table definition modification using this attribute. DSC will delete the attribute during migration.

 **CAUTION**

In MySQL, the keyword **CONNECTION** is used as a referenced, external data source. Currently, DSC cannot completely migrate the feature of **CONNECTION**. So as a workaround, it simply deletes the keyword.

Input

```
CREATE TABLE `public`.`runoob_alter_test`(  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` DOUBLE(20,8),  
  `dataType3` TEXT NOT NULL,  
  `dataType4` YEAR NOT NULL DEFAULT '2018',  
  PRIMARY KEY(`dataType1`)  
);  
  
ALTER TABLE runoob_alter_test CONNECTION 'hello';  
ALTER TABLE runoob_alter_test CONNECTION='hello';
```

Output

```
CREATE TABLE "public"."runoob_alter_test"  
(  
  "datatype1" SERIAL NOT NULL,  
  "datatype2" FLOAT(20),  
  "datatype3" TEXT NOT NULL,  
  "datatype4" VARCHAR(4) NOT NULL DEFAULT '2018',  
  PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");
```

DELAY_KEY_WRITE

DELAY_KEY_WRITE is valid only for MyISAM tables. It is used to delay updates until the table is closed. GaussDB(DWS) does not support table definition modification using this attribute. DSC will delete the attribute during migration.

Input

```
CREATE TABLE `public`.`runoob_tbl_test`(  
  `runoob_id` VARCHAR(30),  
  `runoob_title` VARCHAR(100) NOT NULL,  
  `runoob_author` VARCHAR(40) NOT NULL,  
  `submission_date` VARCHAR(30)  
) ENGINE=MyISAM, DELAY_KEY_WRITE=0;  
  
ALTER TABLE `public`.`runoob_tbl_test6` DELAY_KEY_WRITE=1;
```

Output

```
CREATE TABLE "public"."runoob_tbl_test"  
(  
  "runoob_id" VARCHAR(30),  
  "runoob_title" VARCHAR(100) NOT NULL,  
  "runoob_author" VARCHAR(40) NOT NULL,  
  "submission_date" VARCHAR(30)  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("runoob_id");
```


DIRECTORY

DIRECTORY enables a tablespace to be created outside the data directory and index directory. It allows **DATA DIRECTORY** and **INDEX DIRECTORY**. GaussDB(DWS) does not support table definition modification using this attribute. DSC will delete the attribute during migration.

Input

```
CREATE TABLE `public`.`runoob_tbl_test1` (  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` DOUBLE(20,8),  
  PRIMARY KEY(`dataType1`)  
) ENGINE=MYISAM DATA DIRECTORY = 'D:\\input' INDEX DIRECTORY= 'D:\\input';  
  
CREATE TABLE `public`.`runoob_tbl_test2` (  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` DOUBLE(20,8),  
  PRIMARY KEY(`dataType1`)  
) ENGINE=INNODB DATA DIRECTORY = 'D:\\input';
```

Output

```
CREATE TABLE "public"."runoob_tbl_test1"  
(  
  "datatype1" SERIAL NOT NULL,  
  "datatype2" FLOAT(20),  
  PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");  
  
CREATE TABLE "public"."runoob_tbl_test2"  
(  
  "datatype1" SERIAL NOT NULL,  
  "datatype2" FLOAT(20),  
  PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");
```

ENGINE

In MySQL, **ENGINE** specifies the storage engine for a table. When the storage engine is **ARCHIVE**, **BLACKHOLE**, **CSV**, **FEDERATED**, **INNODB**, **MYISAM**, **MEMORY**, **MRG_MYISAM**, **NDB**, **NDBCLUSTER**, or **PERFORMANCE_SCHEMA**, this attribute can be migrated and will be deleted during the migration.

Input

```
CREATE TABLE `public`.`runoob_alter_test`(  
  `dataType1` int NOT NULL,  
  `dataType2` DOUBLE(20,8),  
  PRIMARY KEY(`dataType1`)  
)ENGINE=MYISAM;  
  
## A.  
ALTER TABLE runoob_alter_test ENGINE INNODB;  
ALTER TABLE runoob_alter_test ENGINE=INNODB;  
  
## B.  
ALTER TABLE runoob_alter_test ENGINE MYISAM;  
ALTER TABLE runoob_alter_test ENGINE=MYISAM;
```

```
## C.  
ALTER TABLE runoob_alter_test ENGINE MEMORY;  
ALTER TABLE runoob_alter_test ENGINE=MEMORY;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"  
(  
  "datatype1" INTEGER NOT NULL,  
  "datatype2" FLOAT(20),  
  PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");  
  
-- A.  
  
-- B.  
  
-- C.
```

INSERT_METHOD

INSERT_METHOD specifies the table into which the row should be inserted. Use a value of **FIRST** or **LAST** to have inserts go to the first or last table, or a value of **NO** to prevent inserts. DSC will delete this attribute during migration.

Input

```
CREATE TABLE `public`.`runoob_alter_test`(  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` DOUBLE(20,8),  
  `dataType3` TEXT NOT NULL,  
  PRIMARY KEY(`dataType1`)  
) INSERT_METHOD=LAST;  
  
ALTER TABLE runoob_alter_test INSERT_METHOD NO;  
ALTER TABLE runoob_alter_test INSERT_METHOD=NO;  
ALTER TABLE runoob_alter_test INSERT_METHOD FIRST;  
ALTER TABLE runoob_alter_test INSERT_METHOD=FIRST;  
ALTER TABLE runoob_alter_test INSERT_METHOD LAST;  
ALTER TABLE runoob_alter_test INSERT_METHOD=LAST;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"  
(  
  "datatype1" SERIAL NOT NULL,  
  "datatype2" FLOAT(20),  
  "datatype3" TEXT NOT NULL,  
  PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");
```

KEY_BLOCK_SIZE

KEY_BLOCK_SIZE choices vary depending on the storage engine used for a table. For MyISAM tables, **KEY_BLOCK_SIZE** optionally specifies the size in bytes to be used for index key blocks. For InnoDB tables, **KEY_BLOCK_SIZE** specifies the page size in kilobytes to be used for compressed InnoDB tables. GaussDB(DWS) does not support this attribute, which will be deleted by DSC during migration.

Input

```
CREATE TABLE `public`.`runoob_tbl_test`(  
  `runoob_id` VARCHAR(30),  
  `runoob_title` VARCHAR(100) NOT NULL,  
  `runoob_author` VARCHAR(40) NOT NULL,  
  `submission_date` VARCHAR(30)  
) ENGINE=MyISAM KEY_BLOCK_SIZE=8;  
  
ALTER TABLE runoob_tbl_test ENGINE=InnoDB;  
ALTER TABLE runoob_tbl_test KEY_BLOCK_SIZE=0;
```

Output

```
CREATE TABLE "public"."runoob_tbl_test"  
(  
  "runoob_id" VARCHAR(30),  
  "runoob_title" VARCHAR(100) NOT NULL,  
  "runoob_author" VARCHAR(40) NOT NULL,  
  "submission_date" VARCHAR(30)  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("runoob_id");
```

MAX_ROWS

In MySQL, **MAX_ROWS** indicates the maximum number of rows that can be stored in a table. This attribute will be deleted during migration using DSC.

Input

```
CREATE TABLE `public`.`runoob_alter_test`(  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` DOUBLE(20,8),  
  `dataType3` TEXT NOT NULL,  
  PRIMARY KEY(`dataType1`)  
);  
  
ALTER TABLE runoob_alter_test MAX_ROWS 100000;  
ALTER TABLE runoob_alter_test MAX_ROWS=100000;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"  
(  
  "datatype1" SERIAL NOT NULL,  
  "datatype2" FLOAT(20),  
  "datatype3" TEXT NOT NULL,  
  PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");
```

MIN_ROWS

MIN_ROWS indicates the minimum number of rows that can be stored in a table. This attribute will be deleted during migration using DSC.

Input

```
CREATE TABLE `public`.`runoob_alter_test`(  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` DOUBLE(20,8),  
  `dataType3` TEXT NOT NULL,  
  PRIMARY KEY(`dataType1`)  
);
```

```
ALTER TABLE runoob_alter_test MIN_ROWS 10000;  
ALTER TABLE runoob_alter_test MIN_ROWS=10000;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"  
(  
  "datatype1" SERIAL NOT NULL,  
  "datatype2" FLOAT(20),  
  "datatype3" TEXT NOT NULL,  
  PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");
```

PACK_KEYS

In MySQL, **PACK_KEYS** specifies the index compression mode in the MyISAM storage engine. GaussDB(DWS) does not support this attribute, which will be deleted by DSC during migration.

Input

```
CREATE TABLE `public`.`runoob_alter_test`(  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` DOUBLE(20,8),  
  `dataType3` TEXT NOT NULL,  
  PRIMARY KEY(`dataType1`)  
) ENGINE=MyISAM PACK_KEYS=1;  
  
##A  
ALTER TABLE runoob_alter_test PACK_KEYS 0;  
ALTER TABLE runoob_alter_test PACK_KEYS=0;  
  
##B  
ALTER TABLE runoob_alter_test PACK_KEYS 1;  
ALTER TABLE runoob_alter_test PACK_KEYS=1;  
  
##C  
ALTER TABLE runoob_alter_test PACK_KEYS DEFAULT;  
ALTER TABLE runoob_alter_test PACK_KEYS=DEFAULT;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"  
(  
  "datatype1" SERIAL NOT NULL,  
  "datatype2" FLOAT(10),  
  "datatype3" FLOAT(20),  
  "datatype4" TEXT NOT NULL,  
  PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");  
  
--A  
  
--B  
  
--C
```

PASSWORD

In MySQL, **PASSWORD** indicates the user password. GaussDB(DWS) does not support this attribute, which will be deleted by DSC during migration.

Input

```
CREATE TABLE `public`.`runoob_alter_test`(  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` DOUBLE(20,8),  
  `dataType3` TEXT NOT NULL,  
  PRIMARY KEY(`dataType1`)  
);  
ALTER TABLE runoob_alter_test PASSWORD 'HELLO';
```

Output

```
CREATE TABLE "public"."runoob_alter_test"  
(  
  "datatype1" SERIAL NOT NULL,  
  "datatype2" FLOAT(20),  
  "datatype3" TEXT NOT NULL,  
  PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");
```

ROW_FORMAT

ROW_FORMAT defines the physical format in which the rows are stored. Row format choices vary depending on the storage engine used for the table. If you specify a row format that is not supported by the storage engine that is used for the table, the table will be created using that storage engine's default row format. If **ROW_FORMAT** is set to **DEFAULT**, the value will be migrated to **SET NOCOMPRESS**. If **ROW_FORMAT** is set to **COMPRESSED**, the value will be migrated to **SET COMPRESS**. GaussDB(DWS) supports only the preceding two **ROW_FORMAT** values. If other values are used, they will be deleted by DSC.

Input

```
CREATE TABLE `public`.`runoob_alter_test`(  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` FLOAT(10,2),  
  `dataType3` DOUBLE(20,8),  
  `dataType4` TEXT NOT NULL,  
  PRIMARY KEY(`dataType1`)  
) ENGINE=InnoDB;  
  
## A.  
ALTER TABLE runoob_alter_test ROW_FORMAT DEFAULT;  
ALTER TABLE runoob_alter_test ROW_FORMAT=DEFAULT;  
  
## B.  
ALTER TABLE runoob_alter_test ROW_FORMAT DYNAMIC;  
ALTER TABLE runoob_alter_test ROW_FORMAT=DYNAMIC;  
  
## C.  
ALTER TABLE runoob_alter_test ROW_FORMAT COMPRESSED;  
ALTER TABLE runoob_alter_test ROW_FORMAT=COMPRESSED;  
  
## D.  
ALTER TABLE runoob_alter_test ROW_FORMAT REDUNDANT;  
ALTER TABLE runoob_alter_test ROW_FORMAT=REDUNDANT;  
  
## E.  
ALTER TABLE runoob_alter_test ROW_FORMAT COMPACT;  
ALTER TABLE runoob_alter_test ROW_FORMAT=COMPACT;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"
(
  "datatype1" SERIAL NOT NULL,
  "datatype2" FLOAT(10),
  "datatype3" FLOAT(20),
  "datatype4" TEXT NOT NULL,
  PRIMARY KEY ("datatype1")
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype1");

-- A.
ALTER TABLE "public"."runoob_alter_test" SET NOCOMPRESS;
ALTER TABLE "public"."runoob_alter_test" SET NOCOMPRESS;

-- B.

-- C.
ALTER TABLE "public"."runoob_alter_test" SET COMPRESS;
ALTER TABLE "public"."runoob_alter_test" SET COMPRESS;

-- D.

-- E.
```

STATS_AUTO_RECALC

STATS_AUTO_RECALC specifies whether to automatically recalculate persistent statistics for an InnoDB table. GaussDB(DWS) does not support this attribute, which will be deleted by DSC during migration.

Input

```
CREATE TABLE `public`.`runoob_alter_test` (
  `runoob_id` VARCHAR(30),
  `runoob_title` VARCHAR(100) NOT NULL,
  `runoob_author` VARCHAR(40) NOT NULL,
  `submission_date` VARCHAR(30)
) ENGINE=InnoDB, STATS_AUTO_RECALC=DEFAULT;

## A.
ALTER TABLE runoob_alter_test STATS_AUTO_RECALC DEFAULT;
ALTER TABLE runoob_alter_test STATS_AUTO_RECALC=DEFAULT;

## B.
ALTER TABLE runoob_alter_test STATS_AUTO_RECALC 0;
ALTER TABLE runoob_alter_test STATS_AUTO_RECALC=0;

## C.
ALTER TABLE runoob_alter_test STATS_AUTO_RECALC 1;
ALTER TABLE runoob_alter_test STATS_AUTO_RECALC=1;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"
(
  "runoob_id" VARCHAR(30),
  "runoob_title" VARCHAR(100) NOT NULL,
  "runoob_author" VARCHAR(40) NOT NULL,
  "submission_date" VARCHAR(30)
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("runoob_id");

-- A.
```

```
-- B.  
-- C.
```

STATS_PERSISTENT

In MySQL, **STATS_PERSISTENT** specifies whether to enable persistence statistics for an InnoDB table. The **CREATE TABLE** and **ALTER TABLE** statements can be used to enable persistence statistics. DSC will delete this attribute during migration.

Input

```
CREATE TABLE `public`.`runoob_alter_test`(  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` DOUBLE(20,8),  
  `dataType3` TEXT NOT NULL,  
  PRIMARY KEY(`dataType1`)  
) ENGINE=InnoDB, STATS_PERSISTENT=0;  
  
## A.  
ALTER TABLE runoob_alter_test STATS_PERSISTENT DEFAULT;  
ALTER TABLE runoob_alter_test STATS_PERSISTENT=DEFAULT;  
  
## B.  
ALTER TABLE runoob_alter_test STATS_PERSISTENT 0;  
ALTER TABLE runoob_alter_test STATS_PERSISTENT=0;  
  
## C.  
ALTER TABLE runoob_alter_test STATS_PERSISTENT 1;  
ALTER TABLE runoob_alter_test STATS_PERSISTENT=1;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"  
(  
  "datatype1" SERIAL NOT NULL,  
  "datatype2" FLOAT(20),  
  "datatype3" TEXT NOT NULL,  
  PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");  
  
-- A.  
-- B.  
-- C.
```

STATS_SAMPLE_PAGES

STATS_SAMPLE_PAGES specifies the number of index pages to sample when cardinality and other statistics for an indexed column are estimated. This attribute will be deleted during migration using DSC.

Input

```
CREATE TABLE `public`.`runoob_alter_test`(  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` DOUBLE(20,8),  
  `dataType3` TEXT NOT NULL,  
  PRIMARY KEY(`dataType1`)  
) ENGINE=InnoDB,STATS_SAMPLE_PAGES=25;
```

```
ALTER TABLE runoob_alter_test STATS_SAMPLE_PAGES 100;  
ALTER TABLE runoob_alter_test STATS_SAMPLE_PAGES=100;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"  
(  
  "datatype1" SERIAL NOT NULL,  
  "datatype2" FLOAT(20),  
  "datatype3" TEXT NOT NULL,  
  PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");
```

UNION

UNION is a table creation parameter of the MERGE storage engine. Creating a table using this keyword is similar to creating a common view. The created table logically combines the data of multiple tables that are specified by UNION. DSC migrates this feature to the view creation statement in GaussDB.

Input

```
CREATE TABLE t1 (  
  a INT NOT NULL AUTO_INCREMENT PRIMARY KEY,  
  message CHAR(20)  
) ENGINE=MyISAM;  
  
CREATE TABLE t2 (  
  a INT NOT NULL AUTO_INCREMENT PRIMARY KEY,  
  message CHAR(20)  
) ENGINE=MyISAM;  
  
CREATE TABLE total (  
  a INT NOT NULL AUTO_INCREMENT,  
  message CHAR(20))  
ENGINE=MERGE UNION=(t1,t2) INSERT_METHOD=LAST;
```

Output

```
CREATE TABLE t1 (  
  a SERIAL NOT NULL PRIMARY KEY,  
  message CHAR(20)  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("a");  
  
CREATE TABLE t2 (  
  a SERIAL NOT NULL PRIMARY KEY,  
  message CHAR(20)  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("a");  
  
CREATE VIEW total(a, message) AS  
SELECT * FROM t1  
UNION ALL  
SELECT * FROM t2;
```

6.11.3 Table Operations

This section contains the migration syntax for migrating MySQL table operation. The migration syntax decides how the supported keywords/features are migrated.

For details, see the following topics:

- [LIKE \(Table Cloning\)](#)
- [ADD|DROP COLUMN](#)
- [MODIFY \(Column Modification\)](#)
- [CHANGE \(Column Modification\)](#)
- [SET|DROP COLUMN DEFAULT VALUE](#)
- [DROP \(Table Deletion\)](#)
- [TRUNCATE \(Table Deletion\)](#)
- [LOCK](#)
- [RENAME \(Table Renaming\)](#)

LIKE (Table Cloning)

MySQL databases support **CREATE TABLE . LIKE** is a method with which a table is created by cloning the old table structure, and this method is supported by GaussDB(DWS). DSC will add additional table attribute information during migration.

Input

```
CREATE TABLE IF NOT EXISTS `public`.`runoob_tbl_old`(  
  `dataType_1` YEAR,  
  `dataType_2` YEAR(4),  
  `dataType_3` YEAR DEFAULT '2018',  
  `dataType_4` TIME DEFAULT NULL  
);  
  
CREATE TABLE `runoob_tbl` (like `runoob_tbl_old`);
```

Output

```
CREATE TABLE "public"."runoob_tbl_old"  
(  
  "datatype_1" VARCHAR(4),  
  "datatype_2" VARCHAR(4),  
  "datatype_3" VARCHAR(4) DEFAULT '2018',  
  "datatype_4" TIME WITHOUT TIME ZONE DEFAULT NULL  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype_1");  
  
CREATE TABLE "public"."runoob_tbl"( LIKE "public"."runoob_tbl_old"  
INCLUDING COMMENTS INCLUDING CONSTRAINTS INCLUDING DEFAULTS INCLUDING INDEXES  
INCLUDING STORAGE);
```

ADD|DROP COLUMN

MySQL and GaussDB(DWS) use different statements for adding and deleting columns. DSC will perform adaptation based on GaussDB features during migration.

CAUTION

GaussDB does not support the update of sequence numbers in table definitions. Temporarily, DSC does not support the complete migration of the FIRST and AFTER features. So as a workaround, it simply deletes the keywords.

Input

```
CREATE TABLE IF NOT EXISTS `runoob_alter_test`(  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` FLOAT(10,2),  
  `dataType3` DOUBLE(20,8),  
  `dataType4` TEXT NOT NULL,  
  `dataType5` YEAR NOT NULL DEFAULT '2018',  
  `dataType6` DATETIME NOT NULL DEFAULT '2018-10-12 15:27:33.999999',  
  `dataType7` CHAR NOT NULL DEFAULT "",  
  `dataType8` VARCHAR(50),  
  `dataType9` VARCHAR(50) NOT NULL DEFAULT "",  
  `dataType10` TIME NOT NULL DEFAULT '10:20:59',  
  PRIMARY KEY(`dataType1`)  
)ENGINE=InnoDB DEFAULT CHARSET=utf8;  
  
## A.  
ALTER TABLE runoob_alter_test ADD dataType1_1 INT NOT NULL AFTER dataType1;  
ALTER TABLE runoob_alter_test DROP dataType1_1;  
  
## B.  
ALTER TABLE runoob_alter_test ADD dataType1_1 INT NOT NULL FIRST;  
ALTER TABLE runoob_alter_test DROP dataType1_1;  
  
## C.  
ALTER TABLE runoob_alter_test ADD COLUMN dataType1_1 INT NOT NULL AFTER dataType2;  
ALTER TABLE runoob_alter_test DROP COLUMN dataType1_1;  
  
## D.  
ALTER TABLE runoob_alter_test ADD COLUMN dataType1_1 INT NOT NULL FIRST;  
ALTER TABLE runoob_alter_test DROP COLUMN dataType1_1;  
  
## E.  
ALTER TABLE runoob_alter_test ADD COLUMN(dataType1_1 INT NOT NULL, dataType1_2 VARCHAR(200)  
NOT NULL);  
ALTER TABLE runoob_alter_test DROP COLUMN dataType1_1, DROP COLUMN dataType1_2;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"  
(  
  "datatype1" SERIAL NOT NULL,  
  "datatype2" FLOAT(10),  
  "datatype3" FLOAT(20),  
  "datatype4" TEXT NOT NULL,  
  "datatype5" VARCHAR(4) NOT NULL DEFAULT '2018',  
  "datatype6" TIMESTAMP WITHOUT TIME ZONE NOT NULL DEFAULT '2018-10-12 15:27:33.999999',  
  "datatype7" CHAR NOT NULL DEFAULT "",  
  "datatype8" VARCHAR(50),  
  "datatype9" VARCHAR(50) NOT NULL DEFAULT "",  
  "datatype10" TIME WITHOUT TIME ZONE NOT NULL DEFAULT '10:20:59',  
  PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");  
  
-- A.  
ALTER TABLE "public"."runoob_alter_test" ADD COLUMN "datatype1_1" INTEGER NOT NULL;  
ALTER TABLE "public"."runoob_alter_test" DROP COLUMN "datatype1_1" RESTRICT;
```

```
-- B.
ALTER TABLE "public"."runoob_alter_test" ADD COLUMN "datatype1_1" INTEGER NOT NULL;
ALTER TABLE "public"."runoob_alter_test" DROP COLUMN "datatype1_1" RESTRICT;

-- C.
ALTER TABLE "public"."runoob_alter_test" ADD COLUMN "datatype1_1" INTEGER NOT NULL;
ALTER TABLE "public"."runoob_alter_test" DROP COLUMN "datatype1_1" RESTRICT;

-- D.
ALTER TABLE "public"."runoob_alter_test" ADD COLUMN "datatype1_1" INTEGER NOT NULL;
ALTER TABLE "public"."runoob_alter_test" DROP COLUMN "datatype1_1" RESTRICT;

-- E.
ALTER TABLE "public"."runoob_alter_test" ADD COLUMN "datatype1_1" VARCHAR(200) NOT NULL, ADD
COLUMN "datatype1_2" VARCHAR(200) NOT NULL;
ALTER TABLE "public"."runoob_alter_test" DROP COLUMN "datatype1_1" RESTRICT, DROP COLUMN
"datatype1_2" RESTRICT;
```

MODIFY (Column Modification)

MySQL uses the **MODIFY** keyword to change column data types and set **NOT NULL** constraints. DSC will perform adaptation based on GaussDB features during migration.

Input

```
CREATE TABLE IF NOT EXISTS `runoob_alter_test` (
  `dataType0` varchar(100),
  `dataType1` bigint,
  `dataType2` bigint,
  `dataType3` bigint
)ENGINE=InnoDB DEFAULT CHARSET=utf8;

## A.
ALTER TABLE runoob_alter_test MODIFY dataType1 smallint;

## B.
ALTER TABLE runoob_alter_test MODIFY dataType1 smallint NOT NULL;

## C.
ALTER TABLE runoob_alter_test MODIFY dataType1 smallint NOT NULL FIRST;

## D.
ALTER TABLE runoob_alter_test MODIFY dataType1 smallint NOT NULL AFTER dataType3;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"
(
  "datatype0" VARCHAR(100),
  "datatype1" BIGINT,
  "datatype2" BIGINT,
  "datatype3" BIGINT
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype0");

-- A.
ALTER TABLE "public"."runoob_alter_test" ALTER COLUMN "datatype1" SET DATA TYPE SMALLINT;

-- B.
ALTER TABLE "public"."runoob_alter_test" ALTER COLUMN "datatype1" SET DATA TYPE SMALLINT, ALTER
COLUMN "datatype1" SET NOT NULL;

-- C.
ALTER TABLE "public"."runoob_alter_test" ALTER COLUMN "datatype1" SET DATA TYPE SMALLINT, ALTER
COLUMN "datatype1" SET NOT NULL;
```

```
-- D.  
ALTER TABLE "public"."runoob_alter_test" ALTER COLUMN "datatype1" SET DATA TYPE SMALLINT, ALTER  
COLUMN "datatype1" SET NOT NULL;
```

CHANGE (Column Modification)

MySQL uses the **CHANGE** keyword to change column names and data types and set **NOT NULL** constraints. DSC will perform adaptation based on GaussDB features during migration.

Input

```
CREATE TABLE IF NOT EXISTS `runoob_alter_test`(  
  `dataType0` varchar(128),  
  `dataType1` bigint,  
  `dataType2` bigint,  
  `dataType3` bigint,  
  `dataType4` bigint  
)ENGINE=InnoDB DEFAULT CHARSET=utf8;  
  
## A.  
ALTER TABLE runoob_alter_test CHANGE dataType1 dataType1New VARCHAR(50);  
  
## B.  
ALTER TABLE runoob_alter_test CHANGE dataType2 dataType2New VARCHAR(50) NOT NULL;  
  
## C.  
ALTER TABLE runoob_alter_test CHANGE dataType3 dataType3New VARCHAR(100) FIRST;  
  
## D.  
ALTER TABLE runoob_alter_test CHANGE dataType4 dataType4New VARCHAR(50) AFTER dataType1;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"  
(  
  "datatype0" VARCHAR(128),  
  "datatype1" BIGINT,  
  "datatype2" BIGINT,  
  "datatype3" BIGINT,  
  "datatype4" BIGINT  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype0");  
  
-- A.  
ALTER TABLE "public"."runoob_alter_test" RENAME COLUMN "datatype1" TO "datatype1new";  
ALTER TABLE "public"."runoob_alter_test" ALTER COLUMN "datatype1new" SET DATA TYPE VARCHAR(50);  
  
-- B.  
ALTER TABLE "public"."runoob_alter_test" RENAME COLUMN "datatype2" TO "datatype2new";  
ALTER TABLE "public"."runoob_alter_test" ALTER COLUMN "datatype2new" SET DATA TYPE VARCHAR(50),  
ALTER COLUMN "datatype2new" SET NOT NULL;  
  
-- C.  
ALTER TABLE "public"."runoob_alter_test" RENAME COLUMN "datatype3" TO "datatype3new";  
ALTER TABLE "public"."runoob_alter_test" ALTER COLUMN "datatype3new" SET DATA TYPE VARCHAR(100);  
  
-- D.  
ALTER TABLE "public"."runoob_alter_test" RENAME COLUMN "datatype4" TO "datatype4new";  
ALTER TABLE "public"."runoob_alter_test" ALTER COLUMN "datatype4new" SET DATA TYPE VARCHAR(50);
```

SET|DROP COLUMN DEFAULT VALUE

In MySQL, the **COLUMN** keyword can be omitted when the **ALTER** statement is used to set the default value of a column. DSC will perform adaptation based on GaussDB features during migration.

Input

```
CREATE TABLE IF NOT EXISTS `runoob_alter_test`(  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` FLOAT(10,2),  
  `dataType3` DOUBLE(20,8),  
  `dataType4` TEXT NOT NULL,  
  `dataType5` YEAR NOT NULL DEFAULT '2018',  
  `dataType6` DATETIME NOT NULL DEFAULT '2018-10-12 15:27:33.999999',  
  `dataType7` CHAR NOT NULL DEFAULT "",  
  `dataType8` VARCHAR(50),  
  `dataType9` VARCHAR(50) NOT NULL DEFAULT "",  
  `dataType10` TIME NOT NULL DEFAULT '10:20:59',  
  PRIMARY KEY(`dataType1`)  
)ENGINE=InnoDB DEFAULT CHARSET=utf8;  
  
ALTER TABLE runoob_alter_test ALTER dataType2 SET DEFAULT 1;  
ALTER TABLE runoob_alter_test ALTER COLUMN dataType2 SET DEFAULT 3;  
ALTER TABLE runoob_alter_test ALTER dataType2 DROP DEFAULT;  
ALTER TABLE runoob_alter_test ALTER COLUMN dataType2 DROP DEFAULT;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"  
(  
  "datatype1" SERIAL NOT NULL,  
  "datatype2" FLOAT(10),  
  "datatype3" FLOAT(20),  
  "datatype4" TEXT NOT NULL,  
  "datatype5" VARCHAR(4) NOT NULL DEFAULT '2018',  
  "datatype6" TIMESTAMP WITHOUT TIME ZONE NOT NULL DEFAULT '2018-10-12 15:27:33.999999',  
  "datatype7" CHAR NOT NULL DEFAULT "",  
  "datatype8" VARCHAR(50),  
  "datatype9" VARCHAR(50) NOT NULL DEFAULT "",  
  "datatype10" TIME WITHOUT TIME ZONE NOT NULL DEFAULT '10:20:59',  
  PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");  
  
ALTER TABLE "public"."runoob_alter_test" ALTER COLUMN "datatype2" SET DEFAULT 1;  
ALTER TABLE "public"."runoob_alter_test" ALTER COLUMN "datatype2" SET DEFAULT 3;  
ALTER TABLE "public"."runoob_alter_test" ALTER COLUMN "datatype2" DROP DEFAULT;  
ALTER TABLE "public"."runoob_alter_test" ALTER COLUMN "datatype2" DROP DEFAULT;
```

DROP (Table Deletion)

Both GaussDB(DWS) and MySQL can use the **DROP** statement to delete tables, but GaussDB(DWS) does not support the **RESTRICT | CASCADE** keyword in **DROP**. DSC will delete the keywords during migration.

Input

```
CREATE TABLE IF NOT EXISTS `public`.`express_elb_server`(  
  `runoob_id` VARCHAR(10),  
  `runoob_title` VARCHAR(100) NOT NULL,  
  `runoob_author` VARCHAR(40) NOT NULL,  
  `submission_date` VARCHAR(10)  
)ENGINE=InnoDB DEFAULT CHARSET=utf8;  
DROP TABLE `public`.`express_elb_server` RESTRICT;
```

Output

```
CREATE TABLE "public"."express_elb_server"
(
  "runoob_id" VARCHAR(10),
  "runoob_title" VARCHAR(100) NOT NULL,
  "runoob_author" VARCHAR(40) NOT NULL,
  "submission_date" VARCHAR(10)
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("runoob_id");
DROP TABLE "public"."express_elb_server";
```

TRUNCATE (Table Deletion)

In MySQL, the **TABLE** keyword can be omitted when the **TRUNCATE** statement is used to delete table data. GaussDB does not support this usage. In addition, DSC will add **CONTINUE IDENTITY RESTRICT** during **TRUNCATE** migration.

Input

```
TRUNCATE TABLE `public`.`test_create_table01`;
TRUNCATE TEST_CREATE_TABLE01;
```

Output

```
TRUNCATE TABLE "public"."test_create_table01" CONTINUE IDENTITY RESTRICT;
TRUNCATE TABLE "public"."test_create_table01" CONTINUE IDENTITY RESTRICT;
```

LOCK

GaussDB(DWS) does not support the **ALTER TABLE *tbName* LOCK** statement of MySQL, which will be deleted by DSC during migration.

Input

```
CREATE TABLE IF NOT EXISTS `runoob_alter_test` (
  `dataType1` int NOT NULL AUTO_INCREMENT,
  `dataType2` FLOAT(10),
  `dataType4` TEXT NOT NULL,
  `dataType5` YEAR NOT NULL DEFAULT '2018',
  `dataType6` DATETIME NOT NULL,
  `dataType7` CHAR NOT NULL DEFAULT "",
  `dataType8` VARCHAR(50),
  `dataType9` VARCHAR(50) NOT NULL DEFAULT "",
  `dataType10` TIME NOT NULL DEFAULT '10:20:59',
  PRIMARY KEY(`dataType1`)
)ENGINE=InnoDB DEFAULT CHARSET=utf8;

## A.
ALTER TABLE runoob_alter_test LOCK DEFAULT;

## B.
ALTER TABLE runoob_alter_test LOCK=DEFAULT;

## C.
ALTER TABLE runoob_alter_test LOCK EXCLUSIVE;

## D.
ALTER TABLE runoob_alter_test LOCK=EXCLUSIVE;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"
(
```

```
"datatype1" SERIAL NOT NULL,  
"datatype2" FLOAT(10),  
"datatype4" TEXT NOT NULL,  
"datatype5" VARCHAR(4) NOT NULL DEFAULT '2018',  
"datatype6" TIMESTAMP WITHOUT TIME ZONE NOT NULL,  
"datatype7" CHAR NOT NULL DEFAULT "",  
"datatype8" VARCHAR(50),  
"datatype9" VARCHAR(50) NOT NULL DEFAULT "",  
"datatype10" TIME WITHOUT TIME ZONE NOT NULL DEFAULT '10:20:59',  
PRIMARY KEY ("datatype1")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("datatype1");  
  
-- A.  
  
-- B.  
  
-- C.  
  
-- D.
```

RENAME (Table Renaming)

The statement for renaming a table in MySQL is slightly different from that in GaussDB(DWS). DSC will perform adaptation based on GaussDB features during migration.

CAUTION

Currently, DSC does not support original table names prefixed with **DATABASE/SCHEMA**.

1. MySQL uses the **RENAME TABLE** statement to change a table name.

Input

```
# Rename a single table.  
RENAME TABLE DEPARTMENT TO NEWDEPT;  
  
# Rename multiple tables.  
RENAME TABLE NEWDEPT TO NEWDEPT_02, PEOPLE TO PEOPLE_02;
```

Output

```
-- Rename a single table.  
ALTER TABLE "public"."department" RENAME TO "newdept";  
  
-- Rename multiple tables.  
ALTER TABLE "public"."newdept" RENAME TO "newdept_02";  
ALTER TABLE "public"."people" RENAME TO "people_02";
```

2. In MySQL, the **ALTER TABLE RENAME** statement is used to change a table name. When this statement is migrated by DSC, the keyword **AS** is converted to **TO**.

Input

```
## A.  
ALTER TABLE runoob_alter_test RENAME TO runoob_alter_testnew;  
  
## B.  
ALTER TABLE runoob_alter_testnew RENAME AS runoob_alter_testnewnew;
```

Output

```
-- A.  
ALTER TABLE "public"."runoob_alter_test" RENAME TO "runoob_alter_testnew";  
  
-- B.  
ALTER TABLE "public"."runoob_alter_testnew" RENAME TO "runoob_alter_testnewnew";
```

6.11.4 Unique Indexes

CAUTION

If MySQL unique indexes (constraints) and primary key constraints are used together during migration, OLAP distribution keys may become unavailable. Therefore, this scenario is not supported by DSC.

1. If there is an inline unique index, DSC will delete it directly.

Input

```
CREATE TABLE IF NOT EXISTS `public`.`runoob_datatype_test`  
(  
  `id` INT PRIMARY KEY AUTO_INCREMENT,  
  `name` VARCHAR(128) NOT NULL,  
  UNIQUE (id ASC)  
);
```

Output

```
CREATE TABLE "public"."runoob_datatype_test"  
(  
  "id" SERIAL PRIMARY KEY,  
  "name" VARCHAR(128) NOT NULL  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("id");
```

2. If there is a unique index created by **ALTER TABLE**, DSC will create a normal index based on GaussDB features.

Input

```
CREATE TABLE IF NOT EXISTS `public`.`runoob_alter_test`(  
  `dataType1` int,  
  `dataType2` FLOAT(10,2),  
  `dataType3` DOUBLE(20,8)  
)ENGINE=InnoDB DEFAULT CHARSET=utf8;  
  
ALTER TABLE runoob_alter_test ADD UNIQUE idx_runoob_alter_test_datatype1(dataType1);  
ALTER TABLE runoob_alter_test ADD UNIQUE INDEX idx_runoob_alter_test_datatype1(dataType2);  
ALTER TABLE runoob_alter_test ADD UNIQUE KEY idx_runoob_alter_test_datatype1(dataType3);  
  
CREATE TABLE IF NOT EXISTS `public`.`runoob_alter_test`(  
  `dataType1` int,  
  `dataType2` FLOAT(10,2),  
  `dataType3` DOUBLE(20,8),  
  `dataType4` TEXT NOT NULL,  
  `dataType5` YEAR NOT NULL DEFAULT '2018',  
  `dataType6` DATETIME NOT NULL DEFAULT '2018-10-12 15:27:33.999999'  
)ENGINE=InnoDB DEFAULT CHARSET=utf8;  
  
ALTER TABLE runoob_alter_test ADD CONSTRAINT UNIQUE  
idx_runoob_alter_test_datatype1(dataType1);  
ALTER TABLE runoob_alter_test ADD CONSTRAINT UNIQUE INDEX  
idx_runoob_alter_test_datatype2(dataType2);  
ALTER TABLE runoob_alter_test ADD CONSTRAINT UNIQUE KEY  
idx_runoob_alter_test_datatype3(dataType3);
```



```
ALTER TABLE runoob_alter_test ADD CONSTRAINT constraint_dataType UNIQUE
idx_runoob_alter_test_datatype4(dataType4);
ALTER TABLE runoob_alter_test ADD CONSTRAINT constraint_dataType UNIQUE INDEX
idx_runoob_alter_test_datatype5(dataType5);
ALTER TABLE runoob_alter_test ADD CONSTRAINT constraint_dataType UNIQUE KEY
idx_runoob_alter_test_datatype6(dataType6);
```

Output

```
CREATE TABLE "public"."runoob_alter_test"
(
  "datatype1" INTEGER,
  "datatype2" FLOAT(10),
  "datatype3" FLOAT(20)
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype1");

CREATE INDEX "idx_runoob_alter_test_datatype1" ON "public"."runoob_alter_test" ("datatype1");
CREATE INDEX "idx_runoob_alter_test_datatype1" ON "public"."runoob_alter_test" ("datatype2");
CREATE INDEX "idx_runoob_alter_test_datatype1" ON "public"."runoob_alter_test" ("datatype3");

CREATE TABLE "public"."runoob_alter_test"
(
  "datatype1" INTEGER,
  "datatype2" FLOAT(10),
  "datatype3" FLOAT(20),
  "datatype4" TEXT NOT NULL,
  "datatype5" VARCHAR(4) NOT NULL DEFAULT '2018',
  "datatype6" TIMESTAMP WITHOUT TIME ZONE NOT NULL DEFAULT '2018-10-12 15:27:33.999999'
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype1");

CREATE INDEX "idx_runoob_alter_test_datatype1" ON "public"."runoob_alter_test" ("datatype1");
CREATE INDEX "idx_runoob_alter_test_datatype2" ON "public"."runoob_alter_test" ("datatype2");
CREATE INDEX "idx_runoob_alter_test_datatype3" ON "public"."runoob_alter_test" ("datatype3");
CREATE INDEX "idx_runoob_alter_test_datatype4" ON "public"."runoob_alter_test" ("datatype4");
CREATE INDEX "idx_runoob_alter_test_datatype5" ON "public"."runoob_alter_test" ("datatype5");
CREATE INDEX "idx_runoob_alter_test_datatype6" ON "public"."runoob_alter_test" ("datatype6");
```

3. If there is a unique index created by **CREATE INDEX**, DSC will create a normal index based on GaussDB features.

Input

```
CREATE TABLE `public`.`test_index_table01` (
  `TABLE01_ID` INT(11) NOT NULL,
  `TABLE01_THEME` VARCHAR(100) NULL DEFAULT NULL,
  `AUTHOR_NAME` CHAR(10) NULL DEFAULT NULL,
  `AUTHOR_ID` INT(11) NULL DEFAULT NULL,
  `CREATE_TIME` INT NULL DEFAULT NULL,
  PRIMARY KEY(`TABLE01_ID`)
);
CREATE UNIQUE INDEX AUTHOR_INDEX ON `test_index_table01`(AUTHOR_ID);
```

Output

```
CREATE TABLE "public"."test_index_table01"
(
  "table01_id" INTEGER(11) NOT NULL,
  "table01_theme" VARCHAR(100) DEFAULT NULL,
  "author_name" CHAR(10) DEFAULT NULL,
  "author_id" INTEGER(11) DEFAULT NULL,
  "create_time" INTEGER DEFAULT NULL,
  PRIMARY KEY ("table01_id")
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("table01_id");
CREATE INDEX "author_index" ON "public"."test_index_table01" ("author_id");
```

6.11.5 Normal and Prefix Indexes

GaussDB(DWS) does not support prefix indexes or inline normal indexes. DSC will replace these indexes with normal indexes based on GaussDB features.

1. Inline normal/prefix index

Input

```
CREATE TABLE IF NOT EXISTS `public`.`runoob_datatype_test`  
(  
  `id` INT PRIMARY KEY AUTO_INCREMENT,  
  `name` VARCHAR(128) NOT NULL,  
  INDEX index_single(name(10))  
);
```

Output

```
CREATE TABLE "public"."runoob_datatype_test"  
(  
  "id" SERIAL PRIMARY KEY,  
  "name" VARCHAR(128) NOT NULL  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("id");  
CREATE INDEX "index_single" ON "public"."runoob_datatype_test" USING BTREE ("name");
```

2. Normal/Prefix index created by **ALTER TABLE**

Input

```
CREATE TABLE `public`.`test_create_table05` (  
  `ID` INT(11) NOT NULL AUTO_INCREMENT,  
  `USER_ID` INT(20) NOT NULL,  
  `USER_NAME` CHAR(20) NULL DEFAULT NULL,  
  `DETAIL` VARCHAR(100) NULL DEFAULT NULL,  
  PRIMARY KEY (`ID`)  
);
```

```
ALTER TABLE TEST_CREATE_TABLE05 ADD INDEX USER_NAME_INDEX_02(USER_NAME(10));
```

Output

```
CREATE TABLE "public"."test_create_table05"  
(  
  "id" SERIAL NOT NULL,  
  "user_id" INTEGER(20) NOT NULL,  
  "user_name" CHAR(20) DEFAULT NULL,  
  "detail" VARCHAR(100) DEFAULT NULL,  
  PRIMARY KEY ("id")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("id");  
CREATE INDEX "user_name_index_02" ON "public"."test_create_table05" ("user_name");
```

3. Normal/Prefix index created by **CREATE INDEX**

Input

```
CREATE TABLE IF NOT EXISTS `public`.`customer`(  
  `name` varchar(64) primary key,  
  id integer,  
  id2 integer  
);  
CREATE INDEX part_of_name ON customer (name(10));
```

Output

```
CREATE TABLE "public"."customer"  
(
```

```
"name" VARCHAR(64) PRIMARY KEY,  
"id" INTEGER,  
"id2" INTEGER  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("name");  
  
CREATE INDEX "part_of_name" ON "public"."customer" USING BTREE ("name");
```

6.11.6 Hash Indexes

GaussDB(DWS) does not support hash indexes. DSC will replace these indexes with normal indexes based on GaussDB features.

1. Inline hash index

Input

```
CREATE TABLE `public`.`test_create_table03` (  
  `DEMAND_ID` INT(11) NOT NULL AUTO_INCREMENT,  
  `DEMAND_NAME` CHAR(100) NOT NULL,  
  `THEME` VARCHAR(200) NULL DEFAULT NULL,  
  `SEND_ID` INT(11) NULL DEFAULT NULL,  
  `SEND_NAME` CHAR(20) NULL DEFAULT NULL,  
  `SEND_TIME` DATETIME NULL DEFAULT NULL,  
  `DEMAND_CONTENT` TEXT NOT NULL,  
  PRIMARY KEY(`DEMAND_ID`),  
  INDEX CON_INDEX(DEMAND_CONTENT(100)) USING HASH ,  
  INDEX SEND_INFO_INDEX USING HASH (SEND_ID,SEND_NAME(10),SEND_TIME)  
);
```

Output

```
CREATE TABLE "public"."test_create_table03"  
(  
  "demand_id" SERIAL NOT NULL,  
  "demand_name" CHAR(100) NOT NULL,  
  "theme" VARCHAR(200) DEFAULT NULL,  
  "send_id" INTEGER(11) DEFAULT NULL,  
  "send_name" CHAR(20) DEFAULT NULL,  
  "send_time" TIMESTAMP WITHOUT TIME ZONE DEFAULT NULL,  
  "demand_content" TEXT NOT NULL,  
  PRIMARY KEY ("demand_id")  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("demand_id");  
CREATE INDEX "con_index" ON "public"."test_create_table03" ("demand_content");  
CREATE INDEX "send_info_index" ON "public"."test_create_table03"  
("send_id","send_name","send_time");
```

2. Hash index created by **ALTER TABLE**

Input

```
CREATE TABLE IF NOT EXISTS `public`.`runoob_alter_test` (  
  `dataType1` int NOT NULL AUTO_INCREMENT,  
  `dataType2` FLOAT(10,2),  
  PRIMARY KEY(`dataType1`)  
)ENGINE=InnoDB DEFAULT CHARSET=utf8;  
  
ALTER TABLE runoob_alter_test ADD KEY alterTable_addKey_indexType(dataType1) USING HASH;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"  
(  
  "datatype1" SERIAL NOT NULL,  
  "datatype2" FLOAT(10),  
  PRIMARY KEY ("datatype1")  
)
```

```
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype1");

CREATE INDEX "altertable_addkey_indeytype" ON "public"."runoob_alter_test" ("datatype1");
```

3. Hash index created by **CREATE INDEX**

Input

```
CREATE TABLE `public`.`test_index_table06` (
  `ID` INT(11) NOT NULL AUTO_INCREMENT,
  `FNAME` VARCHAR(30) NOT NULL,
  `INAME` VARCHAR(30) NOT NULL,
  PRIMARY KEY (`ID`)
);
CREATE INDEX FNAME_INDEX ON TEST_INDEX_TABLE06(FNAME(10)) USING HASH;
CREATE INDEX NAME_01 ON TEST_INDEX_TABLE06(FNAME(10),INAME(10)) USING HASH;
```

Output

```
CREATE TABLE "public"."test_index_table06"
(
  "id" SERIAL NOT NULL,
  "fname" VARCHAR(30) NOT NULL,
  "iname" VARCHAR(30) NOT NULL,
  PRIMARY KEY ("id")
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("id");
CREATE INDEX "fname_index" ON "public"."test_index_table06" ("fname");
CREATE INDEX "name_01" ON "public"."test_index_table06" ("fname","iname");
```

6.11.7 B-tree Indexes

GaussDB(DWS) supports B-tree indexes, but the position of the **USING BTREE** keyword in a statement is different from that in MySQL. DSC will perform adaptation based on GaussDB features during migration.

1. Inline B-tree index

Input

```
CREATE TABLE `public`.`test_create_table03` (
  `DEMAND_ID` INT(11) NOT NULL AUTO_INCREMENT,
  `DEMAND_NAME` CHAR(100) NOT NULL,
  `THEME` VARCHAR(200) NULL DEFAULT NULL,
  `SEND_ID` INT(11) NULL DEFAULT NULL,
  `SEND_NAME` CHAR(20) NULL DEFAULT NULL,
  `SEND_TIME` DATETIME NULL DEFAULT NULL,
  `DEMAND_CONTENT` TEXT NOT NULL,
  PRIMARY KEY(`DEMAND_ID`),
  INDEX THEME_INDEX(THEME) USING BTREE,
  INDEX NAME_INDEX USING BTREE (SEND_NAME(10))
);
```

Output

```
CREATE TABLE "public"."test_create_table03"
(
  "demand_id" SERIAL NOT NULL,
  "demand_name" CHAR(100) NOT NULL,
  "theme" VARCHAR(200) DEFAULT NULL,
  "send_id" INTEGER(11) DEFAULT NULL,
  "send_name" CHAR(20) DEFAULT NULL,
  "send_time" TIMESTAMP WITHOUT TIME ZONE DEFAULT NULL,
  "demand_content" TEXT NOT NULL,
  PRIMARY KEY ("demand_id")
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
```

```
DISTRIBUTE BY HASH ("demand_id");
CREATE INDEX "theme_index" ON "public"."test_create_table03" USING BTREE ("theme");
CREATE INDEX "name_index" ON "public"."test_create_table03" USING BTREE ("send_name");
```

2. B-tree index created by **ALTER TABLE**

Input

```
CREATE TABLE IF NOT EXISTS `public`.`runoob_alter_test` (
  `dataType1` int NOT NULL AUTO_INCREMENT,
  `dataType2` FLOAT(10,2),
  PRIMARY KEY(`dataType1`)
);
```

```
ALTER TABLE runoob_alter_test ADD KEY alterTable_addKey_indexType (dataType1) USING BTREE;
```

Output

```
CREATE TABLE "public"."runoob_alter_test"
(
  "datatype1" SERIAL NOT NULL,
  "datatype2" FLOAT(10),
  PRIMARY KEY ("datatype1")
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("datatype1");

CREATE INDEX "altertable_addkey_indextype" ON "public"."runoob_alter_test" ("datatype1");
```

3. B-tree index created by **CREATE INDEX**

Input

```
CREATE TABLE `public`.`test_create_table03` (
  `DEMAND_ID` INT(11) NOT NULL AUTO_INCREMENT,
  `DEMAND_NAME` CHAR(100) NOT NULL,
  `THEME` VARCHAR(200) NULL DEFAULT NULL,
  `SEND_ID` INT(11) NULL DEFAULT NULL,
  `SEND_NAME` CHAR(20) NULL DEFAULT NULL,
  `SEND_TIME` DATETIME NULL DEFAULT NULL,
  `DEMAND_CONTENT` TEXT NOT NULL,
  PRIMARY KEY(`DEMAND_ID`),
  INDEX CON_INDEX(DEMAND_CONTENT(100)) USING HASH ,
  INDEX SEND_INFO_INDEX USING HASH (SEND_ID,SEND_NAME(10),SEND_TIME)
);
```

```
CREATE TABLE `public`.`test_index_table05` (
  `ID` INT(11) NOT NULL AUTO_INCREMENT,
  `USER_ID` INT(20) NOT NULL,
  `USER_NAME` CHAR(20) NULL DEFAULT NULL,
  `DETAIL` VARCHAR(100) NULL DEFAULT NULL,
  PRIMARY KEY (`ID`)
);
CREATE UNIQUE INDEX USER_ID_INDEX USING BTREE ON TEST_INDEX_TABLE05(USER_ID);
CREATE INDEX USER_NAME_INDEX USING BTREE ON TEST_INDEX_TABLE05(USER_NAME(10));
CREATE INDEX DETAIL_INDEX ON TEST_INDEX_TABLE05(DETAIL(50)) USING BTREE;
CREATE INDEX USER_INFO_INDEX USING BTREE ON
TEST_INDEX_TABLE05(USER_ID,USER_NAME(10));
```

Output

```
CREATE TABLE "public"."test_index_table05"
(
  "id" SERIAL NOT NULL,
  "user_id" INTEGER(20) NOT NULL,
  "user_name" CHAR(20) DEFAULT NULL,
  "detail" VARCHAR(100) DEFAULT NULL,
  PRIMARY KEY ("id")
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("id");
```

```
CREATE INDEX "user_id_index" ON "public"."test_index_table05" ("user_id");
CREATE INDEX "user_name_index" ON "public"."test_index_table05" USING BTREE ("user_name");
CREATE INDEX "detail_index" ON "public"."test_index_table05" USING BTREE ("detail");
CREATE INDEX "user_info_index" ON "public"."test_index_table05" USING BTREE
("user_id","user_name");
```

6.11.8 Spatial Indexes

GaussDB(DWS) does not support spatial indexes. DSC will perform adaptation based on GaussDB features during migration.

1. Inline spatial index

Input

```
CREATE TABLE `public`.`test_create_table04` (
  `ID` INT(11) NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `A` POINT NOT NULL,
  `B` POLYGON NOT NULL,
  `C` GEOMETRYCOLLECTION NOT NULL,
  `D` LINestring NOT NULL,
  `E` MULTILINESTRING NOT NULL,
  `F` MULTIPOINT NOT NULL,
  `G` MULTIPOLYGON NOT NULL,
  SPATIAL INDEX A_INDEX(A),
  SPATIAL INDEX B_INDEX(B),
  SPATIAL INDEX C_INDEX(C),
  SPATIAL KEY D_INDEX(D),
  SPATIAL KEY E_INDEX(E),
  SPATIAL KEY F_INDEX(F),
  SPATIAL INDEX G_INDEX(G)
);
```

Output

```
CREATE TABLE "public"."test_create_table04"
(
  "id" SERIAL NOT NULL PRIMARY KEY,
  "a" POINT NOT NULL,
  "b" POLYGON NOT NULL,
  "c" CIRCLE NOT NULL,
  "d" POLYGON NOT NULL,
  "e" BOX NOT NULL,
  "f" BOX NOT NULL,
  "g" POLYGON NOT NULL
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("id");
CREATE INDEX "a_index" ON "public"."test_create_table04" USING GIST ("a");
CREATE INDEX "b_index" ON "public"."test_create_table04" USING GIST ("b");
CREATE INDEX "c_index" ON "public"."test_create_table04" USING GIST ("c");
CREATE INDEX "d_index" ON "public"."test_create_table04" USING GIST ("d");
CREATE INDEX "e_index" ON "public"."test_create_table04" USING GIST ("e");
CREATE INDEX "f_index" ON "public"."test_create_table04" USING GIST ("f");
CREATE INDEX "g_index" ON "public"."test_create_table04" USING GIST ("g");
```

2. Spatial index created by ALTER TABLE

Input

```
CREATE TABLE `public`.`test_create_table04` (
  `ID` INT(11) NOT NULL AUTO_INCREMENT PRIMARY KEY,
  `A` POINT NOT NULL,
  `B` POLYGON NOT NULL,
  `C` GEOMETRYCOLLECTION NOT NULL,
  `D` LINestring NOT NULL,
  `E` MULTILINESTRING NOT NULL,
  `F` MULTIPOINT NOT NULL,
  `G` MULTIPOLYGON NOT NULL
```

```
);  
ALTER TABLE `test_create_table04` ADD SPATIAL INDEX A_INDEX(A);  
ALTER TABLE `test_create_table04` ADD SPATIAL INDEX E_INDEX(E) USING BTREE;
```

Output

```
CREATE TABLE "public"."test_create_table04"  
(  
  "id" SERIAL NOT NULL PRIMARY KEY,  
  "a" POINT NOT NULL,  
  "b" POLYGON NOT NULL,  
  "c" CIRCLE NOT NULL,  
  "d" POLYGON NOT NULL,  
  "e" BOX NOT NULL,  
  "f" BOX NOT NULL,  
  "g" POLYGON NOT NULL  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("id");  
  
CREATE INDEX "a_index" ON "public"."test_create_table04" USING GIST ("a");  
CREATE INDEX "e_index" ON "public"."test_create_table04" USING GIST ("e");
```

3. Spatial index created by **CREATE INDEX**

Input

```
CREATE TABLE `public`.`test_create_table04` (  
  `ID` INT(11) NOT NULL AUTO_INCREMENT PRIMARY KEY,  
  `A` POINT NOT NULL,  
  `B` POLYGON NOT NULL,  
  `C` GEOMETRYCOLLECTION NOT NULL,  
  `D` LINestring NOT NULL,  
  `E` MULTILINESTRING NOT NULL,  
  `F` MULTIPOINT NOT NULL,  
  `G` MULTIPOLYGON NOT NULL  
);  
  
CREATE SPATIAL INDEX A_INDEX ON `test_create_table04`(A);
```

Output

```
CREATE TABLE "public"."test_create_table04"  
(  
  "id" SERIAL NOT NULL PRIMARY KEY,  
  "a" POINT NOT NULL,  
  "b" POLYGON NOT NULL,  
  "c" CIRCLE NOT NULL,  
  "d" POLYGON NOT NULL,  
  "e" BOX NOT NULL,  
  "f" BOX NOT NULL,  
  "g" POLYGON NOT NULL  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("id");  
  
CREATE INDEX "a_index" ON "public"."test_create_table04" USING GIST ("a");
```

6.11.9 Delete an Index

MySQL supports both **DROP INDEX** and **ALTER TABLE DROP INDEX** for deleting indexes. DSC will perform adaptation based on GaussDB features during migration.

1. DROP INDEX

Input

```
CREATE TABLE `test_create_table03` (  
  `DEMAND_ID` INT(11) NOT NULL,  
  `DEMAND_NAME` CHAR(100) NOT NULL,  
  `THEME` VARCHAR(200) NULL DEFAULT NULL,  
  `SEND_ID` INT(11) NULL DEFAULT NULL,  
  `SEND_NAME` CHAR(20) NULL DEFAULT NULL,  
  `SEND_TIME` DATETIME NULL DEFAULT NULL,  
  `DEMAND_CONTENT` TEXT NOT NULL  
)  
COLLATE='utf8_general_ci'  
ENGINE=InnoDB;  
  
CREATE UNIQUE INDEX DEMAND_NAME_INDEX ON TEST_CREATE_TABLE03(DEMAND_NAME);  
DROP INDEX DEMAND_NAME_INDEX ON TEST_CREATE_TABLE03;  
  
CREATE INDEX SEND_ID_INDEX ON TEST_CREATE_TABLE03(SEND_ID);  
DROP INDEX SEND_ID_INDEX ON TEST_CREATE_TABLE03;
```

Output

```
CREATE TABLE "public"."test_create_table03"  
(  
  "demand_id" INTEGER(11) NOT NULL,  
  "demand_name" CHAR(100) NOT NULL,  
  "theme" VARCHAR(200) DEFAULT NULL,  
  "send_id" INTEGER(11) DEFAULT NULL,  
  "send_name" CHAR(20) DEFAULT NULL,  
  "send_time" TIMESTAMP WITHOUT TIME ZONE DEFAULT NULL,  
  "demand_content" TEXT NOT NULL  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )  
NOCOMPRESS  
DISTRIBUTE BY HASH ("demand_id");  
  
CREATE INDEX "demand_name_index" ON "public"."test_create_table03" ("demand_name");  
DROP INDEX "demand_name_index" RESTRICT;  
  
CREATE INDEX "send_id_index" ON "public"."test_create_table03" USING BTREE ("send_id");  
DROP INDEX "send_id_index" RESTRICT;
```

2. ALTER TABLE DROP INDEX

Input

```
CREATE TABLE `test_create_table03` (  
  `DEMAND_ID` INT(11) NOT NULL,  
  `DEMAND_NAME` CHAR(100) NOT NULL,  
  `THEME` VARCHAR(200) NULL DEFAULT NULL,  
  `SEND_ID` INT(11) NULL DEFAULT NULL,  
  `SEND_NAME` CHAR(20) NULL DEFAULT NULL,  
  `SEND_TIME` DATETIME NULL DEFAULT NULL,  
  `DEMAND_CONTENT` TEXT NOT NULL  
)  
COLLATE='utf8_general_ci'  
ENGINE=InnoDB;  
  
ALTER TABLE TEST_CREATE_TABLE03 ADD UNIQUE INDEX  
TEST_CREATE_TABLE03_NAME_INDEX(DEMAND_NAME(50));  
ALTER TABLE TEST_CREATE_TABLE03 DROP INDEX TEST_CREATE_TABLE03_NAME_INDEX;
```

Output

```
CREATE TABLE "public"."test_create_table03"  
(  
  "demand_id" INTEGER(11) NOT NULL,  
  "demand_name" CHAR(100) NOT NULL,  
  "theme" VARCHAR(200) DEFAULT NULL,  
  "send_id" INTEGER(11) DEFAULT NULL,  
  "send_name" CHAR(20) DEFAULT NULL,  
  "send_time" TIMESTAMP WITHOUT TIME ZONE DEFAULT NULL,  
  "demand_content" TEXT NOT NULL  
)  
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
```



```
NOCOMPRESS
DISTRIBUTE BY HASH ("demand_id");

CREATE INDEX "test_create_table03_name_index" ON "public"."test_create_table03"
("demand_name");
DROP INDEX "test_create_table03_name_index" RESTRICT;
```

6.11.10 Comments

To comment out a single line, MySQL uses # or --, and GaussDB(DWS) uses --. DSC will replace # with -- for commenting out a single line during migration.

Input

```
## comment sample create a table
CREATE TABLE IF NOT EXISTS `public`.`runoob_tbl` (
  `runoob_id` VARCHAR,
  `runoob_title` VARCHAR(100) NOT NULL,
  `runoob_author` VARCHAR(40) NOT NULL,
  `submission_date` VARCHAR
)ENGINE=InnoDB DEFAULT CHARSET=utf8;
```

Output

```
-- comment sample create a table
CREATE TABLE "public"."runoob_tbl"
(
  "runoob_id" VARCHAR,
  "runoob_title" VARCHAR(100) NOT NULL,
  "runoob_author" VARCHAR(40) NOT NULL,
  "submission_date" VARCHAR
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("runoob_id");
```

6.11.11 Databases

In MySQL, **DATABASE** is a schema object, which is equivalent to the **SCHEMA** of Oracle and GaussDB(DWS). DSC supports the following two scenarios:

1. Database creation

Input

```
create database IF NOT EXISTS dbname1 CHARACTER SET=utf8 COLLATE=utf8_unicode_ci;
create database IF NOT EXISTS dbname2;

drop database if exists dbname1;
drop database if exists dbname2;
```

Output

```
CREATE SCHEMA "dbname1";
CREATE SCHEMA "dbname2";

DROP SCHEMA IF EXISTS "dbname1";
DROP SCHEMA IF EXISTS "dbname2";
```

2. Database use

Input

```
drop database if exists test;
create database if not exists test;
use test;
```

Output

```
DROP SCHEMA IF EXISTS "test";
CREATE SCHEMA "test";
SET CURRENT_SCHEMA = "test";
```

6.11.12 Data Manipulation Language (DML)

This section describes the migration syntax of MySQL DML. The migration syntax determines how the keywords and features are migrated.

For details, see the following topics:

- [INSERT](#)
- [UPDATE](#)
- [REPLACE](#)

INSERT

In MySQL, **INSERT** allows the following keywords: **HIGH_PRIORITY**, **LOW_PRIORITY**, **PARTITION**, **DELAYED**, **IGNORE**, **VALUES**, and **ON DUPLICATE KEY UPDATE**. GaussDB(DWS) does not support these keywords, and DSC will convert them.

1. HIGH_PRIORITY

MySQL uses **HIGH_PRIORITY** will override the effect of the **LOW_PRIORITY** option.

Input

```
# HIGH_PRIORITY
INSERT HIGH_PRIORITY INTO exmp_tb2 VALUES(100, 12.3, 'cheap', '2018-11-11');
INSERT HIGH_PRIORITY INTO exmp_tb2 VALUES(DEFAULT, 128.23, 'nice', '2018-10-11');
INSERT HIGH_PRIORITY INTO exmp_tb2 VALUES(DEFAULT, DEFAULT, 'nice', '2018-12-14');
INSERT HIGH_PRIORITY INTO exmp_tb2 VALUES(DEFAULT, DEFAULT, 'nice', DEFAULT);
INSERT HIGH_PRIORITY INTO exmp_tb2 (tb2_id, tb2_price) VALUES(DEFAULT, DEFAULT);
INSERT HIGH_PRIORITY INTO exmp_tb2 (tb2_id, tb2_price, tb2_note) VALUES(DEFAULT, DEFAULT,
DEFAULT);
INSERT HIGH_PRIORITY INTO exmp_tb2 (tb2_id, tb2_price , tb2_note) VALUES(DEFAULT, DEFAULT,
DEFAULT);
INSERT HIGH_PRIORITY INTO exmp_tb2 (tb2_id, tb2_price, tb2_note, tb2_date) VALUES(DEFAULT,
DEFAULT, DEFAULT, DEFAULT);
```

Output

```
-- HIGH_PRIORITY
INSERT INTO "public"."exmp_tb2" VALUES (100,12.3,'cheap','2018-11-11');
INSERT INTO "public"."exmp_tb2" VALUES (DEFAULT,128.23,'nice','2018-10-11');
INSERT INTO "public"."exmp_tb2" VALUES (DEFAULT,DEFAULT,'nice','2018-12-14');
INSERT INTO "public"."exmp_tb2" VALUES (DEFAULT,DEFAULT,'nice',DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price") VALUES (DEFAULT,DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price","tb2_note") VALUES
(DEFAULT,DEFAULT,DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price","tb2_note") VALUES
(DEFAULT,DEFAULT,DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price","tb2_note","tb2_date") VALUES
(DEFAULT,DEFAULT,DEFAULT,DEFAULT);
```

2. LOW_PRIORITY

When the **LOW_PRIORITY** modifier is used, execution of **INSERT** is delayed.

Input

```
# LOW_PRIORITY
INSERT LOW_PRIORITY INTO exmp_tb2 VALUES( DEFAULT, '128.23', 'nice', '2018-10-11');
INSERT LOW_PRIORITY INTO exmp_tb2 VALUES(DEFAULT, DEFAULT, 'nice', '2018-12-14' );
INSERT LOW_PRIORITY INTO exmp_tb2 VALUES(DEFAULT, DEFAULT, 'nice', DEFAULT);
```

```
INSERT LOW_PRIORITY INTO exmp_tb2 (tb2_id, tb2_price) VALUES(DEFAULT, DEFAULT);
INSERT LOW_PRIORITY INTO exmp_tb2 (tb2_id, tb2_price, tb2_note) VALUES(DEFAULT, DEFAULT,
DEFAULT);
```

Output

```
-- LOW_PRIORITY
INSERT INTO "public"."exmp_tb2" VALUES (DEFAULT,'128.23','nice','2018-10-11');
INSERT INTO "public"."exmp_tb2" VALUES (DEFAULT,DEFAULT,'nice','2018-12-14');
INSERT INTO "public"."exmp_tb2" VALUES (DEFAULT,DEFAULT,'nice',DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price") VALUES (DEFAULT,DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price","tb2_note") VALUES
(DEFAULT,DEFAULT,DEFAULT);
```

3. PRATITION

When inserting into a partitioned table, you can control which partitions and subpartitions accept new rows.

Input

```
INSERT INTO employees PARTITION(p3) VALUES (19, 'Frank1', 'Williams', 1, 2);
INSERT INTO employees PARTITION(p0) VALUES (4, 'Frank1', 'Williams', 1, 2);
INSERT INTO employees PARTITION(p1) VALUES (9, 'Frank1', 'Williams', 1, 2);
INSERT INTO employees PARTITION(p2) VALUES (10, 'Frank1', 'Williams', 1, 2);
INSERT INTO employees PARTITION(p2) VALUES (11, 'Frank1', 'Williams', 1, 2);
```

Output

```
INSERT INTO "public"."employees" VALUES (19,'Frank1','Williams',1,2);
INSERT INTO "public"."employees" VALUES (4,'Frank1','Williams',1,2);
INSERT INTO "public"."employees" VALUES (9,'Frank1','Williams',1,2);
INSERT INTO "public"."employees" VALUES (10,'Frank1','Williams',1,2);
INSERT INTO "public"."employees" VALUES (11,'Frank1','Williams',1,2);
```

4. DELAYED

NOTICE

In MySQL 5.7, the **DELAYED** keyword is recognized but ignored by the server.

Input

```
# DELAYED
INSERT DELAYED INTO exmp_tb2 VALUES(99, 15.68, 'good', '2018-11-12');
INSERT DELAYED INTO exmp_tb2 VALUES(80, 12.3, 'cheap', '2018-11-11');
INSERT DELAYED INTO exmp_tb2 VALUES(DEFAULT, 128.23, 'nice', '2018-10-11');
INSERT DELAYED INTO exmp_tb2 VALUES(DEFAULT, DEFAULT, 'nice', '2018-12-14');
INSERT DELAYED INTO exmp_tb2 VALUES(DEFAULT, DEFAULT, 'nice', DEFAULT);
INSERT DELAYED INTO exmp_tb2 (tb2_id, tb2_price) VALUES(DEFAULT, DEFAULT);
INSERT DELAYED INTO exmp_tb2 (tb2_id, tb2_price, tb2_note) VALUES(DEFAULT, DEFAULT,
DEFAULT);
INSERT DELAYED INTO exmp_tb2 (tb2_id, tb2_price, tb2_note, tb2_date) VALUES(DEFAULT, DEFAULT,
DEFAULT, DEFAULT);
```

Output

```
-- DELAYED
INSERT INTO "public"."exmp_tb2" VALUES (99,15.68,'good','2018-11-12');
INSERT INTO "public"."exmp_tb2" VALUES (80,12.3,'cheap','2018-11-11');
INSERT INTO "public"."exmp_tb2" VALUES (DEFAULT,128.23,'nice','2018-10-11');
INSERT INTO "public"."exmp_tb2" VALUES (DEFAULT,DEFAULT,'nice','2018-12-14');
INSERT INTO "public"."exmp_tb2" VALUES (DEFAULT,DEFAULT,'nice',DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price") VALUES (DEFAULT,DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price","tb2_note") VALUES
(DEFAULT,DEFAULT,DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price","tb2_note","tb2_date") VALUES
(DEFAULT,DEFAULT,DEFAULT,DEFAULT);
```

5. IGNORE

When the **IGNORE** modifier is used, errors that occur during **INSERT** execution are ignored.

Input

```
# New data will be ignored if there is duplicate in the table.
INSERT IGNORE INTO exmp_tb2 VALUES(189, '189.23','nice','2017-11-12');
INSERT IGNORE INTO exmp_tb2 VALUES(130,'189.23','nice','2017-11-12');
INSERT IGNORE INTO exmp_tb2 VALUES(120,15.68,'good','2018-11-12');
INSERT IGNORE INTO exmp_tb2 VALUES(DEFAULT,128.23,'nice','2018-10-11');
INSERT IGNORE INTO exmp_tb2 VALUES(DEFAULT,DEFAULT,'nice','2018-12-14');
INSERT IGNORE INTO exmp_tb2 VALUES(DEFAULT,DEFAULT,'nice',DEFAULT);test
INSERT IGNORE INTO exmp_tb2 (tb2_id,tb2_price) VALUES(DEFAULT,DEFAULT);
INSERT IGNORE INTO exmp_tb2 (tb2_id,tb2_price,tb2_note) VALUES(DEFAULT,DEFAULT,DEFAULT);
INSERT IGNORE INTO exmp_tb2 (tb2_id,tb2_price,tb2_note,tb2_date)
VALUES(DEFAULT,DEFAULT,DEFAULT,DEFAULT);
```

Output

```
-- New data will be ignored if there is duplicate in the table.
INSERT INTO "public"."exmp_tb2" VALUES (101,'189.23','nice','2017-11-12');
INSERT INTO "public"."exmp_tb2" VALUES (130,'189.23','nice','2017-11-12');
INSERT INTO "public"."exmp_tb2" VALUES (120,15.68,'good','2018-11-12');
INSERT INTO "public"."exmp_tb2" VALUES (DEFAULT,128.23,'nice','2018-10-11');
INSERT INTO "public"."exmp_tb2" VALUES (DEFAULT,DEFAULT,'nice','2018-12-14');
INSERT INTO "public"."exmp_tb2" VALUES (DEFAULT,DEFAULT,'nice',DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price") VALUES (DEFAULT,DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price","tb2_note") VALUES
(DEFAULT,DEFAULT,DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price","tb2_note","tb2_date") VALUES
(DEFAULT,DEFAULT,DEFAULT,DEFAULT);
```

6. VALUES

INSERT statements use the **VALUES** syntax can insert multiple lines, separated by commas.

Input

```
INSERT INTO exmp_tb1 (tb1_name,tb1_sex,tb1_address,tb1_number)
VALUES('David','male','NewYork','01015827875'),('Rachel','female','NewYork','01015827749'),
('Monica','female','NewYork','010158996743');
```

Output

```
INSERT INTO "public"."exmp_tb1" ("tb1_name","tb1_sex","tb1_address","tb1_number") VALUES
('David','male','NewYork','01015827875');
INSERT INTO "public"."exmp_tb1" ("tb1_name","tb1_sex","tb1_address","tb1_number") VALUES
('Rachel','female','NewYork','01015827749');
INSERT INTO "public"."exmp_tb1" ("tb1_name","tb1_sex","tb1_address","tb1_number") VALUES
('Monica','female','NewYork','010158996743');
```

7. ON DUPLICATE KEY UPDATE

INSERT uses the **ON DUPLICATE KEY UPDATE** clause to update existing rows.

Input

```
# ON DUPLICATE KEY UPDATE (If new data will cause a duplicate value in the primary/unique key,
UPDATE will work. Otherwise, INSERT will work.)
INSERT INTO exmp_tb2(tb2_id,tb2_price) VALUES(3,12.3) ON DUPLICATE KEY UPDATE
tb2_price=12.3;
INSERT INTO exmp_tb2(tb2_id,tb2_price) VALUES(4,12.3) ON DUPLICATE KEY UPDATE
tb2_price=12.3;
INSERT INTO exmp_tb2(tb2_id,tb2_price,tb2_note) VALUES(10,DEFAULT,DEFAULT) ON DUPLICATE
KEY UPDATE tb2_price=66.6;
INSERT INTO exmp_tb2(tb2_id,tb2_price,tb2_note,tb2_date) VALUES(11,DEFAULT,DEFAULT,DEFAULT)
ON DUPLICATE KEY UPDATE tb2_price=66.6;
```

Output

```
-- ON DUPLICATE KEY UPDATE (If new data will cause a duplicate value in the primary/unique key,
UPDATE will work. Otherwise, INSERT will work.)
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price") VALUES (3,12.3);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price") VALUES (4,12.3);
```

```
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price","tb2_note") VALUES (10,DEFAULT,DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price","tb2_note","tb2_date") VALUES
(11,DEFAULT,DEFAULT,DEFAULT);
```

8. SET

MySQL INSERT...SET statement inserts rows based on explicitly specified values.

Input

```
# INSERT INTO SET (Data records can be inserted specially. One record can be inserted at a time,
and batch insertion is not supported.)
```

```
INSERT INTO exmp_tb2 SET tb2_price=56.1,tb2_note='unbelievable',tb2_date='2018-11-13';
INSERT INTO exmp_tb2 SET tb2_price=99.9,tb2_note='perfect',tb2_date='2018-10-13';
INSERT INTO exmp_tb2 SET tb2_id=9,tb2_price=99.9,tb2_note='perfect',tb2_date='2018-10-13';
```

Output

```
-- INSERT INTO SET (Data records can be inserted specially. One record can be inserted at a time,
and batch insertion is not supported.)
```

```
INSERT INTO "public"."exmp_tb2" ("tb2_price","tb2_note","tb2_date") VALUES
(56.1,'unbelievable','2018-11-13');
INSERT INTO "public"."exmp_tb2" ("tb2_price","tb2_note","tb2_date") VALUES
(99.9,'perfect','2018-10-13');
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price","tb2_note","tb2_date") VALUES
(9,99.9,'perfect','2018-10-13');
```

UPDATE

In MySQL, **UPDATE** allows the following keywords: **LOW_PRIORITY**, **ORDER BY**, **LIMIT**, and **IGNORE**. GaussDB(DWS) does not support these keywords, and DSC will convert them.

1. LOW_PRIORITY

With the **LOW_PRIORITY** modifier, execution of **UPDATE** is delayed.

Input

```
# LOW_PRIORITY
UPDATE LOW_PRIORITY employees SET department_id=2;
```

Output

```
-- LOW_PRIORITY
UPDATE "public"."employees" SET "department_id" = 2;
```

2. ORDER_BY

In MySQL, if an **UPDATE** statement includes an **ORDER BY** clause, the rows will be updated in the order specified by the clause.

Input

```
# ORDER BY
UPDATE employees SET department_id=department_id+1 ORDER BY id;
```

Output

```
-- ORDER BY
UPDATE "public"."employees" SET "department_id" = department_id+1;
```

3. LIMIT

UPDATE LIMIT syntax can be used to limit the scope. A clause is a limit on row matching. As long as the rows that satisfy the clause are found, the statements will stop, regardless of whether they have actually changed.

Input

```
# LIMIT
UPDATE employees SET department_id=department_id+1 LIMIT 3 ;
UPDATE employees SET department_id=department_id+1 LIMIT 3 , 10 ;
```

```
# LIMIT + OFFSET
UPDATE employees SET department_id=department_id+1 LIMIT 3 OFFSET 2;

# LIMIT + ORDER BY
UPDATE employees SET department_id=department_id+1 ORDER BY fname LIMIT 3 ;

# LIMIT + WHERE + ORDER BY
UPDATE employees SET department_id=department_id+1 WHERE id<5 ORDER BY fname LIMIT 3 ;

# LIMIT + WHERE + ORDER BY + OFFSET
UPDATE employees SET department_id=department_id+1 WHERE id<5 ORDER BY fname LIMIT 3
OFFSET 2 ;
```

Output

```
-- LIMIT
UPDATE "public"."employees" SET "department_id" = department_id+1;
UPDATE "public"."employees" SET "department_id" = department_id+1;

-- LIMIT + OFFSET
UPDATE "public"."employees" SET "department_id" = department_id+1;

-- LIMIT + ORDER BY
UPDATE "public"."employees" SET "department_id" = department_id+1;

-- LIMIT + WHERE + ORDER BY
UPDATE "public"."employees" SET "department_id" = department_id+1 WHERE id<5;

-- LIMIT + WHERE + ORDER BY + OFFSET
UPDATE "public"."employees" SET "department_id" = department_id+1 WHERE id<5;
```

4. IGNORE

With the **IGNORE** modifier, the **UPDATE** statement does not abort even if errors occur during execution.

Input

```
# IGNORE
UPDATE IGNORE employees SET department_id=3;
```

Output

```
-- IGNORE
UPDATE "public"."employees" SET "department_id" = 3;
```

REPLACE

In MySQL, **REPLACE** allows the following keywords: **LOW_PRIORITY**, **PARTITION**, **DELAYED**, **VALUES**, and **SET**. The following examples are temporary migration solutions only.

NOTE

REPLACE works exactly like **INSERT**, except that if an old row in the table has the same value as a new row for a primary key or unique index, the old row is deleted before the new row is inserted.

1. LOW_PRIORITY

MySQL **REPLACE** supports the use of **LOW_PRIORITY**, which is converted by the Migration tool.

Input

```
# LOW_PRIORITY
Replace LOW_PRIORITY INTO exmp_tb2 VALUES(1, '128.23', 'nice', '2018-10-11 19:00:00');
Replace LOW_PRIORITY INTO exmp_tb2 VALUES(2, DEFAULT, 'nice', '2018-12-14 19:00:00' );
Replace LOW_PRIORITY INTO exmp_tb2 VALUES(3, DEFAULT, 'nice', DEFAULT);
Replace LOW_PRIORITY INTO exmp_tb2 (tb2_id, tb2_price) VALUES(5, DEFAULT);
Replace LOW_PRIORITY INTO exmp_tb2 (tb2_id, tb2_price, tb2_note) VALUES(4, DEFAULT, DEFAULT);
```

Output

```
-- LOW_PRIORITY
INSERT INTO "public"."exmp_tb2" VALUES (1,128.23,'nice','2018-10-11 19:00:00');
INSERT INTO "public"."exmp_tb2" VALUES (2,DEFAULT,'nice','2018-12-14 19:00:00');
INSERT INTO "public"."exmp_tb2" VALUES (3,DEFAULT,'nice',DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price") VALUES (5,DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price","tb2_note") VALUES (4,DEFAULT,DEFAULT);
```

2. PARTITION

MySQL REPLACE supports explicit partitioning selection using the PARTITION keyword and a comma-separated name list for partitions, subpartitions, or both.

Input

```
replace INTO employees PARTITION(p3) VALUES (19, 'Frank1', 'Williams', 1, 2);
replace INTO employees PARTITION(p0) VALUES (4, 'Frank1', 'Williams', 1, 2);
replace INTO employees PARTITION(p1) VALUES (9, 'Frank1', 'Williams', 1, 2);
replace INTO employees PARTITION(p2) VALUES (10, 'Frank1', 'Williams', 1, 2);
replace INTO employees PARTITION(p2) VALUES (11, 'Frank1', 'Williams', 1, 2);
```

Output

```
INSERT INTO "public"."employees" VALUES (19,'Frank1','Williams',1,2);
INSERT INTO "public"."employees" VALUES (4,'Frank1','Williams',1,2);
INSERT INTO "public"."employees" VALUES (9,'Frank1','Williams',1,2);
INSERT INTO "public"."employees" VALUES (10,'Frank1','Williams',1,2);
INSERT INTO "public"."employees" VALUES (11,'Frank1','Williams',1,2);
```

3. DELAYED



DELAYED INSERT and **REPLACE** operations were deprecated in MySQL 5.6. In MySQL 5.7, **DELAYED** was not supported. The server recognizes but ignores the **DELAYED** keyword, handles **REPLACE** as a non-delayed one, and generates an **ER_WARN_LEGACY_SYNTAX_CONVERTED** warning. (**REPLACE DELAYED** is no longer supported, and the statement is converted to **REPLACE**.) The keyword **DELAYED** will be deleted in later versions.

Input

```
#DELAYED INSERT DELAYED works only with MyISAM, MEMORY, ARCHIVE, and BLACKHOLE tables.
#If you execute INSERT DELAYED with another storage engine,
#you will get an error like this: ERROR 1616 (HY000): DELAYED option not supported
Replace DELAYED INTO exmp_tb2 VALUES(10, 128.23, 'nice', '2018-10-11 19:00:00');
Replace DELAYED INTO exmp_tb2 VALUES(6, DEFAULT, 'nice', '2018-12-14 19:00:00');
Replace DELAYED INTO exmp_tb2 VALUES(7, 20, 'nice', DEFAULT);
Replace DELAYED INTO exmp_tb2 (tb2_id, tb2_price) VALUES(11, DEFAULT);
Replace DELAYED INTO exmp_tb2 (tb2_id, tb2_price, tb2_note) VALUES(12, DEFAULT, DEFAULT);
Replace DELAYED INTO exmp_tb2 (tb2_id, tb2_price, tb2_note, tb2_date) VALUES(13, DEFAULT, DEFAULT, DEFAULT);
```

Output

```
--DELAYED INSERT DELAYED works only with MyISAM, MEMORY, ARCHIVE, and BLACKHOLE tables.
--If you execute INSERT DELAYED with another storage engine,
--you will get an error like this: ERROR 1616 (HY000): DELAYED option not supported.
INSERT INTO "public"."exmp_tb2" VALUES (10,128.23,'nice','2018-10-11 19:00:00');
INSERT INTO "public"."exmp_tb2" VALUES (6,DEFAULT,'nice','2018-12-14 19:00:00');
INSERT INTO "public"."exmp_tb2" VALUES (7,20,'nice',DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price") VALUES (11,DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price","tb2_note") VALUES (12,DEFAULT,DEFAULT);
INSERT INTO "public"."exmp_tb2" ("tb2_id","tb2_price","tb2_note","tb2_date") VALUES (13,DEFAULT,DEFAULT,DEFAULT);
```

4. VALUES

MySQL REPLACE supports a statement to insert or delete multiple values, separated by commas.

Input

```
# If data is available, replacement will be performed. Otherwise, insertion will be performed.
Replace INTO exmp_tb1 (tb1_id,tb1_name,tb1_sex,tb1_address,tb1_number)
VALUES(17,'David','male','NewYork11','01015827875'),
(18,'Rachel','female','NewYork22','01015827749'),(20,'Monica','female','NewYork','010158996743');
Replace INTO exmp_tb1 (tb1_id,tb1_name,tb1_sex,tb1_address,tb1_number)
VALUES(17,'David1','male','NewYork11','01015827875'),
(21,'Rachel','female','NewYork22','01015827749'),(22,'Monica','female','NewYork','010158996743');
Replace INTO exmp_tb1 (tb1_id,tb1_name,tb1_sex,tb1_address,tb1_number,tb1_date)
VALUES(17,'David2',DEFAULT,'NewYork11','01015827875',DEFAULT),
(18,'Rachel','female',DEFAULT,'01015827749','2018-12-14 10:44:20'),
(DEFAULT,'Monica','female',DEFAULT,DEFAULT,'2018-12-14 10:44:20');
Replace INTO exmp_tb1 VALUES(DEFAULT,'David',DEFAULT,'NewYork11','01015827875',DEFAULT),
(18,'Rachel','female',DEFAULT,'01015827749','2018-12-14 10:44:20'),
(DEFAULT,'Monica','female',DEFAULT,DEFAULT,'2018-12-14 10:44:20');
```

Output

```
-- If data is available, replacement will be performed. Otherwise, insertion will be performed.
INSERT INTO "public"."exmp_tb1" ("tb1_id","tb1_name","tb1_sex","tb1_address","tb1_number")
VALUES (17,'David','male','NewYork11','01015827875');
INSERT INTO "public"."exmp_tb1" ("tb1_id","tb1_name","tb1_sex","tb1_address","tb1_number")
VALUES (18,'Rachel','female','NewYork22','01015827749');
INSERT INTO "public"."exmp_tb1" ("tb1_id","tb1_name","tb1_sex","tb1_address","tb1_number")
VALUES (20,'Monica','female','NewYork','010158996743');
INSERT INTO "public"."exmp_tb1" ("tb1_id","tb1_name","tb1_sex","tb1_address","tb1_number")
VALUES (17,'David1','male','NewYork11','01015827875');
INSERT INTO "public"."exmp_tb1" ("tb1_id","tb1_name","tb1_sex","tb1_address","tb1_number")
VALUES (21,'Rachel','female','NewYork22','01015827749');
INSERT INTO "public"."exmp_tb1" ("tb1_id","tb1_name","tb1_sex","tb1_address","tb1_number")
VALUES (22,'Monica','female','NewYork','010158996743');
INSERT INTO "public"."exmp_tb1"
("tb1_id","tb1_name","tb1_sex","tb1_address","tb1_number","tb1_date") VALUES
(17,'David2',DEFAULT,'NewYork11','01015827875',DEFAULT);
INSERT INTO "public"."exmp_tb1"
("tb1_id","tb1_name","tb1_sex","tb1_address","tb1_number","tb1_date") VALUES
(18,'Rachel','female',DEFAULT,'01015827749','2018-12-14 10:44:20');
INSERT INTO "public"."exmp_tb1"
("tb1_id","tb1_name","tb1_sex","tb1_address","tb1_number","tb1_date") VALUES
(DEFAULT,'Monica','female',DEFAULT,DEFAULT,'2018-12-14 10:44:20');
INSERT INTO "public"."exmp_tb1" VALUES
(DEFAULT,'David',DEFAULT,'NewYork11','01015827875',DEFAULT);
INSERT INTO "public"."exmp_tb1" VALUES (18,'Rachel','female',DEFAULT,'01015827749','2018-12-14
10:44:20');
INSERT INTO "public"."exmp_tb1" VALUES (DEFAULT,'Monica','female',DEFAULT,DEFAULT,'2018-12-14
10:44:20');
```

5. SET

MySQL REPLACE supports the use of SET settings, which the Migration tool will convert.

Input

```
replace INTO `runoob_datatype_test` VALUES (100, 100, 100, 0, 1);
replace INTO `runoob_datatype_test` VALUES (100.23, 100.25, 100.26, 0.12,1.5);
replace INTO `runoob_datatype_test` (dataType_numeric,dataType_numeric1) VALUES (100.23,
100.25);
replace INTO `runoob_datatype_test` (dataType_numeric,dataType_numeric1,dataType_numeric2)
VALUES (100.23, 100.25, 2.34);
replace into runoob_datatype_test set dataType_numeric=23.1, dataType_numeric4 = 25.12 ;
```

Output

```
INSERT INTO "public"."runoob_datatype_test" VALUES (100,100,100,0,1);
INSERT INTO "public"."runoob_datatype_test" VALUES (100.23,100.25,100.26,0.12,1.5);
INSERT INTO "public"."runoob_datatype_test" ("datatype_numeric","datatype_numeric1") VALUES
```



```
(100.23,100.25);
INSERT INTO "public"."runoob_datatype_test"
("datatype_numeric","datatype_numeric1","datatype_numeric2") VALUES (100.23,100.25,2.34);
INSERT INTO "public"."runoob_datatype_test" ("datatype_numeric","datatype_numeric4") VALUES
(23.1,25.12);
```

6.11.13 Transaction Management and Database Management

This section describes how to migrate keywords and features related to MySQL transaction and database management.

Transaction Management

1. TRANSACTION

DSC will perform adaptation based on GaussDB features during MySQL transaction statement migration.

Input

```
## Each statement applies only to the next single transaction performed within the session.
SET TRANSACTION ISOLATION LEVEL READ COMMITTED;
SET TRANSACTION ISOLATION LEVEL REPEATABLE READ;
SET TRANSACTION ISOLATION LEVEL READ UNCOMMITTED;
SET TRANSACTION ISOLATION LEVEL SERIALIZABLE;
SET TRANSACTION READ ONLY;
SET TRANSACTION READ WRITE;
SET TRANSACTION ISOLATION LEVEL READ COMMITTED,READ ONLY;
SET TRANSACTION ISOLATION LEVEL SERIALIZABLE,READ WRITE;
## Each statement (with the SESSION keyword) applies to all subsequent transactions performed
within the current session.
START TRANSACTION;
SET SESSION TRANSACTION ISOLATION LEVEL READ COMMITTED;
SET SESSION TRANSACTION ISOLATION LEVEL READ COMMITTED;
SET SESSION TRANSACTION ISOLATION LEVEL SERIALIZABLE;
SET SESSION TRANSACTION ISOLATION LEVEL SERIALIZABLE;
commit ;
```

Output

```
-- Each statement applies only to the next single transaction performed within the session.
SET LOCAL TRANSACTION ISOLATION LEVEL READ COMMITTED;
SET LOCAL TRANSACTION ISOLATION LEVEL REPEATABLE READ;
SET LOCAL TRANSACTION ISOLATION LEVEL READ UNCOMMITTED;
SET LOCAL TRANSACTION ISOLATION LEVEL SERIALIZABLE;
SET LOCAL TRANSACTION READ ONLY;
SET LOCAL TRANSACTION READ WRITE;
SET LOCAL TRANSACTION ISOLATION LEVEL READ COMMITTED READ ONLY;
SET LOCAL TRANSACTION ISOLATION LEVEL SERIALIZABLE READ WRITE;
-- Each statement (with the SESSIONkeyword) applies to all subsequent transactions performed
within the current session.
START TRANSACTION;
SET SESSION CHARACTERISTICS AS TRANSACTION ISOLATION LEVEL READ COMMITTED;
SET SESSION CHARACTERISTICS AS TRANSACTION ISOLATION LEVEL READ COMMITTED;
SET SESSION CHARACTERISTICS AS TRANSACTION ISOLATION LEVEL SERIALIZABLE;
SET SESSION CHARACTERISTICS AS TRANSACTION ISOLATION LEVEL SERIALIZABLE;
COMMIT WORK;
```

2. LOCK

DSC will perform adaptation based on GaussDB features during the migration of MySQL table locking statements which are used in transaction processing.

Input

```
## A.
START TRANSACTION;
LOCK TABLES `mt`.`runoob_tbl` WRITE,`mt`.`runoob_tb2` READ;
commit;
```

```
## B.  
START TRANSACTION;  
LOCK TABLES `mt`.`runoob_tbl` WRITE;  
commit;  
  
## C.  
START TRANSACTION;  
LOCK TABLES `mt`.`runoob_tbl` READ,`mt`.`runoob_tbl` AS t1 READ;  
commit;
```

Output

```
-- A.  
START TRANSACTION;  
LOCK TABLE "mt"."runoob_tbl" IN ACCESS EXCLUSIVE MODE;  
LOCK TABLE "mt"."runoob_tb2" IN ACCESS SHARE MODE;  
COMMIT WORK;  
  
-- B.  
START TRANSACTION;  
LOCK TABLE "mt"."runoob_tbl" IN ACCESS EXCLUSIVE MODE;  
COMMIT WORK;  
  
-- C.  
START TRANSACTION;  
LOCK TABLE "mt"."runoob_tbl" IN ACCESS SHARE MODE;  
COMMIT WORK;
```

Database Management

1. SET CHARACTER

DSC will replace MySQL **SET CHARACTER SET** with **SET SESSION NAMES** during migration. The following table lists character set mapping.

Table 6-28

MySQL CHARACTER SET	GaussDB SESSION NAMES
ASCII	SQL_ASCII
BIG5	BIG5
CP1250	WIN1250
CP1251	WIN1251
CP1256	WIN1256
CP1257	WIN1257
CP932	SJIS
EUCJPMS	EUC_JP
EUCKR	EUC_KR
GB2312	GB18030
GBK	GBK
GREEK	ISO_8859_7

MySQL CHARACTER SET	GaussDB SESSION NAMES
HEBREW	ISO_8859_8
KOI8R	KOI8R
KOI8U	KOI8U
LATIN1	LATIN1
LATIN2	LATIN2
LATIN5	LATIN5
LATIN7	LATIN7
SJIS	SJIS
SWE7	UTF8
TIS620	WIN874
UTF8	UTF8
UTF8MB4	UTF8

Input

```

SET CHARACTER SET 'ASCII';
SET CHARACTER SET 'BIG5';
SET CHARACTER SET 'CP1250';
SET CHARACTER SET 'CP1251';
SET CHARACTER SET 'CP1256';
SET CHARACTER SET 'CP1257';
SET CHARACTER SET 'CP932';
SET CHARACTER SET 'EUCJPMS';
SET CHARACTER SET 'EUCKR';
SET CHARACTER SET 'GB2312';
SET CHARACTER SET 'GBK';
SET CHARACTER SET 'GREEK';
SET CHARACTER SET 'HEBREW';
SET CHARACTER SET 'KOI8R';
SET CHARACTER SET 'KOI8U';
SET CHARACTER SET 'LATIN1';
SET CHARACTER SET 'LATIN2';
SET CHARACTER SET 'LATIN5';
SET CHARACTER SET 'LATIN7';
SET CHARACTER SET 'SJIS';
SET CHARACTER SET 'SWE7';
SET CHARACTER SET 'TIS620';
SET CHARACTER SET 'UTF8';
SET CHARACTER SET 'UTF8MB4';
## MySQL does not support SET CHARACTER SET 'UCS2';
## MySQL does not support SET CHARACTER SET 'UTF16';
## MySQL does not support SET CHARACTER SET 'UTF16LE';
## MySQL does not support SET CHARACTER SET 'UTF32';

```

Output

```

SET SESSION NAMES 'SQL_ASCII';
SET SESSION NAMES 'BIG5';
SET SESSION NAMES 'WIN1250';
SET SESSION NAMES 'WIN1251';
SET SESSION NAMES 'WIN1256';

```

```

SET SESSION NAMES 'WIN1257';
SET SESSION NAMES 'SJIS';
SET SESSION NAMES 'EUC_JP';
SET SESSION NAMES 'EUC_KR';
SET SESSION NAMES 'GB18030';
SET SESSION NAMES 'GBK';
SET SESSION NAMES 'ISO_8859_7';
SET SESSION NAMES 'ISO_8859_8';
SET SESSION NAMES 'KOI8R';
SET SESSION NAMES 'KOI8U';
SET SESSION NAMES 'LATIN1';
SET SESSION NAMES 'LATIN2';
SET SESSION NAMES 'LATIN5';
SET SESSION NAMES 'LATIN7';
SET SESSION NAMES 'SJIS';
SET SESSION NAMES 'UTF8';
SET SESSION NAMES 'WIN874';
SET SESSION NAMES 'UTF8';
SET SESSION NAMES 'UTF8';
-- MySQL does not support SET CHARACTER SET 'UCS2';
-- MySQL does not support SET CHARACTER SET 'UTF16';
-- MySQL does not support SET CHARACTER SET 'UTF16LE';
-- MySQL does not support SET CHARACTER SET 'UTF32';

```

6.12 DB2 Syntax Migration

6.12.1 Tables

GaussDB Keyword

If a keyword is used as a column name, quotes (") must be added, for example, "order".

DB2 Syntax	Syntax After Migration
<pre> CREATE TABLE tbl_bd2 (ORDER NUMBER(10), USER varchar2(30), DATE VARCHAR(10); </pre>	<pre> CREATE TABLE tbl_bd2 ("ORDER" NUMBER(10), "USER" varchar2(30), "DATE" VARCHAR(10); </pre>

Data Type (I)

LONG VARCHAR should be changed to CLOB.

DB2 Syntax	Syntax After Migration
<pre> CREATE TABLE tbl_db2 (ID VARCHAR(36), NAME LONG VARCHAR); </pre>	<pre> CREATE TABLE tbl_db2 (ID VARCHAR(36), NAME CLOB); </pre>

LONG VARGRAPHIC.

DB2 Syntax	Syntax After Migration
<pre>CREATE TABLE tbl_db2 (ID VARCHAR(36), NAME LONG VARGRAPHIC);</pre>	<pre>CREATE TABLE tbl_db2 (ID VARCHAR(36), NAME CLOB);</pre>

Foreign Key

Below attributes of Foreign key constraint should be commented:

- ON UPDATE RESTRICT
- ENFORCED
- ENABLE QUERY OPTIMIZATION

DB2 Syntax	Syntax After Migration
<pre>ALTER TABLE "SCH"."TBL_DB2" ADD CONSTRAINT "Const_Name" FOREIGN KEY("ID") REFERENCES "SCH"."TBL_DB2_1"("ID") ON DELETE CASCADE ON UPDATE RESTRICT ENFORCED ENABLE QUERY OPTIMIZATION;</pre>	<pre>ALTER TABLE "SCH"."TBL_DB2" ADD CONSTRAINT "Const_Name" FOREIGN KEY("ID") REFERENCES "SCH"."TBL_DB2_1"("ID") ON DELETE CASCADE /*ON UPDATE RESTRICT ENFORCED ENABLE QUERY OPTIMIZATION*;</pre>

Sequence

built-in auto-increment function.

DB2 Syntax	Syntax After Migration
<pre>CREATE TABLE tbl_db2 (ID BIGINT NOT NULL GENERATED BY DEFAULT AS IDENTITY (START WITH +1 INCREMENT BY +1 MINVALUE +1 MAXVALUE +9223372036854775807 NO CYCLE CACHE 20 NO ORDER) , NAME VARCHAR2(50), ORDER VARCHAR2(100));</pre>	<pre>CREATE SEQUENCE mseq_tbl_db2_id START WITH +1 INCREMENT BY +1 MINVALUE +1 MAXVALUE +9223372036854775807 NOCYCLE CACHE 20 NOORDER; CREATE TABLE tbl_db2 (ID BIGINT NOT NULL DEFAULT mseq_tbl_db2_id.NEXTVAL, NAME VARCHAR2(50), "ORDER" VARCHAR2(100));</pre>

Tablespace

TABLESPACE for a table to be placed is specified with IN clause.

DB2 Syntax	Syntax After Migration
<pre>CREATE TABLE tbl_db2 (ID number(20) NOT NULL DEFAULT IDENTITY.NEXTVAL, NAME VARCHAR2(50)) IN tbs1 ;</pre>	<pre>CREATE TABLE tbl_db2 (ID number(20) NOT NULL DEFAULT IDENTITY.NEXTVAL, NAME VARCHAR2(50)) TABLESPACE tbs1 ;</pre>

Default

WITH DEFAULT is specified to specified DEFAULT value.

DB2 Syntax	Syntax After Migration
<pre>CREATE TABLE tbl_db2 (ID number(20) , NAME VARCHAR2(50), STATUS CHAR(1) WITH DEFAULT '0');</pre>	<pre>CREATE TABLE tbl_db2 (ID number(20) , NAME VARCHAR2(50), STATUS CHAR(1) DEFAULT '0');</pre>

DEFAULT specified without value.

DB2 Syntax	Syntax After Migration
<pre>CREATE TABLE tbl_db2 (ID number(20) , NAME VARCHAR2(50), STATUS CHAR(1) WITH DEFAULT);</pre>	<pre>CREATE TABLE tbl_db2 (ID number(20) , NAME VARCHAR2(50), STATUS CHAR(1));</pre>

Data Type (II)

CLOB(1048576)

DB2 Syntax	Syntax After Migration
<pre>CREATE TABLE tbl_db2 (ID number(20) , NAME VARCHAR2(50), REMARKS CLOB(1048576));</pre>	<pre>CREATE TABLE tbl_db2 (ID number(20) , NAME VARCHAR2(50), REMARKS CLOB);</pre>

BLOB(2048000)

DB2 Syntax	Syntax After Migration
<pre>CREATE TABLE tbl_db2 (ID number(20) , NAME VARCHAR2(50), REMARKS BLOB(2048000));</pre>	<pre>CREATE TABLE tbl_db2 (ID number(20) , NAME VARCHAR2(50), REMARKS BLOB);</pre>

LOB Options

LOGGED/UNLOGGED

DB2 Syntax	Syntax After Migration
<pre>CREATE TABLE tbl_db2 ("ID" number(20) , "NAME" VARCHAR2(50), "REMARKS" BLOB LOGGED);</pre>	<pre>CREATE TABLE tbl_db2 ("ID" number(20) , "NAME" VARCHAR2(50), "REMARKS" BLOB /*LOGGED */);</pre>

COMPACT/NOT COMPACT

DB2 Syntax	Syntax After Migration
<pre>CREATE TABLE tbl_db2 ("ID" number(20) , "NAME" VARCHAR2(50), "REMARKS" BLOB LOGGED NOT COMPACT);</pre>	<pre>CREATE TABLE tbl_db2 ("ID" number(20) , "NAME" VARCHAR2(50), "REMARKS" BLOB /*LOGGED */ /* NOT COMPACT*/);</pre>

Organize By

Organize By

DB2 Syntax	Syntax After Migration
<pre>CREATE TABLE tbl_db2 ("ID" number(20) , "NAME" VARCHAR2(50), "REMARKS" BLOB) IN tbs1 ORGANIZE BY ("ID","NAME");</pre>	<pre>CREATE TABLE tbl_db2 ("ID" number(20) , "NAME" VARCHAR2(50), "REMARKS" BLOB) TABLESPACE tbs1 /*ORGANIZE BY ("ID","NAME")*/;</pre>

6.12.2 DML

SELECT

FETCH clause

DB2 Syntax	Syntax After Migration
<pre>SELECT empno, ename, deptno FROM emp_t ORDER BY salary FETCH FIRST ROW ONLY ----- SELECT empno, ename FROM emp_t WHERE deptno = 10 ORDER BY salary fetch first 2 rows only;</pre>	<pre>SELECT empno, ename, deptno FROM emp_t ORDER BY salary LIMIT 1; ----- SELECT empno, ename FROM emp_t WHERE deptno = 10 ORDER BY salary LIMIT 2;</pre>

NOTE

The fetch-first-clause sets a maximum number of rows that can be retrieved.

WITH AS

WITH AS with column list

DB2 Syntax	Syntax After Migration
<pre>WITH rec (emp_no, emp_name, dept_name, dept_no) AS (SELECT empno, ename, cast('admin' as varchar(90)), 100 AS deptno FROM emp_t) SELECT * FROM rec;</pre>	<pre>WITH rec AS (SELECT empno AS emp_no, ename AS emp_name, cast('admin' as varchar(90)) AS dept_name, 100 AS dept_no FROM emp_t) SELECT * FROM rec;</pre>

WITH AS with VALUES clause

DB2 Syntax	Syntax After Migration
<pre>WITH rec (baseschema, basename, baselevel) AS (VALUES(cast('SCOTT' as varchar(90)), cast('EMP' as varchar(90)), 10000)) SELECT owner, table_name, baselevel -1 FROM ALL_TABLES, REC WHERE owner = BASESCHEMA AND table_name = BASENAME;</pre>	<pre>WITH rec AS (SELECT cast('SCOTT' as varchar(90)) AS baseschema, cast('EMP' as varchar(90)) AS basename, 10000 AS baselevel From dual) SELECT owner, table_name, baselevel -1 FROM ALL_TABLES, REC WHERE owner = BASESCHEMA AND table_name = BASENAME;</pre>

Table Function

TABLE function is specified with subquery.

DB2 Syntax	Syntax After Migration
<pre>SELECT prod_code, prod_desc, (received_qty- issued_qty) stk FROM prod p, TABLE(select prod_code, SUM(received_qty) received_qty FROM prod_recd) r , TABLE(select prod_code, SUM(issued_qty) issued_qty FROM prod_issue) i WHERE r.prod_code = p.prod_code AND i.prod_code = p.prod_code;</pre>	<pre>SELECT prod_code, prod_desc, (received_qty- issued_qty) stk FROM prod p, (select prod_code, SUM(received_qty) received_qty FROM prod_recd) r , (select prod_code, SUM(issued_qty) issued_qty FROM prod_issue) i WHERE r.prod_code = p.prod_code AND i.prod_code = p.prod_code;</pre>

6.12.3 Index

Reverse Scans

Reverse Scans

DB2 Syntax	Syntax After Migration
<pre>CREATE INDEX IDX_1 ON EMP (ID ASC) ALLOW REVERSE SCANS; CREATE INDEX IDX_1 ON EMP (ID ASC) DISALLOW REVERSE SCANS;</pre>	<pre>CREATE INDEX IDX_1 ON EMP (ID ASC) /*ALLOW REVERSE SCANS*/; CREATE INDEX IDX_1 ON EMP (ID ASC) /*DISALLOW REVERSE SCANS*/;</pre>

Schema

index's schema is different from its table's schema.

DB2 Syntax	Syntax After Migration
<pre>CREATE INDEX IDXSC.IDX_1 ON EMP (ID ASC);</pre>	<pre>CREATE INDEX IDX_1 ON EMP (ID ASC);</pre>

6.12.4 NICKNAME

NICKNAME

Synonym is referred to **Nickname** in DB2.

DB2 Syntax	Syntax After Migration
<pre>CREATE NICKNAME sc2.emp FOR sc.emp;</pre>	<pre>CREATE SYNONYM sc2.emp FOR sc.emp;</pre>

6.12.5 Statement

CURRENT SCHEMA

SET CURRENT SCHEMA

DB2 Syntax	Syntax After Migration
CREATE NICKNAME sc2.emp FOR sc.emp;	CREATE SYNONYM sc2.emp FOR sc.emp;

GET DIAGNOSTICS with ROW_COUNT

DB2 Syntax	Syntax After Migration
<pre>CC_ORDER_HY_CUSTORCOUNT SET ' STR_CUST_COUNT '_COUNT= char(CUST_COUNT) ', SELF_UPDATE_TIME = '''' STR_DATE '''' ', SUB_UPDATE_TIME = '''' STR_DATE1 '''' ', REPORT_STATE = '''' STR_CHAR '''' WHERE ORG_CODE = '''' TEMP_ORG_CODE '''' AND Y= char(TEMP_YEAR) ' AND HY= char(TEMP_HY) AND REGION_CODE= '''' TEMP_SALE_REG_CODE '''' ' AND BRAND_CODE= '''' TEMP_BRAND_CODE '''' AND exists (select 1 from CC_ORDER_HY_CUSTORCOUNT' where ORG_CODE = '''' TEMP_ORG_CODE '''' AND Y= char(TEMP_YEAR) ' AND HY= char(TEMP_HY) AND REGION_CODE= '''' TEMP_SALE_REG_CODE '''' ' AND BRAND_CODE= '''' TEMP_BRAND_CODE '''' ');-- PREPARE S1 FROM STR_UPDATE1; EXECUTE S1; -- GET DIAGNOSTICS V_NUMRECORDS = ROW_COUNT;</pre>	<pre>V_NUMRECORDS = SQL%ROWCOUNT;</pre>

6.12.6 System Functions

DAY

Day

DB2 Syntax	Syntax After Migration
SELECT DAYS(doj) FROM emp;	SELECT (TRUNC(doj - TO_DATE('0001/01/01', 'YYYY/MM/DD'))+1) FROM emp;

MONTH

Month

DB2 Syntax	Syntax After Migration
SELECT (MONTH(ORDER_DATE)-1)/6+1 as TEMP_HY;	SELECT (EXTRACT (MONTH FROM ORDER_DATE) -1)/6+1 as TEMP_HY;

YEAR

Year

DB2 Syntax	Syntax After Migration
SELECT YEAR(ORDER_DATE) as TEMP_HY;	SELECT EXTRACT (YEAR FROM ORDER_DATE) as TEMP_HY;

CURRENT DATE

Current date

DB2 Syntax	Syntax After Migration
SELECT CURRENT DATE FROM DUAL;	SELECT CURRENT_DATE FROM DUAL;

CURRENT TIMESTAMP

Current timestamp

DB2 Syntax	Syntax After Migration
SELECT CURRENT TIMESTAMP - 7 DAYS;	SELECT CURRENT_TIMESTAMP - 7 DAYS;

POSSTR

POSSTR

DB2 Syntax	Syntax After Migration
SELECT POSSTR('THIS IS TEST','TEST') FROM DUAL;	SELECT INSTR('THIS IS TEST','TEST') FROM DUAL;

VALUE

Value

DB2 Syntax	Syntax After Migration
Select VALUE('abc','') from dual;	Select Coalesce('abc','') from dual;

Date

The **date** function returns a date using a value.

DB2 Syntax	Syntax After Migration
<pre>SELECT org_code, DATE(order_date) FROM view_cc_order WHERE order_date = DATE((SELECT start_date FROM year_week_mark WHERE year=TEMP_YEAR and week=TEMP_WEEK)); --- SELECT deptno, deptname, DATE(SELECT max(doj) FROM emp e WHERE e.deptno = d.deptno) FROM dept d;</pre>	<pre>SELECT org_code, mig_db2_ext.mig_db2_fn_date(order_date) FROM view_cc_order WHERE order_date = mig_db2_ext.mig_db2_fn_date((SELECT start_date FROM year_week_mark WHERE year=TEMP_YEAR and week=TEMP_WEEK)); --- SELECT deptno, deptname, mig_db2_ext.mig_db2_fn_date((SELECT max(doj) FROM emp e WHERE e.deptno = d.deptno)) FROM dept d;</pre>

6.13 Command Reference

6.13.1 Database Schema Conversion

Function

runDSC.sh or **runDSC.bat** is used to migrate schemas and queries of Teradata, Oracle, Netezza, MySQL, and DB2 to GaussDB(DWS).

Format

Linux:

```
./runDSC.sh
--source-db<source-database>
[--input-folder<input-script-path>]
[--output-folder<output-script-path>]
[-application-lang <application-lang>]
[--conversion-type<conversion-type>]
[--log-folder<log-path>]
[--version-number <Gauss Kernel Version>]
[--target-db<target-database>
```

Windows:

```
runDSC.bat
--source-db<source-database>
[--input-folder<input-script-path>]
[--output-folder<output-script-path>]
[-application-lang <application-lang>]
[--conversion-type<conversion-type>]
[--log-folder<log-path>]
[--version-number <Gauss Kernel Version>]
[--target-db<target-database>
```

Parameter Description

Table 6-29 Parameters

Long	Short	Data Type	Description	Value Range	Default Value	Example
-- source -db	-S	String	Source database	<ul style="list-style-type: none"> • Oracle • Teradata • Netezza • MySQL • DB2 	N/A	--source-db <i>Oracle(or)</i> <i>-S Oracle</i>
-- input-folder	-I	String	Input folder containing Teradata or Oracle scripts	N/A	N/A	--input-folder / <i>home/</i> <i>testmigration/</i> <i>Documentation/</i> <i>input</i> (or) <i>-I /home/</i> <i>testmigration/</i> <i>Documentation/</i> <i>input</i>
-- output -folder	-O	String	Output folder where the migrated scripts are saved	N/A	N/A	--output-folder / <i>home/</i> <i>testmigration/</i> <i>Documentation/</i> <i>output(or)-O /</i> <i>home/</i> <i>testmigration/</i> <i>Documentation/</i> <i>output</i>

Long	Short	Data Type	Description	Value Range	Default Value	Example
--application-lang	-A	String	Application language parser used for migration SQL: Migrate SQL schemas or scripts in SQL files. Perl: Migrate BTEQ or SQL_LANG scripts in Perl files.	<ul style="list-style-type: none"> SQL Perl 	SQL	--application-lang Perl or -A <i>Perl</i>
--conversion-type	-M	String	Migration type. Set this parameter based on input scripts. Bulk: Migrate DML and DDL scripts. BLogic: Migrate service logic, such as procedures and functions. BLogic is used only for Oracle PL/SQL.	<ul style="list-style-type: none"> Bulk BLogic 	Bulk	--conversion-type <i>bulk</i> or -M <i>bulk</i>
--log-folder	-L	String	Log file path	N/A	N/A	--log-folder / <i>home/</i> <i>testmigration/</i> <i>Documentation(o</i> <i>r)-L /home/</i> <i>testmigration/</i> <i>Documentation</i>

Long	Short	Data Type	Description	Value Range	Default Value	Example
--version-number	-VN	String	Oracle specified parameter	Oracle	N/A	--version-number or -V1R8_330
--target-db	-T	String	Target database	<ul style="list-style-type: none"> gaussdbT gaussdbA 	gaussdbA	--target-db gaussdbT (or) <i>-T gaussdbT</i>

Usage Guidelines

It is mandatory to specify the source database, input folder path, and output folder path, and optional to specify the migration type and log path.

NOTE

If no log path is specified, DSC creates the **log** folder under **TOOL_HOME** to store logs.

Example

```
./runDSC.sh --source-db Oracle --input-folder opt/DSC/DSC/input/oracle/ --output-folder /opt/DSC/DSC/output/ --log-folder /opt/DSC/DSC/log/ --application-lang SQL --conversion-type bulk --target-db gaussdbT
```

System Response

```
***** Schema Conversion Started *****
DSC process start time : Mon Jan 20 17:24:49 IST 2020
Statement count progress 100% completed [FILE(1/1)]

Schema Conversion Progress 100% completed
*****
Total number of files in input folder : 1
*****
Log file path :...../DSC/DSC/log/dsc.log
DSC process end time : Mon Jan 20 17:24:49 IST 2020
DSC total process time : 0 seconds
***** Schema Conversion Completed *****
```

NOTE

If there are no sql files in the input folder, the following message will be displayed on the console:

```
DSC process start time : Tue Jan 21 16:04:28 IST 2020
No valid files found in the input folder. Hence DSC stopped.
DSC Application failed to start : No valid files found in the input folder.
```

Environment Creation and Restoration Procedure (database and database user)

GaussDB(DWS): Database Creation and Schema Setup

Step 1 Log in to postgres:

```
gsq -p <port> -d postgres
drop database <database name>;
create database <database name>;
\c <database name>
GRANT ALL PRIVILEGES ON DATABASE <database name> TO <user>;
grant database to <user>;\q
gsq -p <port> -d <database name> -U <user> -W <password> -h <IP> -f
drop database <database name>;
create database <database name>;
\c <database name>;
GRANT ALL PRIVILEGES ON DATABASE <database name> TO <user>;
gsq -p <port> -d <database name> -U <user> -W <password> -f
```

Step 2 Run all files in setup.

----End

Commands:

```
sh runDSC.sh -S oracle -M blogic -I <input path>
sh runDSC.sh -S oracle -M bulk -I <input path>
```

Configuration Details

Step 1 Set the value of **GaussDBSQLExec** to **True**, and update the **gaussdb.properties** file.

Step 2 Create a user (T) and a database (A). Add all schemas.

----End

Verification After Migration

After DSC converts the source sql files, execute the converted files on target gaussdb and provide a report with details of number of statements succeeded and failed.

After the DSC finishes the translation, it will invoke (controlled through a configuration item) post migration verification script. The verification script (for details about the configuration, see the configuration file) is connected to the target GaussDB database and executed.

The post migration verification script will connect to the target gauss database (details are configured in a configuration file) and executes the scripts.

1. **application.properties** in config folder

Execute migrated script on Gauss DB: true/false, default value = false

executesqlingauss=true

true: It will execute the migrated script on gaussdb

2. **gaussdb.properties** in config folder

#Target Database configurations

#gauss database user with all privileges

gaussdb-user=


```
gaussdb-port=
#Database name for GaussDBA
gaussdb-name=
#gaussdb ip
gaussdb-ip=
```

Dependency between gsql and zsql clients

- a. gsql (GaussDB(DWS)) is required for executing scripts on GaussDB(DWS). Therefore, to ensure the smooth running of DSC, DSC is required to run on a node installed with a GaussDB(DWS) instance or client (gsql), and the user that performs verification must have the permission for executing commands using gsql or zsql.
- b. Since the Gauss DB Instance/Client can be installed on a linux OS only, this can be used to verify functionality only on a linux environment.
- c. To execute the gsql command on a remote GaussDB instance, it is advised to add the client system IP/hostname in the following configuration file of Gauss DB instance.

```
/home/gsmig/database/coordinator
---pg_hba.conf
```

Response

GaussDB(DWS)

```
***** Verification Started *****
Sql script execution on Gauss DB start time : Wed Jan 22 17:27:07 CST 2020
Sql script execution on Gauss DB end time : Wed Jan 22 17:27:44 CST 2020

Summary of Verification :
=====
Statement          | Total      | Passed     | Failed     | Success Rate(%)
-----
COMMENT            | 15         | 15         | 0          | 100
CREATE VIEW        | 4          | 3          | 1          | 75
CREATE INDEX       | 4          | 3          | 1          | 75
CREATE TABLE      | 6          | 6          | 0          | 100
ALTER TABLE       | 3          | 3          | 0          | 100
-----
Total              | 32         | 30         | 2          | 93

Gauss Execution Log file : /home/gsmig/18Jan/DSC/DSC/log/gaussexecutionlog.log
Gauss Execution Error Log file : /home/gsmig/18Jan/DSC/DSC/log/gaussexecutionerror.log
Verification finished in 38 seconds

***** Verification Completed *****
```

6.13.2 Version

Function

The **version** command is used to display the version number of the DSC.

Format

Linux:

```
./runDSC.sh --version
```

Windows:

```
runDSC.bat --version
```

Parameters

None

Usage Guidelines

Linux:

```
./runDSC.sh --version
```

Windows:

```
runDSC.bat --version
```

System Response

```
Version: DSC (Gauss Tools 8.0.1)
```

6.13.3 Help

Function

The **help** command is used to provide the help information for the commands supported by DSC.

Format

Linux:

```
./runDSC.sh --help
```

Windows:

```
runDSC.bat --help
```

Parameter Description

None

Usage Guidelines

None

Example

Linux:

```
./runDSC.sh --help
```

Windows:

```
runDSC.bat --help
```

System Response

Linux:

```
./runDSC.sh --help
To migrate teradata/oracle/netezza/mysql/db2 database scripts to FusionInsight LibrA
runDSC.sh -S <source-database> [-T <target-database>] -I <input-script-path> -O <output-script-path> [-M
<conversion-type>] [-A <application-lang>] [-L <log-path>] [-VN <version-number>]

-S | --source-db
The source database, which can be either Teradata or Oracle or Netezza or MySQL or DB2.

-T | --target-db
The target database, which can be either GaussDBT or GaussDBA.

-I | --input-folder
The input/source folder that contains the Teradata/Oracle/Netezza/MySQL/DB2 scripts to be migrated.

-O | --output-folder
The output/target folder where the migrated scripts are placed.

-M | --conversion-type
The conversion type, which can be either Bulk or BLogic.

-A | --application-lang
The application language type, which can be either SQL or Perl.

-L | --log-folder
The log file path where the log files are created.

-VN | --version-number
The version number, which can be either V1R7 or V1R8_330.

To display DSC version details
runDSC.sh -V | --version

To display DSC help details
runDSC.sh -H | --help

[Internal] To guess encoding for a file
runDSC.sh guessencoding -F <filename>

-F | --file-name
The filename for which the encoding must be guessed.

Refer the user manual for more details.
```

Windows:

```
runDSC.bat --help
To migrate teradata/oracle/netezza/mysql/db2 database scripts to FusionInsight LibrA
runDSC.bat -S <source-database> [-T <target-database>] -I <input-script-path> -O <output-script-path> [-M
M <conversion-type>] [-A <application-lang>] [-L <log-path>] [-VN <version-number>]

-S | --source-db
The source database, which can be either Teradata or Oracle or Netezza or MySQL or DB2.

-T | --target-db
The target database, which can be either GaussDBT or GaussDBA.
```

```
-I | --input-folder
The input/source folder that contains the Teradata/Oracle/Netezza/MySQL/DB2 scripts to be migrated.

-O | --output-folder
The output/target folder where the migrated scripts are placed.

-M | --conversion-type
The conversion type, which can be either Bulk or BLogic.

-A | --application-lang
The application language type, which can be either SQL or Perl.

-L | --log-folder
The log file path where the log files are created.

-VN | --version-number
The version number, which can be either V1R7 or V1R8_330.

To display DSC version details
runDSC.sh -V | --version

To display DSC help details
runDSC.sh -H | --help

[Internal] To guess encoding for a file
runDSC.sh guessencoding -F <filename>

-F | --file-name
The filename for which the encoding must be guessed.
```

Refer the user manual for more details.

6.14 Log Reference

6.14.1 Overview

The log files are the repository for all operations and status of the DSC. The following log files are available:

- **SQL Migration Logs**
 - a. *DSC.log*: SQL Migration all activities.
 - b. *DSCError.log*: SQL Migration errors.
 - c. *successRead.log*: SQL Migration successful input file reads.
 - d. *successWrite.log*: SQL Migration successful output file writes.
- **Perl Migration Logs**
 - a. *perlDSC.log*: Perl Migration all activities, warnings and errors.

Apache Log4j is used for the DSC logging framework. The following Log4j configuration files are used and can be customized as required:

- Teradata/Oracle/Netezza/DB2 : config/log4j2.xml
- MySQL : config/log4j2_mysql.xml

The topics in this section explain the different logs available for the tool.

6.14.2 SQL Migration Logs

The SQL DSC (DSC.jar) supports the following types of logging:

- Activity Logging
- Error Logging
- successRead
- successWrite

NOTE

- If a user specifies a log path, then all the logs are saved in the specified log path.
- If a user does not specify the logging path, then the tool creates the **log** folder in the TOOL_HOME path and saves all the logs in this *log* folder.
- To control the disk space usage, the maximum size of a log file is 10 MB. You can have a maximum of 10 log files.
- The tool does not log sensitive data such as queries.

Activity Logging

DSC saves all log and error information to **DSC.log**. This file is available in the **log** folder. The **DSC.log** file consists of details such as user who executed the migration and files that have been migrated along with the timestamp. The logging level for activity logging is INFO.

The file structure of the **DSC.log** file is as follows:

```
2020-01-22 09:35:10,769 INFO CLMigrationUtility:159 DSC is initiated by sWX575686
2020-01-22 09:35:10,828 INFO CLMigrationUtility:456 Successfully changed permission of files in D:
\Migration\Gauss_Tools_18_Migration\code\migration\config
2020-01-22 09:35:10,832 INFO PropertyLoader:90 Successfully loaded Property file : D:\Migration
\Gauss_Tools_18_Migration\code\migration\config\application.properties
2020-01-22 09:35:10,833 INFO ApplicationPropertyLoader:42 Application properties have been loaded
Successfully
2020-01-22 09:35:10,917 INFO MigrationValidatorService:549 Files in output directory has been overwritten
as configured by sWX575686
2020-01-22 09:35:10,920 INFO PropertyLoader:90 Successfully loaded Property file : D:\Migration
\Gauss_Tools_18_Migration\code\migration\config\features-oracle.properties
2020-01-22 09:35:10,921 INFO FeatureLoader:41 Features have been loaded Successfully
2020-01-22 09:35:10,926 INFO MigrationService:80 DSC process start time : Wed Jan 22 09:35:10 GMT
+05:30 2020
2020-01-22 09:35:10,933 INFO FileHandler:179 File is not supported. D:\Migration_Output\Source
\ARRYTYPE.sql-
2020-01-22 09:35:10,934 INFO FileHandler:179 File is not supported. D:\Migration_Output\Source
\varray.sql-
2020-01-22 09:35:12,816 INFO PropertyLoader:90 Successfully loaded Property file : D:\Migration
\Gauss_Tools_18_Migration\code\migration\config\global-temp-tables.properties
2020-01-22 09:35:12,830 INFO PropertyLoader:90 Successfully loaded Property file : D:\Migration
\Gauss_Tools_18_Migration\code\migration\config\create-types-UDT.properties
2020-01-22 09:35:12,834 INFO PropertyLoader:90 Successfully loaded Property file : D:\Migration
\Gauss_Tools_18_Migration\code\migration\config\package-names-oracle.properties
2020-01-22 09:35:12,849 INFO DBMigrationService:76 Number of Available Processors: 4
2020-01-22 09:35:12,850 INFO DBMigrationService:78 Configured simultaneous processes in the Tool : 3
2020-01-22 09:35:13,032 INFO MigrationProcessor:94 File name: D:\Migration_Output\Source\Input.sql is
started
2020-01-22 09:35:13,270 INFO FileHandler:606 guessencoding command output = Error: Unable to access
```

```
jarfile D:\Migration\Gauss_Tools_18_Migration\code\migration\RE_migration\target\dsctool.jar , for file= D:\Migration_Output\Source\Input.sql
2020-01-22 09:35:13,272 INFO FileHandler:625 couldn't get the encoding format, so using the default
charset for D:\Migration_Output\Source\Input.sql
2020-01-22 09:35:13,272 INFO FileHandler:310 File D:\Migration_Output\Source\Input.sql will be read with
charset : UTF-8
2020-01-22 09:35:13,390 INFO FileHandler:668 D:\Migration_Output\target\output\Input.sql - File already
exists/Failed to create target file
2020-01-22 09:35:13,562 INFO FileHandler:606 guessencoding command output = Error: Unable to access
jarfile D:\Migration\Gauss_Tools_18_Migration\code\migration\RE_migration\target\dsctool.jar , for file= D:\Migration_Output\Source\Input.sql
2020-01-22 09:35:13,563 INFO FileHandler:625 couldn't get the encoding format, so using the default
charset for D:\Migration_Output\Source\Input.sql
2020-01-22 09:35:13,563 INFO FileHandler:675 File D:\Migration_Output\Source\Input.sql will be written
with charset : UTF-8
2020-01-22 09:35:13,604 INFO MigrationProcessor:139 File name: D:\Migration_Output\Source\Input.sql is
processed successfully
2020-01-22 09:35:13,605 INFO MigrationService:147 Total number of files in Input folder : 3
2020-01-22 09:35:13,605 INFO MigrationService:148 Total number of queries : 1
2020-01-22 09:35:13,607 INFO PropertyLoader:164 Successfully updated Property file : D:\Migration
\Gauss_Tools_18_Migration\code\migration\config\global-temp-tables.properties
2020-01-22 09:35:13,630 INFO PropertyLoader:164 Successfully updated Property file : D:\Migration
\Gauss_Tools_18_Migration\code\migration\config\create-types-UDT.properties
2020-01-22 09:35:13,631 INFO PropertyLoader:164 Successfully updated Property file : D:\Migration
\Gauss_Tools_18_Migration\code\migration\config\package-names-oracle.properties
2020-01-22 09:35:13,632 INFO CLMigrationUtility:305 Log file : dsc.log and the file is present in the path : D:\Migration_Output\log
2020-01-22 09:35:13,632 INFO CLMigrationUtility:312 DSC process end time : Wed Jan 22 09:35:13 GMT
+05:30 2020
2020-01-22 09:35:13,632 INFO CLMigrationUtility:217 Total process time : 2842 seconds
```

Error Logging

DSC logs only the errors that are encountered during the migration process to **DSCError.log**. This file is available in the **log** folder. The **DSCError.log** file consists of details such as date and time of the error and the details of the file (file name) along with the query position. The logging level for error logging is ERROR.

The file structure of the **DSCError.log** file is as follows:

```
2017-06-29 14:07:39,585 ERROR TeradataBulkHandler:172 Error occurred during processing of input in Bulk
Migration. PreQueryValidation failed in not proper termination or exclude keyword. /home/testmigration/
Documentation/Input/c005.sql for Query in position : 4
2017-06-29 14:07:39,962 ERROR TeradataBulkHandler:172 Error occurred during processing of input in Bulk
Migration. PreQueryValidation failed in not proper termination or exclude keyword. /home/testmigration/
Documentation/Input/c013.sql for Query in position : 11
2017-06-29 14:07:40,136 ERROR QueryConversionUtility:250 Query is not converted as it contains
unsupported keyword: join select
2017-06-29 14:07:40,136 ERROR TeradataBulkHandler:172 Error occurred during processing of input in Bulk
Migration. PreQueryValidation failed in not proper termination or exclude keyword. /home/testmigration/
Documentation/Input/sample.sql for Query in position : 1
2017-06-29 14:07:40,136 ERROR TeradataBulkHandler:172 Error occurred during processing of input in Bulk
Migration. PreQueryValidation failed in not proper termination or exclude keyword. /home/testmigration/
Documentation/Input/sample.sql for Query in position : 3
```

Success Read

After a file has been read by the DSC, the file is logged for tracking purposes. In certain scenarios, these logs let the user know the status of the execution of files. This file is available in the **log** folder. The log file consists of details such as date and time, and the details of the file name. The logging level for this log file is INFO.

The file structure of the **successRead.log** file is as follows:

```
2017-07-21 14:13:00,461 INFO readlogger:213 /home/testmigration/Documentation/is not in.sql is read
successfully.
2017-07-21 14:13:00,957 INFO readlogger:213 /home/testmigration/Documentation/date quotes.sql is read
successfully.
2017-07-21 14:13:01,509 INFO readlogger:213 /home/testmigration/Documentation/column alias
replace.sql is read successfully.
2017-07-21 14:13:02,034 INFO readlogger:213 /home/testmigration/Documentation/sampleRownum.sql is
read successfully.
2017-07-21 14:13:02,578 INFO readlogger:213 /home/testmigration/Documentation/samp.sql is read
successfully.
2017-07-21 14:13:03,145 INFO readlogger:213 /home/testmigration/Documentation/2.6BuildInputs/
testWithNodataSamples.sql is read successfully.
```

Success Write

DSC reads a file, processes it, and writes the output to the disk. This is logged to the success write log file. In some scenarios, this log lets the user know which of the files are successfully processed. In case of a re-run, the user can skip these files and run the remaining files. This file is available in the **log** folder. The log file consists of details such as date and time, and the details of the file name. The logging level for this log file is INFO.

The file structure of the **successWrite.log** file is as follows:

```
2017-07-21 14:13:00,616 INFO writellogger:595 /home/testmigration/Documentation/is not in.sql has
written successfully.
2017-07-21 14:13:01,055 INFO writellogger:595 /home/testmigration/Documentation/date quotes.sql has
written successfully.
2017-07-21 14:13:01,569 INFO writellogger:595 /home/testmigration/Documentation/column alias
replace.sql has written successfully.
2017-07-21 14:13:02,055 INFO writellogger:595 /home/testmigration/Documentation/sampleRownum.sql
has written successfully.
2017-07-21 14:13:02,597 INFO writellogger:595 /home/testmigration/Documentation/samp.sql has written
successfully.
2017-07-21 14:13:03,178 INFO writellogger:595 /home/testmigration/Documentation/
testWithNodataSamples.sql has written successfully.
```

6.14.3 Perl Migration Logs

The DSC writes all log information to a single file, **perlDSC.log**.

NOTE

Since the DSC will execute the SQL to migrate the SQL scripts inside Perl files, the following **SQL migration logs** are also supported:

- Activity Logging
- Error Logging
- successRead
- successWrite

Logging Levels

The logging level for Perl Migration logs is configured using the **logging-level** configuration parameter.

Logging

The DSC saves all log, warnings and error information to **perlDSC.log**. This file is available in the **log** folder. The log file consists of details such as user who

executed the migration and files that have been migrated along with the timestamp.

The structure of the **perlDSC.log** file is as follows:

```
2018-07-08 13:35:10 INFO teradacore.pm:1316 Extracting SQL contents from perl files started
2018-07-08 13:35:10 INFO teradacore.pm:1329 Extracting SQL contents from perl files completed
2018-07-08 13:35:10 INFO teradacore.pm:1331 Migrating SQL files
2018-07-08 13:35:12 INFO teradacore.pm:1348 Migrating SQL files completed
2018-07-08 13:35:12 INFO teradacore.pm:1349 Merging migrated SQL contents to perl files started
2018-07-08 13:35:12 INFO teradacore.pm:1362 Merging migrated SQL contents to perl files completed
2018-07-08 13:35:12 INFO teradacore.pm:1364 Perl file migration completed
2018-07-08 13:35:32 INFO teradacore.pm:1316 Extracting SQL contents from perl files started
2018-07-08 13:35:58 ERROR teradacore.pm:426 opendir ../..../perptest/ failed
2018-07-08 13:36:17 INFO teradacore.pm:1316 Extracting SQL contents from perl files started
2018-07-08 13:38:21 INFO teradacore.pm:1329 Extracting SQL contents from perl files completed
2018-07-08 13:38:21 INFO teradacore.pm:1331 Migrating SQL files
2018-07-08 13:38:22 INFO teradacore.pm:1348 Migrating SQL files completed
2018-07-08 13:38:22 INFO teradacore.pm:1349 Merging migrated SQL contents to perl files started
2018-07-08 13:38:37 ERROR teradacore.pm:1044 Directory ../..../perptest/ should have 700, but has 0
permission
2018-07-08 13:38:53 ERROR teradacore.pm:1241 Another migration process is running on same folder, re-
execute after the process has completed
2018-07-08 13:39:01 INFO teradacore.pm:1316 Extracting SQL contents from perl files started
2018-07-08 13:39:51 INFO teradacore.pm:1329 Extracting SQL contents from perl files completed
2018-07-08 13:39:51 INFO teradacore.pm:1331 Migrating SQL files
2018-07-08 13:39:53 INFO teradacore.pm:1348 Migrating SQL files completed
2018-07-08 13:39:54 INFO teradacore.pm:1349 Merging migrated SQL contents to perl files started
2018-07-08 13:39:55 INFO teradacore.pm:1362 Merging migrated SQL contents to perl files completed
2018-07-08 13:39:57 INFO teradacore.pm:1364 Perl file migration completed
```

6.15 Troubleshooting

This section contains a list of troubleshooting steps and solutions for issues encountered while using DSC.

The table lists the troubleshooting symptoms/issues along with their cause and solution.

Table 6-30 Error Message Reference

Symptom/Issue	Cause and Solution
Error occurred while formatting! Returning unformatted SQL: select count(* from table_temp;	Cause: This could be due to inconsistency in the number of opening and closing parentheses in the input file. Solution: Ensure each opening parenthesis has a corresponding closing parenthesis.
ERROR QueryConversionUtility:249 Query is not converted as it contains unsupported keyword: LAST	Cause: Input query file contains an unsupported keyword. Solution: Ensure no unsupported keywords are present in the scripts to be migrated. For details, see Supported Keywords and Features .

Symptom/Issue	Cause and Solution
Disk is almost full. Please clear the space and re-run the tool.	<p>Cause: Insufficient space on the disk.</p> <p>Solution: Free space from the disk and retry the operation.</p>
Please enter valid input parameters, Kindly refer the user manual to execute.	<p>Cause: The possible cause could be:</p> <ol style="list-style-type: none"> 1. No valid parameters are specified. 2. The short keys are in lower case. <p>Solutions:</p> <ol style="list-style-type: none"> 1. Provide all mandatory parameters when performing migration. 2. Ensure all short keys are in upper case. <p>For details, see Database Schema Conversion.</p>
No SQL files found in input folder. Hence stopping migration.	<p>Cause: No valid SQL files are present in the input folder during the migration process.</p> <p>Solution: Ensure SQL files to be migrated are present in the input folder.</p> <p>For details, see Migration Process.</p>
Migration Application failed to start : Currently we are not supporting this Database : <database-name>	<p>Cause: Incorrect database name mentioned in the source database parameter.</p> <p>Solution: Use only Teradata or Oracle as values to the source database parameter.</p> <p>For details, see Database Schema Conversion.</p>
Output folder is not set. Please enter an output folder and refer the user manual for syntax.	<p>Cause: The output folder path is not specified.</p> <p>Solution: Specify a valid path for the output folder parameter.</p> <p>For details, see Database Schema Conversion.</p>

Symptom/Issue	Cause and Solution
<p>ascii "****" does not map to charset</p>	<p>Cause: DSC cannot detect the encoding format of the file input, and the character set configured in the system does not match that of the file input. As a result, an alarm is reported.</p> <p>Solution: Set encodingFormat to the actual encoding format and try again.</p> <p>Example:</p> <pre>testmigration@BLR1000026522:~/18.1_RETEST/DSC/scripts/teradata> perl sqlTDtoGS.pl -i ../PERL -o ../PERL_OUT/ -m /home/testmigration/18.1_FORMAT_RETEST/sep6thpackage/DSC</pre> <p>Extracting SQL contents from perl files started ascii "\xFF" does not map to Unicode at core/teratacore.pm line 1270. ascii "\xFE" does not map to Unicode at core/teratacore.pm line 1270. ascii "\xFE" does not map to Unicode at core/teratacore.pm line 1270. ascii "\xFF" does not map to Unicode at core/teratacore.pm line 1270. Extracting SQL contents from perl files completed ***** Schema Conversion Started ***** DSC process start time : Mon Jan 20 17:24:49 IST 2020 Statement count progress 100% completed [FILE(1/1)] Schema Conversion Progress 100% completed ***** Total number of files in input folder : 1 ***** Log file path :...../DSC/DSC/log/dsc.log DSC process end time : Mon Jan 20 17:24:49 IST 2020 DSC total process time : 0 seconds ***** Schema Conversion Completed *****</p>

GaussDB(DWS)

Table 6-31 Error Message Reference

Symptom/Issue	Cause and Solution
<p>Cannot create index whose evaluation is enforced to remote nodes.</p>	<p>Cause: This issue is because of Gauss limitation that distribution key columns should be super set of the unique index columns.</p> <p>Solution: Currently, Gauss does not support.</p>

Symptom/Issue	Cause and Solution
Type "urowid" does not exist	Cause: User defined type is used to create the table. Solution: Currently, Gauss does not support.
syntax error at or near "LOCAL"	Cause: Gauss does not support LOCAL keyword in index. Solution: Local index needs to be created.
syntax error at or near "1"	Cause: GaussDB(DWS) does not support additional parameters in index. Solution: This needs to be commented.
Syntax error occurs at or near =.	Cause: GaussDB(DWS) does not support = in constraint. Solution: Currently, Gauss does not support.

6.16 FAQs

This section covers the frequently asked questions.

Q1: During installation, I get an error "Root privileged users are not allowed to install the DSC for Linux." What is the solution?

Answer: A root privileged user must not be used for installation and execution of the DSC for Linux. It is recommended that a user without root privileges be used to install and operate the DSC.

Q2: How do I configure the DSC to support GaussDB T, GaussDB A and GaussDB(DWS) version V100R002C60 for Teradata?

Answer: Perform the following steps to configure the DSC to support GaussDB T, GaussDB A and GaussDB(DWS) version V100R002C60 for Teradata:

1. Open the *features-teradata.properties* file in the *config* subfolder of TOOL_HOME.
2. Change the following variable values based on the requirement.
 - VOLATILE
 - PRIMARY INDEX

For example,

```
VOLATILE=UNLOGGED / LOCAL TEMPORARY  
PRIMARY INDEX=ONE / MANY
```

NOTE

The default variable value for **VOLATILE** is *LOCAL TEMPORARY* and for **PRIMARY INDEX** it is *MANY*.

6.17 Security Management

NOTICE

Ensure that the operating system and the required software (refer to [System Requirements](#) for more details) are updated with the latest patches to prevent vulnerabilities and other security issues.

Security in DSC is managed by access control to the files and folders that are created by the tool. To access these files and folders, you must have the required permissions. For example, you need the permission 600/400 to access target files and log files, and the permission 700 to access target folders and log folders. The tool also ensures data security by not saving sensitive data in the log files.

The file or folder specified in **--input-folder** must not have write privileges to GROUP and/or OTHERS. For security reasons, the tool will not execute if the input files/folders have write privileges.

It is required that the root privileged user must not be used for installation and execution of the DSC for Linux.

The **umask** value provided in the **DSC** file is a set value that is related to file permissions. It is recommended that users do not modify this value. Modifying this value will affect file permissions.

NOTE

DSC is a standalone application. It does not require any network or database connection to run. It can be run on any machine that is isolated from any network.

7 Server Tool

7.1 gs_dump

Background

gs_dump is tool provided by GaussDB(DWS) to export database information. You can export a database or its objects, such as schemas, tables, and views. The database can be the default **postgres** database or a user-specified database.

When **gs_dump** is used to export data, other users still can access the database (readable or writable).

gs_dump can export complete, consistent data. For example, if **gs_dump** is started to export database A at T1, data of the database at that time point will be exported, and modifications on the database after that time point will not be exported.

gs_dump can export database information to a plain-text SQL script file or archive file.

- Plain-text SQL script: It contains the SQL statements required to restore the database. You can use **gsql** to execute the SQL script. With only a little modification, the SQL script can rebuild a database on other hosts or database products.
- Archive file: It contains data required to restore the database. It can be a tar-, directory-, or custom-format archive. For details, see [Table 7-1](#). The export result must be used with **gs_restore** to restore the database. The system allows you to select or even to sort the content to import.

Functions

gs_dump can create export files in four formats, which are specified by **-F** or **--format=**, as listed in [Table 7-1](#).

Table 7-1 Formats of exported files

Format	Value of - F	Description	Suggestion	Corresponding Import Tool
Plain-text	p	A plain-text script file containing SQL statements and commands. The commands can be executed on gsql , a command line terminal, to recreate database objects and load table data.	You are advised to use plain-text export files for small databases.	Before using gsql to restore database objects, you can use a text editor to edit the exported plain-text file as required.
Custom	c	A binary file that allows the restoration of all or selected database objects from an exported file.	You are advised to use custom-format archive files for medium or large database.	You can use gs_restore to import database objects from a custom-format archive.
Directory	d	A directory containing directory files and the data files of tables and BLOB objects.	-	
.tar	t	A tar-format archive that allows the restoration of all or selected database objects from an exported file. It cannot be further compressed and has an 8-GB limitation on the size of a single table.	-	

NOTE

To reduce the size of an exported file, you can use the **gs_dump** tool to compress it to a plain-text file or custom-format file. By default, a plain-text file is not compressed when generated. When a custom-format archive is generated, a medium level of compression is applied by default. Archived exported files cannot be compressed using **gs_dump**.

Precautions

Do not modify an exported file or its content. Otherwise, restoration may fail.

To ensure the data consistency and integrity, **gs_dump** acquires a share lock on a table to be dumped. If another transaction has acquired a share lock on the table,

gs_dump waits until this lock is released and then locks the table for dumping. If the table cannot be locked within the specified time, the dump fails. You can customize the timeout duration to wait for lock release by specifying the **--lock-wait-timeout** parameter.

Syntax

```
gs_dump [OPTION]... [DBNAME]
```

NOTE

DBNAME does not follow a short or long option. It specifies the database to connect to.

For example:

Specify *DBNAME* without a **-d** option preceding it.

```
gs_dump -p port_number postgres -f dump1.sql
```

or

```
export PGDATABASE=postgres
```

```
gs_dump -p port_number -f dump1.sql
```

Environment variable: *PGDATABASE*

Parameter Description

Common parameters:

- **-f, --file=FILENAME**
Sends the output to the specified file or directory. If this parameter is omitted, the standard output is generated. If the output format is (**-F c**/**-F d**/**-F t**), the **-f** parameter must be specified. If the value of the **-f** parameter contains a directory, the directory has the read and write permissions to the current user.
- **-F, --format=c|d|t|p**
Selects the exported file format. Its format can be:
 - **p|plain**: Generates a text SQL script file. This is the default value.
 - **c|custom**: Outputs a custom-format archive as a directory to be used as the input of **gs_restore**. This is the most flexible output format in which users can manually select it and reorder the archived items during the restore process. An archive in this format is compressed by default.
 - **d|directory**: A directory containing directory files and the data files of tables and BLOB objects.
 - **t|tar**: Outputs a tar format as the archive form that is suitable for the input of **gs_restore**. The .tar format is compatible with the directory format. Extracting a .tar archive generates a valid directory-format archive. However, the .tar archive cannot be further compressed and has an 8-GB limitation on the size of a single table. The order of table data items cannot be changed during restoration.
A .tar archive can be used as input of **gsql**.
- **-v, --verbose**
Specifies the verbose mode. If it is specified, **gs_dump** writes detailed object comments and the number of startups/stops to the dump file, and progress messages to standard error.
- **-V, --version**
Prints the *gs_dump* version and exits.

- **-Z, --compress=0-9**
Specifies the used compression level.
Value range: 0 to 9
 - **0** indicates no compression.
 - **1** indicates that the compression ratio is the lowest and processing speed the fastest.
 - **9** indicates the compression ratio is the highest and processing speed the slowest.

For the custom-format archive, this option specifies the compression level of a single table data segment. By default, data is compressed at a medium level. Setting the non-zero compression level will result in that the entire text output files are to be compressed, as if the text has been compressed using the gzip tool, but the default method is non-compression. The .tar archive format does not support compression currently.

- **--lock-wait-timeout=TIMEOUT**
Do not keep waiting to obtain shared table locks at the beginning of the dump. Consider it as failed if you are unable to lock a table within the specified time. The timeout duration can be specified in any of the formats accepted by **SET statement_timeout**.
- **-?, --help**
Shows help about **gs_dump** parameters and exits.

Dump parameters:

- **-a, --data-only**
Generates only the data, not the schema (data definition). Dumps the table data, big objects, and sequence values.
- **-b, --blobs**
Specifies a reserved port for function expansion. This parameter is not recommended.
- **-c, --clean**
Before writing the command of creating database objects into the backup file, write the command of clearing (deleting) database objects to the backup files. (If no objects exist in the target database, **gs_restore** probably displays some error information.)
This parameter is used only for the plain-text format. For the archive format, you can specify the option when using **gs_restore**.
- **-C, --create**
The backup file content starts with the commands of creating the database and connecting to the created database. (If the script is in this format, any database to be connected is allowed before running the script.)
This parameter is used only for the plain-text format. For the archive format, you can specify the option when using **gs_restore**.
- **-E, --encoding=ENCODING**
Creates a dump file in the specified character set encoding. By default, the dump file is created in the database encoding. (Alternatively, you can set the environment variable **PGCLIENTENCODING** to the required dump encoding.)

- `-n, --schema=SCHEMA`

Dumps only schemas matching the schema names. This option contains the schema and all its contained objects. If this option is not specified, all non-system schemas in the target database will be dumped. Multiple schemas can be selected by specifying multiple `-n` options. The schema parameter is interpreted as a pattern according to the same rules used by the `\d` command of **gsq**. Therefore, multiple schemas can also be selected by writing wildcard characters in the pattern. When you use wildcards, quote the pattern to prevent the shell from expanding the wildcards.

 **NOTE**

- If `-n` is specified, **gs_dump** does not dump any other database objects that the selected schemas might depend upon. Therefore, there is no guarantee that the results of a specific-schema dump can be automatically restored to an empty database.
- If `-n` is specified, the non-schema objects are not dumped.

Multiple schemas can be dumped. Entering `-n schemaname` multiple times dumps multiple schemas.

For example:

```
gs_dump -h host_name -p port_number postgres -f backup/bkp_shl2.sql -n sch1 -n sch2
```

In the preceding example, **sch1** and **sch2** are dumped.

- `-N, --exclude-schema=SCHEMA`

Does not dump any tables matching the table pattern. The pattern is interpreted according to the same rules as for `-n`. `-N` can be specified multiple times to exclude schemas matching any of the specified patterns.

When both `-n` and `-N` are specified, the schemas that match at least one `-n` option but no `-N` is dumped. If `-N` is specified and `-n` is not, the schemas matching `-N` are excluded from what is normally dumped.

Dump allows you to exclude multiple schemas during dumping.

Specifies `-N exclude schema name` to exclude multiple schemas while dumping.

For example:

```
gs_dump -h host_name -p port_number postgres -f backup/bkp_shl2.sql -N sch1 -N sch2
```

In the preceding example, **sch1** and **sch2** will be excluded during the dumping.

- `-o, --oids`

Dumps object identifiers (OIDs) as parts of the data in each table. Use this parameter if your application references the OID columns in some way (for example, in a foreign key constraint). If the preceding situation does not occur, do not use this parameter.

- `-O, --no-owner`

Do not output commands to set ownership of objects to match the original database. By default, **gs_dump** issues the **ALTER OWNER** or **SET SESSION AUTHORIZATION** command to set ownership of created database objects. These statements will fail when the script is running unless it is started by a system administrator (or the same user that owns all of the objects in the script). To make a script that can be stored by any user and give the user ownership of all objects, specify `-O`.

This parameter is used only for the plain-text format. For the archive format, you can specify the option when using **gs_restore**.

- **-s, --schema-only**

Dumps only the object definition (schema) but not data.

- **-S, --sysadmin=NAME**

Specifies a reserved port for function expansion. This parameter is not recommended.

- **-t, --table=TABLE**

Specifies a list of tables, views, sequences, or foreign tables to be dumped. You can use multiple **-t** parameters or wildcard characters to specify tables.

When using wildcards to specify dump tables, quote the pattern to prevent the shell from expanding the wildcards.

The **-n** and **-N** options have no effect when **-t** is used, because tables selected by using **-t** will be dumped regardless of those options, and non-table objects will not be dumped.

NOTE

The number of **-t** parameters must be less than or equal to 100.

If the number of **-t** parameters is greater than 100, you are advised to use the **--include-table-file** parameter to replace some **-t** parameters.

If **-t** is specified, **gs_dump** does not dump any other database objects that the selected tables might depend upon. Therefore, there is no guarantee that the results of a specific-table dump can be automatically restored to an empty database.

-t tablename only dumps visible tables in the default search path. **-t '*.tablename'** dumps *tablename* tables in all the schemas of the dumped database. **-t schema.table** dumps tables in a specific schema.

-t tablename does not export the trigger information from a table.

For example:

```
gs_dump -h host_name -p port_number postgres -f backup/bkp_shl2.sql -t schema1.table1 -t schema2.table2
```

In the preceding example, **schema1.table1** and **schema2.table2** are dumped.

- **--include-table-file=FILENAME**

Specifies the table file to be dumped.

- **-T, --exclude-table=TABLE**

Specifies a list of tables, views, sequences, or foreign tables not to be dumped. You can use multiple **-T** parameters or wildcard characters to specify tables.

When **-t** and **-T** are input, the object will be stored in **-t** list not **-T** table object.

For example:

```
gs_dump -h host_name -p port_number postgres -f backup/bkp_shl2.sql -T table1 -T table2
```

In the preceding example, **table1** and **table2** are excluded from the dumping.

- **--exclude-table-file=FILENAME**

Specifies the table file to be dumped.

 **NOTE**

Same as **--include-table-file**, the content format of this parameter is as follows:

```
schema1.table1
```

```
schema2.table2
```

```
...
```

- **-x, --no-privileges|--no-acl**
Prevents the dumping of access permissions (grant/revoke commands).
- **--column-inserts|--attribute-inserts**
Exports data by running the **INSERT** command with explicit column names {**INSERT INTO table (column, ...) VALUES ...**}. This will cause a slow restoration. However, since this option generates an independent command for each row, an error in reloading a row causes only the loss of the row rather than the entire table content.
- **--disable-dollar-quoting**
Disables the use of dollar sign (\$) for function bodies, and forces them to be quoted using the SQL standard string syntax.
- **--disable-triggers**
Specifies a reserved port for function expansion. This parameter is not recommended.
- **--exclude-table-data=TABLE**
Does not dump data that matches any of table patterns. The pattern is interpreted according to the same rules as for **-t**.
--exclude-table-data can be entered more than once to exclude tables matching any of several patterns. When the user needs the specified table definition rather than data in the table, this option is helpful.
To exclude data of all tables in the database, see **--schema-only**.
- **--inserts**
Dumps data when the **INSERT** statement (rather than **COPY**) is issued. This will cause a slow restoration.
However, since this option generates an independent command for each row, an error in reloading a row causes only the loss of the row rather than the entire table content. The restoration may fail if you rearrange the column order. The **--column-inserts** option is unaffected against column order changes, though even slower.
- **--no-security-labels**
Specifies a reserved port for function expansion. This parameter is not recommended.
- **--no-tablespaces**
Does not issue commands to select tablespaces. All the objects will be created during the restoration process, no matter which tablespace is selected when using this option.
This parameter is used only for the plain-text format. For the archive format, you can specify the option when using **gs_restore**.
- **--no-unlogged-table-data**

- Specifies a reserved port for function expansion. This parameter is not recommended.
- `--non-lock-table`
Specifies a reserved port for function expansion. This parameter is not recommended.
 - `--quote-all-identifiers`
Forcibly quotes all identifiers. This parameter is useful when you dump a database for migration to a later version, in which additional keywords may be introduced.
 - `--section=SECTION`
Specifies dumped name sections (pre-data, data, or post-data).
 - `--serializable-deferrable`
Uses a serializable transaction for the dump to ensure that the used snapshot is consistent with later database status. Perform this operation at a time point in the transaction flow, at which everything is normal. This ensures successful transaction and avoids serialization failures of other transactions, which requires serialization again.

This option has no benefits for disaster recovery. During the upgrade of the original database, load a database copy as a report or other shared read-only dump is helpful. The option does not exist, dump reveals a status which is different from the submitted sequence status of any transaction.

This option will make no difference if there are no active read-write transactions when **gs_dump** is started. If the read-write transactions are in active status, the dump start time will be delayed for an uncertain period.
 - `--use-set-session-authorization`
Specifies that the standard SQL **SET SESSION AUTHORIZATION** command rather than **ALTER OWNER** is returned to ensure the object ownership. This makes dumping more standard. However, if a dump file contains objects that have historical problems, restoration may fail. A dump using **SET SESSION AUTHORIZATION** requires the system administrator rights, whereas **ALTER OWNER** requires lower permissions.
 - `--with-encryption=AES128`
Specifies that dumping data needs to be encrypted using AES128.
 - `--with-key=KEY`
Specifies that the key length of AES128 must be 16 bytes.
 - `--include-nodes`
Includes the **TO NODE** or **TO GROUP** statement in the dumped **CREATE TABLE** or **CREATE FOREIGN TABLE** statement. This parameter is valid only for HDFS and foreign tables.
 - `--include-extensions`
Includes extensions in the dump.
 - `--include-depend-objs`
Includes information about the objects that depend on the specified object in the backup result. This parameter takes effect only if the **-t** or **--include-table-file** parameter is specified.
 - `--exclude-self`

Excludes information about the specified object from the backup result. This parameter takes effect only if the **-t** or **--include-table-file** parameter is specified.

- **--dont-overwrite-file**

The existing files in plain-text, .tar, and custom formats will be overwritten. This parameter is not used for the directory format.

For example:

Assume that the **backup.sql** file exists in the current directory. If you specify **-f backup.sql** in the input command, and the **backup.sql** file is generated in the current directory, the original file will be overwritten.

If the backup file already exists and **--dont-overwrite-file** is specified, an error will be reported with the message that the dump file exists.

```
gs_dump -p port_number postgres -f backup.sql -F plain --dont-overwrite-file
```

NOTE

- The **-s/--schema-only** and **-a/--data-only** parameters do not coexist.
- The **-c/--clean** and **-a/--data-only** parameters do not coexist.
- **--inserts/--column-inserts** and **-o/--oids** do not coexist, because **OIDs** cannot be set using the **INSERT** statement.
- **--role** must be used in conjunction with **--rolepassword**.
- **--binary-upgrade-usermap** must be used in conjunction with **--binary-upgrade**.
- **--include-depend-objs/--exclude-self** takes effect only when **-t/--include-table-file** is specified.
- **--exclude-self** must be used with **--include-depend-objs**.

Connection parameters:

- **-h, --host=HOSTNAME**

Specifies the host name. If the value begins with a slash (/), it is used as the directory for the UNIX domain socket. The default is taken from the **PGHOST** environment variable (if available). Otherwise, a Unix domain socket connection is attempted.

This parameter is used only for defining names of the hosts outside a cluster. The names of the hosts inside the cluster must be 127.0.0.1.

Example: the host name

Environment Variable: *PGHOST*

- **-p, --port=PORT**

Specifies the host port.

Environment variable: *PGPORT*

- **-U, --username=NAME**

Specifies the user name of the host to connect to.

Environment variable: *PGUSER*

- **-w, --no-password**

Never issue a password prompt. The connection attempt fails if the host requires password verification and the password is not provided in other ways. This parameter is useful in batch jobs and scripts in which no user password is required.

- **-W, --password=PASSWORD**
Specifies the user password to connect to. If the host uses the trust authentication policy, the administrator does not need to enter the **-W** option. If the **-W** option is not provided and you are not a system administrator, the Dump Restore tool will ask you to enter a password.
- **--role=ROLENAME**
Specifies a role name to be used for creating the dump. If this option is selected, the **SET ROLE** command will be issued after the database is connected to **gs_dump**. It is useful when the authenticated user (specified by **-U**) lacks the permissions required by **gs_dump**. It allows the user to switch to a role with the required permissions. Some installations have a policy against logging in directly as a system administrator. This option allows dumping data without violating the policy.
- **--rolepassword=ROLEPASSWORD**
Password for the role

Description

Scenario 1

If your database cluster has any local additions to the template1 database, restore the output of **gs_dump** into an empty database with caution. Otherwise, you are likely to obtain errors due to duplicate definitions of the added objects. To create an empty database without any local additions, copy data from template0 rather than template1. Example:

```
CREATE DATABASE foo WITH TEMPLATE template0;
```

The .tar format file size must be smaller than 8 GB. (This is the tar file format limitations.) The total size of a .tar archive and any of the other output formats are not limited, except possibly by the OS.

The dump file generated by **gs_dump** does not contain the statistics used by the optimizer to make execution plans. Therefore, you are advised to run **ANALYZE** after restoring from a dump file to ensure optimal performance. The dump file does not contain any **ALTER DATABASE ... SET** commands; these settings are dumped by **gs_dumpall**, along with database users and other installation settings.

Scenario 2

When the value of **SEQUENCE** reaches the maximum or minimum value, backing up the value of **SEQUENCE** using **gs_dump** will exit due to an execution error. Handle the problem by referring to the following example:

1. The value of **SEQUENCE** reaches the maximum value, but the maximum value is less than $2^{63}-2$.

Error message example:

Object defined by sequence

```
CREATE SEQUENCE seq INCREMENT 1 MINVALUE 1 MAXVALUE 3 START WITH 1;
```

Perform the **gs_dump** backup.

```
gs_dump -U dbadmin -W {password} -p 37300 postgres -t PUBLIC.seq -f backup/MPPDB_backup.sql  
gs_dump[port='37300'][postgres][2019-12-27 15:09:49]: The total objects number is 337.
```

```
gs_dump[port='37300'][postgres][2019-12-27 15:09:49]: WARNING: get invalid xid from GTM because connection is not established
gs_dump[port='37300'][postgres][2019-12-27 15:09:49]: WARNING: Failed to receive GTM rollback transaction response for aborting prepared (null).
gs_dump: [port='37300'] [postgres] [archiver (db)] [2019-12-27 15:09:49] query failed: ERROR: Can not connect to gtm when getting gxid, there is a connection error.
gs_dump: [port='37300'] [postgres] [archiver (db)] [2019-12-27 15:09:49] query was: RELEASE bfnxtval
```

Handling procedure:

Run the following SQL statement to connect to the PostgreSQL database and change the maximum value of **sequence seq1**:

```
gsql -p 37300 postgres -r -c "ALTER SEQUENCE PUBLIC.seq MAXVALUE 10;"
```

Use the dump tool to back up the data.

```
gs_dump -U dbadmin -W {password} -p 37300 postgres -t PUBLIC.seq -f backup/MPPDB_backup.sql
gs_dump[port='37300'][postgres][2019-12-27 15:10:53]: The total objects number is 337.
gs_dump[port='37300'][postgres][2019-12-27 15:10:53]: [100.00%] 337 objects have been dumped.
gs_dump[port='37300'][postgres][2019-12-27 15:10:53]: dump database postgres successfully
gs_dump[port='37300'][postgres][2019-12-27 15:10:53]: total time: 230 ms
```

2. The value of **SEQUENCE** reaches the minimum or the maximum value of **2⁶³-2**.

The **gs_dump** command does not support backup of the **SEQUENCE** value in this scenario.

NOTE

The SQL end does not support the modification of **MAXVALUE** when **SEQUENCE** reaches the maximum value of **2⁶³-2** or the modification of **MINVALUE** when **SEQUENCE** reaches the minimum value.

Scenario 3

gs_dump is mainly used to export metadata of the entire database. The performance of exporting a single table is optimized, but the performance of exporting multiple tables is poor. If multiple tables need to be exported, you are advised to export them one by one. Example:

```
gs_dump -U dbadmin -W {password} -p 37300 postgres -t public.table01 -s -f backup/table01.sql
gs_dump -U dbadmin -W {password} -p 37300 postgres -t public.table02 -s -f backup/table02.sql
```

When services are stopped or during off-peak hours, you can increase the value of **--non-lock-table** to improve the **gs_dump** performance. Example:

```
gs_dump -U dbadmin -W {password} -p 37300 postgres -t public.table03 -s --non-lock-table -f backup/table03.sql
```

Examples

Use **gs_dump** to dump a database as a SQL text file or a file in other formats.

In the following examples, **password** indicates the password configured by the database user. **backup/MPPDB_backup.sql** indicates an exported file where **backup** indicates the relative path of the current directory. **37300** indicates the port ID of the database server. **postgres** indicates the name of the database to be accessed.

NOTE

Before exporting files, ensure that the directory exists and you have the read and write permissions on the directory.

Example 1: Use **gs_dump** to export the full information of the **postgres** database. The exported **MPPDB_backup.sql** file is in plain-text format.

```
gs_dump -U dbadmin -W {password} -f backup/MPPDB_backup.sql -p 37300 postgres -F p
gs_dump[port='37300'][postgres][2018-06-27 09:49:17]: The total objects number is 356.
gs_dump[port='37300'][postgres][2018-06-27 09:49:17]: [100.00%] 356 objects have been dumped.
gs_dump[port='37300'][postgres][2018-06-27 09:49:17]: dump database postgres successfully
gs_dump[port='37300'][postgres][2018-06-27 09:49:17]: total time: 1274 ms
```

Use **gsql** to import data from the export plain-text file.

Example 2: Use **gs_dump** to export the full information of the **postgres** database. The exported **MPPDB_backup.tar** file is in .tar format.

```
gs_dump -U dbadmin -W {password} -f backup/MPPDB_backup.tar -p 37300 postgres -F t
gs_dump[port='37300'][postgres][2018-06-27 10:02:24]: The total objects number is 1369.
gs_dump[port='37300'][postgres][2018-06-27 10:02:53]: [100.00%] 1369 objects have been dumped.
gs_dump[port='37300'][postgres][2018-06-27 10:02:53]: dump database postgres successfully
gs_dump[port='37300'][postgres][2018-06-27 10:02:53]: total time: 50086 ms
```

Example 3: Use **gs_dump** to export the full information of the **postgres** database. The exported **MPPDB_backup.dmp** file is in custom format.

```
gs_dump -U dbadmin -W {password} -f backup/MPPDB_backup.dmp -p 37300 postgres -F c
gs_dump[port='37300'][postgres][2018-06-27 10:05:40]: The total objects number is 1369.
gs_dump[port='37300'][postgres][2018-06-27 10:06:03]: [100.00%] 1369 objects have been dumped.
gs_dump[port='37300'][postgres][2018-06-27 10:06:03]: dump database postgres successfully
gs_dump[port='37300'][postgres][2018-06-27 10:06:03]: total time: 36620 ms
```

Example 4: Use **gs_dump** to export the full information of the **postgres** database. The exported **MPPDB_backup** file is in directory format.

```
gs_dump -U dbadmin -W {password} -f backup/MPPDB_backup -p 37300 postgres -F d
gs_dump[port='37300'][postgres][2018-06-27 10:16:04]: The total objects number is 1369.
gs_dump[port='37300'][postgres][2018-06-27 10:16:23]: [100.00%] 1369 objects have been dumped.
gs_dump[port='37300'][postgres][2018-06-27 10:16:23]: dump database postgres successfully
gs_dump[port='37300'][postgres][2018-06-27 10:16:23]: total time: 33977 ms
```

Example 5: Use **gs_dump** to export the information of the **postgres** database, excluding the information of the table specified in the **/home/MPPDB_temp.sql** file. The exported **MPPDB_backup.sql** file is in plain-text format.

```
gs_dump -U dbadmin -W {password} -p 37300 postgres --exclude-table-file=/home/MPPDB_temp.sql -f
backup/MPPDB_backup.sql
gs_dump[port='37300'][postgres][2018-06-27 10:37:01]: The total objects number is 1367.
gs_dump[port='37300'][postgres][2018-06-27 10:37:22]: [100.00%] 1367 objects have been dumped.
gs_dump[port='37300'][postgres][2018-06-27 10:37:22]: dump database postgres successfully
gs_dump[port='37300'][postgres][2018-06-27 10:37:22]: total time: 37017 ms
```

Example 6: Use **gs_dump** to export only the information about the views that depend on the **testtable** table. Create another **testtable** table, and then restore the views that depend on it.

Back up only the views that depend on the **testtable** table.

```
gs_dump -s -p 37300 postgres -t PUBLIC.testtable --include-depend-objs --exclude-self -f backup/
MPPDB_backup.sql -F p
gs_dump[port='37300'][postgres][2018-06-15 14:12:54]: The total objects number is 331.
gs_dump[port='37300'][postgres][2018-06-15 14:12:54]: [100.00%] 331 objects have been dumped.
gs_dump[port='37300'][postgres][2018-06-15 14:12:54]: dump database postgres successfully
gs_dump[port='37300'][postgres][2018-06-15 14:12:54]: total time: 327 ms
```

Change the name of the **testtable** table.

```
gsql -p 37300 postgres -r -c "ALTER TABLE PUBLIC.testtable RENAME TO testtable_bak;"
```

Create a **testtable** table.


```
CREATE TABLE PUBLIC.testtable(a int, b int, c int);
```

Restore the views for the new **testtable** table.

```
gsql -p 37300 postgres -r -f backup/MPPDB_backup.sql
```

Helpful Links

[gs_dumpall](#) and [gs_restore](#)

7.2 gs_dumpall

Background

gs_dumpall is a tool provided by GaussDB(DWS) to export all database information, including the data of the default **postgres** database, data of user-specified databases, and global objects of all databases in a cluster.

When **gs_dumpall** is used to export data, other users still can access the databases (readable or writable) in a cluster.

gs_dumpall can export complete, consistent data. For example, if **gs_dumpall** is started to export all databases from a cluster at T1, data of the databases at that time point will be exported, and modifications on the databases after that time point will not be exported.

To export all databases in a cluster:

- **gs_dumpall** exports all global objects, including information about database users and groups, tablespaces, and attributes (for example, global access permissions).
- **gs_dumpall** invokes **gs_dump** to export SQL scripts, which contain all the SQL statements required for restoring databases.

Both of the preceding exported files are plain-text SQL scripts. Use **gsql** to execute them to restore databases.

Precautions

- Do not modify an exported file or its content. Otherwise, restoration may fail.
- To ensure the data consistency and integrity, **gs_dumpall** sets a share lock for a table to be dumped. If a share lock has been set for the table in other transactions, **gs_dumpall** locks the table after it is released. If the table cannot be locked in the specified time, the dump will fail. You can customize the timeout duration to wait for lock release by specifying the **--lock-wait-timeout** parameter.
- During an export, **gs_dumpall** reads all tables in a database. Therefore, you need to connect to the database as a cluster administrator to export a complete file. When using **gsql** to execute the SQL scripts, you need the administrator permissions so that you can add users and user groups, and create databases.

Syntax

```
gs_dumpall [OPTION]...
```

Parameter Description

Common parameters:

- **-f, --filename=FILENAME**
Sends the output to the specified file. If this parameter is omitted, the standard output is used.
- **-v, --verbose**
Specifies the verbose mode. This will cause **gs_dumpall** to output detailed object comments and start/stop times to the dump file, and progress messages to standard error.
- **-V, --version**
Prints the version information for **gs_dumpall** and exits.
- **--lock-wait-timeout=TIMEOUT**
Do not keep waiting to obtain shared table locks at the beginning of the dump. Consider it as failed if you are unable to lock a table within the specified time. The timeout duration can be specified in any of the formats accepted by **SET statement_timeout**.
- **-, --help**
Shows help about the command line parameters for **gs_dumpall** and exits.

Dump parameters:

- **-a, --data-only**
Dumps only the data, not the schema (data definition).
- **-c, --clean**
Runs SQL statements to delete databases before rebuilding them. Statements for dumping roles and tablespaces are added.
- **-g, --globals-only**
Dumps only global objects (roles and tablespaces) but no databases.
- **-o, --oids**
Dumps object identifiers (OIDs) as parts of the data in each table. Use this parameter if your application references the OID columns in some way (for example, in a foreign key constraint). If the preceding situation does not occur, do not use this parameter.
- **-O, --no-owner**
Do not output commands to set ownership of objects to match the original database. By default, **gs_dumpall** issues the **ALTER OWNER** or **SET SESSION AUTHORIZATION** statement to set ownership of created schema elements. These statements will fail when the script is running unless it is started by a system administrator (or the same user that owns all of the objects in the script). To make a script that can be stored by any user and give the user ownership of all objects, specify **-O**.
- **-r, --roles-only**
Dumps only roles but not databases or tablespaces.
- **-s, --schema-only**
Dumps only the object definition (schema) but not data.

- **-S, --sysadmin=NAME**
Name of the system administrator during the dump.
- **-t, --tablespaces-only**
Dumps only tablespaces but not databases or roles.
- **-x, --no-privileges**
Prevents the dumping of access permissions (grant/revoke commands).
- **--column-inserts|--attribute-inserts**
Exports data by running the **INSERT** command with explicit column names {**INSERT INTO table (column, ...) VALUES ...**}. This will cause a slow restoration. However, since this option generates an independent command for each row, an error in reloading a row causes only the loss of the row rather than the entire table content.
- **--disable-dollar-quoting**
Disables the use of dollar sign (\$) for function bodies, and forces them to be quoted using the SQL standard string syntax.
- **--disable-triggers**
Specifies a reserved port for function expansion. This parameter is not recommended.
- **--inserts**
Dumps data when the **INSERT** statement (rather than **COPY**) is issued. This will cause a slow restoration. The restoration may fail if you rearrange the column order. The **--column-inserts** parameter is safer against column order changes, though even slower.
- **--no-security-labels**
Specifies a reserved port for function expansion. This parameter is not recommended.
- **--no-tablespaces**
Do not output statements to create tablespaces or select tablespaces for objects. All the objects will be created during the restoration process, no matter which tablespace is selected when using this option.
- **--no-unlogged-table-data**
Specifies a reserved port for function expansion. This parameter is not recommended.
- **--quote-all-identifiers**
Forcibly quotes all identifiers. This parameter is useful when you dump a database for migration to a later version, in which additional keywords may be introduced.
- **--dont-overwrite-file**
Do not overwrite the current file.
- **--use-set-session-authorization**
Specifies that the standard SQL **SET SESSION AUTHORIZATION** command rather than **ALTER OWNER** is returned to ensure the object ownership. This makes dumping more standard. However, if a dump file contains objects that have historical problems, restoration may fail. A dump using **SET SESSION AUTHORIZATION** requires the system administrator rights, whereas **ALTER OWNER** requires lower permissions.

- `--with-encryption=AES128`
Specifies that dumping data needs to be encrypted using AES128.
- `--with-key=KEY`
Specifies that the key length of AES128 must be 16 bytes.
- `--include-extensions`
Backs up all CREATE EXTENSION statements if the **include-extensions** parameter is set.
- `--include-templatedb`
Includes template databases during the dump.
- `--dump-nodes`
Includes nodes and Node Groups during the dump.
- `--include-nodes`
Includes the **TO NODE** statement in the dumped **CREATE TABLE** statement.
- `--include-buckets`
Specifies a reserved port for function expansion. This parameter is not recommended.
- `--dump-wrm`
Includes workload resource manager (resource pool, load group, and load group mapping) during the dump.
- `--binary-upgrade`
Specifies a reserved port for function expansion. This parameter is not recommended.
- `--binary-upgrade-usermap="USER1=USER2"`
Specifies a reserved port for function expansion. This parameter is not recommended.
- `--tablespaces-postfix`
Specifies a reserved port for function expansion. This parameter is not recommended.
- `--parallel-jobs`
Specifies the number of concurrent backup processes. The value range is 1-1000.

 **NOTE**

- The `-g/--globals-only` and `-r/--roles-only` parameters do not coexist.
- The `-g/--globals-only` and `-t/--tablespaces-only` parameters do not coexist.
- The `-r/--roles-only` and `-t/--tablespaces-only` parameters do not coexist.
- The `-s/--schema-only` and `-a/--data-only` parameters do not coexist.
- The `-r/--roles-only` and `-a/--data-only` parameters do not coexist.
- The `-t/--tablespaces-only` and `-a/--data-only` parameters do not coexist.
- The `-g/--globals-only` and `-a/--data-only` parameters do not coexist.
- `--tablespaces-postfix` must be used in conjunction with `--binary-upgrade`.
- `--parallel-jobs` must be used in conjunction with `-f/--file`.

Connection parameters:

- **-h, --host**
Specifies the host name. If the value begins with a slash (/), it is used as the directory for the UNIX domain socket. The default value is taken from the *PGHOST* environment variable. If it is not set, a UNIX domain socket connection is attempted.

This parameter is used only for defining names of the hosts outside a cluster. The names of the hosts inside the cluster must be 127.0.0.1.

Environment Variable: *PGHOST*
- **-l, --database**
Specifies the name of the database connected to dump all objects and discover other databases to be dumped. If this parameter is not specified, the **postgres** database will be used. If the **postgres** database does not exist, **template1** will be used.
- **-p, --port**
Specifies the TCP port listened to by the server or the local UNIX domain socket file name extension to ensure a correct connection. The default value is the *PGPORT* environment variable.

Environment variable: *PGPORT*
- **-U, --username**
Specifies the user name to connect to.

Environment variable: *PGUSER*
- **-w, --no-password**
Never issue a password prompt. The connection attempt fails if the host requires password verification and the password is not provided in other ways. This parameter is useful in batch jobs and scripts in which no user password is required.
- **-W, --password**
Specifies the user password to connect to. If the host uses the trust authentication policy, the administrator does not need to enter the **-W** option. If the **-W** option is not provided and you are not a system administrator, the Dump Restore tool will ask you to enter a password.
- **--role**
Specifies a role name to be used for creating the dump. This option causes **gs_dumpall** to issue the **SET ROLE** statement after connecting to the database. It is useful when the authenticated user (specified by **-U**) lacks the permissions required by **gs_dumpall**. It allows the user to switch to a role with the required permissions. Some installations have a policy against logging in directly as a system administrator. This option allows dumping data without violating the policy.
- **--rolepassword**
Specifies the password of the specific role.

Description

The **gs_dumpall** internally invokes **gs_dump**. For details about the diagnosis information, see **gs_dump**.

Once **gs_dumpall** is restored, run ANALYZE on each database so that the optimizer can provide useful statistics.

gs_dumpall requires all needed tablespace directories to exist before the restoration. Otherwise, database creation will fail if the databases are in non-default locations.

Examples

Run **gs_dumpall** to export all databases from a cluster at a time.

NOTE

gs_dumpall supports only plain-text format export. Therefore, only **gs_sql** can be used to restore a file exported using **gs_dumpall**.

```
gs_dumpall -f backup/bkp2.sql -p 37300
gs_dump[port='37300'][dbname='postgres'][2018-06-27 09:55:09]: The total objects number is 2371.
gs_dump[port='37300'][dbname='postgres'][2018-06-27 09:55:35]: [100.00%] 2371 objects have been
dumped.
gs_dump[port='37300'][dbname='postgres'][2018-06-27 09:55:46]: dump database dbname='postgres'
successfully
gs_dump[port='37300'][dbname='postgres'][2018-06-27 09:55:46]: total time: 55567 ms
gs_dumpall[port='37300'][2018-06-27 09:55:46]: dumpall operation successful
gs_dumpall[port='37300'][2018-06-27 09:55:46]: total time: 56088 ms
```

Helpful Links

[gs_dump](#) and [gs_restore](#)

7.3 gs_restore

Context

gs_restore is a tool provided by GaussDB(DWS) to import data that was exported using **gs_dump**. It can also be used to import files that were exported using **gs_dump**.

It has the following functions:

- Imports data to the database.
If a database is specified, data is imported in the database. For parallel import, the password for connecting to the database is required.
- Imports data to the script file.
If the database storing imported data is not specified, a script containing the SQL statement to recreate the database is created and written to a file or standard output. This script output is equivalent to the plain text output format of **gs_dump**.

Syntax

```
gs_restore [OPTION]... FILE
```

 NOTE

- The **FILE** does not have a short or long parameter. It is used to specify the location for the archive files.
- The **dbname** or **-l** parameter is required as prerequisites. Users cannot enter **dbname** and **-l** parameters at the same time.
- **gs_restore** incrementally imports data by default. To prevent data exception caused by multiple import jobs, use the **-e** and **-c** parameters during the jobs. In this way, existing database objects in a target database are deleted before import; and errors during import will be ignored to proceed the import and the error information will be displayed after the import.

Parameter Description

Common parameters:

- **-d, --dbname=NAME**
Connects to the **dbname** database and imports data to the database.
- **-f, --file=FILENAME**
Specifies the output file for the generated script, or uses the output file in the list specified using **-l**.
The default is the standard output.

 NOTE

- **-f** cannot be used in conjunction with **-d**.
- **-F, --format=c|d|t**
Specifies the format of the archive. The format does not need to be specified because the *gs_restore* determines the format automatically.
Value range:
 - **c/custom**: The archive form is the customized format in section 4.21-*gs_dump*.
 - **d/directory**: The archive form is a directory archive format.
 - **t/tar**: The archive form is a tar archive format.
- **-l, --list**
Lists the forms of the archive. The operation output can be used for the input of the **-L** parameter. If filtering parameters, such as **-n** or **-t**, are used together with **-l**, they will restrict the listed items.
- **-v, --verbose**
Specifies the verbose mode.
- **-V, --version**
Prints the **gs_restore** version and exits.
- **-?, --help**
Shows help information about the parameters of **gs_restore** and exits.

Import parameters

- **-a, -data-only**
Imports only the data, not the schema (data definition). **gs_restore** incrementally imports data.

- **-c, --clean**
Cleans (deletes) existing database objects in the database to be restored before recreating them.
- **-C, --create**
Creates the database before importing data to it. (When this parameter is used, the database named with **-d** is used to issue the initial **CREATE DATABASE** command. All data is imported to the database that appears in the archive files.)
- **-e, --exit-on-error**
Exits if an error occurs when you send the SQL statement to the database. If you do not exit, the commands will still be sent and error information will be displayed when the import ends.
- **-I, --index=NAME**
Imports only the definition of the specified index. Multiple indexes can be imported. Enter **-I index** multiple times to import multiple indexes.
For example:

```
gs_restore -h host_name -p port_number -d gaussdb -I Index1 -I Index2 backup/MPPDB_backup.tar
```


In this example, *Index1* and *Index2* will be imported.
- **-j, --jobs=NUM**
Specifies the number of concurrent, the most time-consuming jobs of **gs_restore** (such as loading data, creating indexes, or creating constraints). This parameter can greatly reduce the time to import a large database to a server running on a multiprocessor machine.
Each job is one process or one thread, depending on the OS; and uses a separate connection to the server.
The optimal value of this option depends on the hardware settings of the server, the client, the network, the number of CPU cores, and hard disk settings. It is recommended that the parameter be set to the number of CPU cores on the server. In addition, a larger value can also lead to faster import in many cases. However, an overly large value will lead to decreased performance because of thrashing.
This parameter supports custom-format archives only. The input file must be a regular file (not the pipe file). This parameter can be ignored when you select the script method rather than connect to a database server. In addition, multiple jobs cannot be used in conjunction with the **--single-transaction** parameter.
- **-L, --use-list=FILENAME**
Imports only archive elements that are listed in **list-file** and imports them in the order that they appear in the file. If filtering parameters, such as **-n** or **-t**, are used in conjunction with **-L**, they will further limit the items to be imported.
list-file is normally created by editing the output of a previous **-I** parameter. File lines can be moved or removed, and can also be commented out by placing a semicolon (;) at the beginning of the row. An example is provided in this document.
- **-n, --schema=NAME**
Restores only objects that are listed in schemas.

This parameter can be used in conjunction with the **-t** parameter to import a specific table.

Entering **-n schemaname** multiple times can import multiple schemas.

For example:

```
gs_restore -h host_name -p port_number -d gaussdb -n sch1 -n sch2 backup/MPPDB_backup.tar
```

In this example, **sch1** and **sch2** will be imported.

- **-O, --no-owner**

Do not output commands to set ownership of objects to match the original database. By default, **gs_restore** issues the **ALTER OWNER** or **SET SESSION AUTHORIZATION** statement to set ownership of created schema elements. Unless the system administrator or the user who has all the objects in the script initially accesses the database. Otherwise, the statement will fail. Any user name can be used for the initial connection using **-O**, and this user will own all the created objects.

- **-P, --function=NAME(args)**

Imports only listed functions. You need to correctly spell the function name and the parameter based on the contents of the dump file in which the function exists.

Entering **-P** alone means importing all function-name(args) functions in a file. Entering **-P** with **-n** means importing the function-name(args) functions in a specified schema. Entering **-P** multiple times and using **-n** once means that all imported functions are in the **-n** schema by default.

You can enter **-n schema-name -P 'function-name(args)'** multiple times to import functions in specified schemas.

For example:

```
./gs_restore -h host_name -p port_number -d gaussdb -n test1 -P 'Func1(integer)' -n test2 -P 'Func2(integer)' backup/MPPDB_backup.tar
```

In this example, both **Func1 (i integer)** in the **test1** schema and **Func2 (j integer)** in the **test2** schema will be imported.

- **-s, --schema-only**

Imports only schemas (data definitions), instead of data (table content). The current sequence value will not be imported.

- **-S, --sysadmin=NAME**

Specifies a reserved port for function expansion. This parameter is not recommended.

- **-t, --table=NAME**

Imports only listed table definitions or data, or both. This parameter can be used in conjunction with the **-n** parameter to specify a table object in a schema. When **-n** is not entered, the default schema is PUBLIC. Entering **-n schemaname -t tablename** multiple times can import multiple tables in a specified schema.

For example:

Import **table1** in the **PUBLIC** schema.

```
gs_restore -h host_name -p port_number -d gaussdb -t table1 backup/MPPDB_backup.tar
```

Import **test1** in the **test1** schema and **test2** in the **test2** schema.

```
gs_restore -h host_name -p port_number -d gaussdb -n test1 -t test1 -n test2 -t test2 backup/MPPDB_backup.tar
```

Import **table1** in the **PUBLIC** schema and **test1** in the **test1** schema.

```
gs_restore -h host_name -p port_number -d gaussdb -n PUBLIC -t table1 -n test1 -t table1 backup/  
MPPDB_backup.tar
```

NOTICE

-t does not support the **schema_name.table_name** input format.

- **-T, --trigger=NAME**
This parameter is reserved for extension.
- **-x, --no-privileges/--no-acl**
Prevents the import of access permissions (**GRANT/REVOKE** commands).
- **-1, --single-transaction**
Executes import as a single transaction (that is, commands are wrapped in **BEGIN/COMMIT**).
This parameter ensures that either all the commands are completed successfully or no application is changed. This parameter means **--exit-on-error**.
- **--disable-triggers**
Specifies a reserved port for function expansion. This parameter is not recommended.
- **--no-data-for-failed-tables**
By default, table data will be imported even if the statement to create a table fails (for example, the table already exists). Data in such table is skipped using this parameter. This operation is useful if the target database already contains the desired table contents.
This parameter takes effect only when you import data directly into a database, not when you output SQL scripts.
- **--no-security-labels**
Specifies a reserved port for function expansion. This parameter is not recommended.
- **--no-tablespaces**
Does not issue commands to select tablespaces. If this parameter is used, all objects will be created during the import process no matter which tablespace is selected.
- **--section=SECTION**
Imports the listed sections (such as pre-data, data, or post-data).
- **--use-set-session-authorization**
Is used for plain-text backup.
Outputs the **SET SESSION AUTHORIZATION** statement instead of the **ALTER OWNER** statement to determine object ownership. This parameter makes dump more standards-compatible. If the records of objects in exported files are referenced, import may fail. Only administrators can use the **SET SESSION AUTHORIZATION** statement to dump data, and the administrators must manually change and verify the passwords of exported files by referencing the **SET SESSION AUTHORIZATION** statement before import. The **ALTER OWNER** statement requires lower permissions.

- **--with-key=KEY**
Specifies that the key length of AES128 must be 16 bytes.

NOTE

If the dump is encrypted, enter the **--with-key <keyname>** parameter in the **gs_restore** command. If it is not entered, you will receive an error message.
Enter the same key while entering the dump.

NOTICE

- If any local additions need to be added to the template1 database during the installation, restore the output of **gs_restore** into an empty database with caution. Otherwise, you are likely to obtain errors due to duplicate definitions of the added objects. To create an empty database without any local additions, copy data from template0 rather than template1. Example:

```
CREATE DATABASE foo WITH TEMPLATE template0;
```

- **gs_restore** cannot import large objects selectively. For example, it can only import the objects of a specified table. If an archive contains large objects, all large objects will be imported, or none of them will be restored if they are excluded by using **-L**, **-t**, or other parameters.

NOTE

1. The **-d/--dbname** and **-f/--file** parameters do not coexist.
2. The **-s/--schema-only** and **-a/--data-only** parameters do not coexist.
3. The **-c/--clean** and **-a/--data-only** parameters do not coexist.
4. When **--single-transaction** is used, **-j/--jobs** must be a single job.
5. **--role** must be used in conjunction with **--rolepassword**.

Connection parameters:

- **-h, --host=HOSTNAME**
Specifies the host name. If the value begins with a slash (/), it is used as the directory for the UNIX domain socket. The default value is taken from the *PGHOST* environment variable. If it is not set, a UNIX domain socket connection is attempted.
This parameter is used only for defining names of the hosts outside a cluster. The names of the hosts inside the cluster must be 127.0.0.1.
- **-p, --port=PORT**
Specifies the TCP port listened to by the server or the local UNIX domain socket file name extension to ensure a correct connection. The default value is the *PGPORT* environment variable.
- **-U, --username=NAME**
Specifies the user name to connect to.
- **-w, --no-password**
Never issue a password prompt. The connection attempt fails if the host requires password verification and the password is not provided in other ways. This parameter is useful in batch jobs and scripts in which no user password is required.

- `-W, --password=PASSWORD`
Specifies the user password to connect to. If the host uses the trust authentication policy, the administrator does not need to enter the `-W` parameter. If the `-W` parameter is not provided and you are not a system administrator, `gs_restore` will ask you to enter a password.
- `--role=ROLENAME`
Specifies a role name for the import operation. If this parameter is selected, the `SET ROLE` statement will be issued after `gs_restore` connects to the database. It is useful when the authenticated user (specified by `-U`) lacks the permissions required by `gs_restore`. This parameter allows the user to switch to a role with the required permissions. Some installations have a policy against logging in directly as the initial user. This parameter allows data to be imported without violating the policy.
- `--rolepassword=ROLEPASSWORD`
Specifies the password of the specific role.

Examples

Special case: Execute the `gsql` tool. Run the following commands to import the `MPPDB_backup.sql` file in the exported folder (in plain-text format) generated by `gs_dump/gs_dumpall` to the `gaussdb` database:

```
gsql -d gaussdb -p 8000 -W {password} -f /home/omm/test/MPPDB_backup.sql
SET
SET
SET
SET
SET
ALTER TABLE
ALTER TABLE
ALTER TABLE
ALTER TABLE
ALTER TABLE
CREATE INDEX
CREATE INDEX
CREATE INDEX
SET
CREATE INDEX
REVOKE
REVOKE
GRANT
GRANT
total time: 30476 ms
```

`gs_restore` is used to import the files exported by `gs_dump`.

Example 1: Execute the `gs_restore` tool to import the exported `MPPDB_backup.dmp` file (in custom format) to the `gaussdb` database.

```
gs_restore -W {password} backup/MPPDB_backup.dmp -p 8000 -d gaussdb
gs_restore: restore operation successful
gs_restore: total time: 13053 ms
```

Example 2: Execute the `gs_restore` tool to import the exported `MPPDB_backup.tar` file (in tar format) to the `gaussdb` database.

```
gs_restore backup/MPPDB_backup.tar -p 8000 -d gaussdb
gs_restore[2017-07-21 19:16:26]: restore operation successful
gs_restore[2017-07-21 19:16:26]: total time: 21203 ms
```

Example 3: Execute the **gs_restore** tool to import the exported **MPPDB_backup** file (in directory format) to the **gaussdb** database.

```
gs_restore backup/MPPDB_backup -p 8000 -d gaussdb
gs_restore[2017-07-21 19:16:26]: restore operation successful
gs_restore[2017-07-21 19:16:26]: total time: 21003 ms
```

Example 4: Execute the **gs_restore** tool and run the following commands to import the **MPPDB_backup.dmp** file (in custom format). Specifically, import all the object definitions and data in the **PUBLIC** schema. Existing objects are deleted from the target database before the import. If an existing object references to an object in another schema, you need to manually delete the referenced object first.

```
gs_restore backup/MPPDB_backup.dmp -p 8000 -d gaussdb -e -c -n PUBLIC
gs_restore: [archiver (db)] Error while PROCESSING TOC:
gs_restore: [archiver (db)] Error from TOC entry 313; 1259 337399 TABLE table1 gaussdba
gs_restore: [archiver (db)] could not execute query: ERROR: cannot drop table table1 because other objects
depend on it
DETAIL: view t1.v1 depends on table table1
HINT: Use DROP ... CASCADE to drop the dependent objects too.
Command was: DROP TABLE public.table1;
```

Manually delete the referenced object and create it again after the import is complete.

```
gs_restore backup/MPPDB_backup.dmp -p 8000 -d gaussdb -e -c -n PUBLIC
gs_restore[2017-07-21 19:16:26]: restore operation successful
gs_restore[2017-07-21 19:16:26]: total time: 2203 ms
```

Example 5: Execute the **gs_restore** tool and run the following commands to import the **MPPDB_backup.dmp** file (in custom format). Specifically, import only the definition of **table1** in the **PUBLIC** schema.

```
gs_restore backup/MPPDB_backup.dmp -p 8000 -d gaussdb -e -c -s -n PUBLIC -t table1
gs_restore[2017-07-21 19:16:26]: restore operation successful
gs_restore[2017-07-21 19:16:26]: total time: 21000 ms
```

Example 6: Execute the **gs_restore** tool and run the following commands to import the **MPPDB_backup.dmp** file (in custom format). Specifically, import only the data of **table1** in the **PUBLIC** schema.

```
gs_restore backup/MPPDB_backup.dmp -p 8000 -d gaussdb -e -a -n PUBLIC -t table1
gs_restore[2017-07-21 19:16:26]: restore operation successful
gs_restore[2017-07-21 19:16:26]: total time: 20203 ms
```

Helpful Links

[gs_dump](#) and [gs_dumpall](#)

7.4 gds_check

Context

gds_check is used to check the GDS deployment environment, including the OS parameters, network environment, and disk usage. It also supports the recovery of system parameters. This helps detect potential problems during GDS deployment and running, improving the execution success rate.

Precautions

- Set environment variables before executing the script. For details, see "Importing Data > Using a Foreign Table to Import Data In Parallel > Installing, Configuring, and Starting GDS" in the *Developer Guide*.
- The script must be executed in the Python 3 environment.
- This script must be run by user **root**.
- The **-t** and **--host** parameters must be specified.
- If **--host** specifies the network address 0.0.0.0 or 127.0.0.1, the MTU and NIC multi-queue are not checked.
- The NIC multi-queue check and recovery require that the NIC be at least 10 GE.
- The passwords of all nodes specified by the **--host** parameter must be the same so that the script can perform remote check successfully.
- During the recovery, set the OS configuration items according to the recommended values. For details, see the following table.

Table 7-2 OS configuration items

Parameter	Recommended Value
net.core.somaxconn	65535
net.ipv4.tcp_max_syn_backlog	65535
net.core.netdev_max_backlog	65535
net.ipv4.tcp_retries1	5
net.ipv4.tcp_retries2	12
net.ipv4.ip_local_port_range	26000 to 65535
MTU	1500
net.core.wmem_max	21299200
net.core.rmem_max	21299200
net.core.wmem_default	21299200
net.core.rmem_default	21299200
max handler	1000000
vm.swappiness	10

Table 7-3 Disk check

Check Item	Warning
Disk space usage	Greater than or equal to 70% and less than 90%

Check Item	Warning
Inode usage	Greater than or equal to 70% and less than 90%

Table 7-4 Network conditions

Check Item	Error
Network connectivity	100% packet loss
NIC multi-queue	When NIC multi-queue is enabled and different CPUs are bound, fix can be modified.

Syntax

- **check** command
`gds_check -t check --host [/path/to/hostfile | ipaddr1,ipaddr2...] --ping-host [/path/to/pinghostfile | ipaddr1,ipaddr2...] [--detail]`
- **fix** command
`gds_check -t fix --host [/path/to/hostfile | ipaddr1,ipaddr2...] [--detail]`

Parameter Description

- **-t**
Operation type, indicating check or recovery.
The value can be **check** or **fix**.
- **--host**
IP addresses of the nodes to be checked or recovered.
Value: IP address list in the file or character string format
 - File format: Each IP address occupies a row, for example:
192.168.1.200
192.168.1.201
 - Character string format: IP addresses are separated by commas (,), for example:
192.168.1.200,192.168.1.201
- **--ping-host**
Destination IP address for the network ping check on each node to be checked.
Value: IP address list in the file or character string format. Generally, the value is the IP address of a DN, CN, or gateway.
 - File format: Each IP address occupies a row, for example:
192.168.2.200
192.168.2.201

- Character string format: IP addresses are separated by commas (,), for example:
192.168.2.200,192.168.2.201
- --detail
Displays detailed information about check and repair items and saves the information to logs.
- -V
Version information.
- -h, --help
Help information.

Examples

Perform a check. Both **--host** and **--ping-host** are in character string format.

```
gds_check -t check --host 192.168.1.100,192.168.1.101 --ping-host 192.168.2.100
```

Perform a check. **--host** is in character string format and **--ping-host** is in file format.

```
gds_check -t check --host 192.168.1.100,192.168.1.101 --ping-host /home/gds/iplist
cat /home/gds/iplist
192.168.2.100
192.168.2.101
```

Perform a check. **--host** is in file format and **--ping-host** is in character string format.

```
gds_check -t check --host /home/gds/iplist --ping-host 192.168.1.100,192.168.1.101
```

Perform a recovery. **--host** is in character string format.

```
gds_check -t fix --host 192.168.1.100,192.168.1.101
```

Run the following command to perform the check, print the detailed information, and save the information to logs:

```
gds_check -t check --host 192.168.1.100 --detail
```

Run the following command to perform the repair, print the detailed information, and save the information to logs:

```
gds_check -t fix --host 192.168.1.100 --detail
```

7.5 gds_install

Context

`gds_install` is a script tool used to install GDS in batches, improving GDS deployment efficiency.

Precautions


- Set environment variables before executing the script. For details, see "Importing Data > Using a Foreign Table to Import Data In Parallel > Installing, Configuring, and Starting GDS" in the *Developer Guide*.

- The script must be executed in the Python 3 environment.
- This script must be run by user **root**.
- You need to check the permission on the upper-layer directory to ensure that the GDS user has the read and write permissions on the installation operation directory, installation directory, and installation package.
- Cross-platform installation and deployment are not supported.
- The node where the command is executed must be one of the installation and deployment nodes.
- The passwords of all nodes specified by the **--host** parameter must be the same so that the script can perform remote deployment successfully.

Syntax

```
gds_install -I /path/to/install_dir -U user -G user_group --pkg /path/to/pkg.tar.gz --host [/path/to/hostfile | ipaddr1,ipaddr2...] [--ping-host [/path/to/hostfile | ipaddr1,ipaddr2...]]
```

Parameter Description

- **-I**
Installation directory.
Default value: **/opt/\${gds_user}/packages/**, in which **\${gds_user}** indicates the operating system user of the GDS service.
 - **-U**
GDS user.
 - **-G**
Group to which the GDS user belongs.
 - **--pkg**
Path of the GDS installation package, for example, **/path/to/GaussDB-8.1.1-REDHAT-x86_64bit-Gds.tar.gz**.
 - **--host**
IP addresses of the nodes to be installed. The value can be a file name or a string.
 - File format: Each IP address occupies a row, for example:
192.168.2.200
192.168.2.201
 - Character string format: IP addresses are separated by commas (,), for example:
192.168.2.200,192.168.2.201
-  **NOTE**
- The node where the command is executed must be one of the nodes to be deployed. The IP address of the node must be in the list.
- **--ping-host**
Destination IP address for the network ping check on each target node when **gds_check** is called.
Value: IP address list in the file or string format. Generally, the value is the IP address of a DN, CN, or gateway.

- File format: Each IP address occupies a row, for example:
192.168.2.200
192.168.2.201
- String format: IP addresses are separated by commas (,), for example:
192.168.2.200,192.168.2.201
- -V
Version information.
- -h, --help
Help information.

Examples

Install GDS on nodes 192.168.1.100 and 192.168.1.101, and specify the installation directory as `/opt/gdspackages/install_dir`. The GDS user is `gds_test:wheel`.

```
gds_install -I /opt/gdspackages/install_dir --host 192.168.1.100,192.168.1.101 -U gds_test -G wheel --pkg /home/gds_test/GaussDB-8.1.1-REDHAT-x86_64bit-Gds.tar.gz
```

7.6 gds_uninstall

Background

`gds_uninstall` is a script tool used to uninstall GDS in batches.

Precautions

- Set environment variables before executing the script. For details, see "Importing Data > Using a Foreign Table to Import Data In Parallel > Installing, Configuring, and Starting GDS" in the *Developer Guide*.
- The script must be executed in the Python 3 environment.
- You must execute the `gds_uninstall` script as the **root** user.
- The `--host` and `-U` parameters must be contained.
- Currently, cross-platform uninstallation is not supported.
- The passwords of all nodes specified by the `--host` parameter must be the same to ensure that the script can be remotely uninstalled.

Syntax

```
gds_uninstall --host [/path/to/hostfile | ipaddr1,ipaddr2...] -U gds_user [--delete-user | --delete-user-and-group]
```

Parameter Description

- `--host`
IP addresses of the nodes to be uninstalled. The value can be a file name or a string:
 - File format: Each IP address occupies a row, for example:
192.168.2.200
192.168.2.201

- String format: IP addresses are separated by commas (,), for example:
192.168.2.200,192.168.2.201
- -U
GDS user.
- --delete-user
The user is deleted when GDS is uninstalled. The user to be deleted cannot be the **root** user.
- --delete-user-and-group
When GDS is uninstalled, the user and the user group to which the user belongs are deleted. You can delete a user group only when the user to be deleted is the only user of the user group. The user group cannot be the **root** user group.
- -V
Version information.
- -h, --help
Help information.

Example

Uninstall the GDS folders and environment variables installed and deployed by the **gds_test** user on nodes 192.168.1.100 and 192.168.1.101.

```
gds_uninstall -U gds_test --host 192.168.1.100,192.168.1.101
```

The user is deleted when GDS is uninstalled.

```
gds_uninstall -U gds_test --host 192.168.1.100,192.168.1.101 --delete-user
```

During the uninstallation, the user and user group are deleted at the same time.

```
gds_uninstall -U gds_test --host 192.168.1.100,192.168.1.101 --delete-user-and-group
```

7.7 gds_ctl

Context

gds_ctl is a script tool used for starting or stopping GDS service processes in batches. You can start or stop GDS service processes, which use the same port, on multiple nodes at a time, and set a daemon for each GDS process during the startup.

Precautions

- Before running the script, switch to a GDS user. You must run the **gds_ctl** script as a common user.
- The script must be executed in the Python 3 environment.
- **gds_ctl** inherits the main command-line parameters of GDS. Except **-p** and **-h**, the meanings of other parameters remain unchanged. In **gds_ctl**, **-p** is used only to specify a port.
- The nodes to be operated in batches using **gds_ctl** must have been installed and deployed using **gds_install**.

Syntax

- Startup command
`gds_ctl start --host [/path/to/hostfile | ipaddr1,ipaddr2...] -p PORT -d DATADIR -H ALLOW_IPs [gds other original options]`
- Stop command
`gds_ctl stop --host [/path/to/hostfile | ipaddr1,ipaddr2...] -p PORT`
- Restart command
`gds_ctl restart --host [/path/to/hostfile | ipaddr1,ipaddr2...] -p PORT`


Parameter Description

- `--host`
IP addresses of the GDS nodes to be run. The value can be a file name or a character string.
 - File format: Each IP address occupies a row, for example:
192.168.2.200
192.168.2.201
 - Character string format: IP addresses are separated by commas (,), for example:
192.168.2.200,192.168.2.201
- `-p`
Listening port.
Value range: an integer ranging from 1024 to 65535
Default value: **8098**
- `--help`
Help information.
- `-V`
Version information.

Compatible with Original GDS Parameters

- `-d dir`
Sets the directory of the data file to be imported. If the GDS process has the permission, the directory specified by `-d` will be automatically created.
- `-l log_file`
Sets the log file.
This parameter is used together with the `-R` parameter to support automatic log splitting. After the `-R` parameter is set, GDS generates a new file based on the set value to prevent a single log file from being too large.
Generation rule: By default, GDS identifies only files with the **.log** extension name and generates new log files.
For example, if `-l` is set to **gds.log** and `-R` is set to 20 MB, a **gds-2020-01-17_115425.log** file will be created when the size of **gds.log** reaches 20 MB.
If the log file name specified by `-l` does not end with **.log**, for example, **gds.log.txt**, the name of the new log file is **gds.log-2020-01-19_122739.txt**.

When GDS is started, it checks whether the log file specified by **-l** exists. If the log file exists, a new log file is generated based on the current date and time, and the original log file is not overwritten.

- **-H address_string**
Sets the hosts that can be connected to GDS. This parameter must be the CIDR format and it supports the Linux system only. If multiple network segments need to be configured, use commas (,) to separate them. For example, **-H 10.10.0.0/24, 10.10.5.0/24**.
 - **-e dir**
Sets the saving path of error logs generated when data is imported.
Default value: data file directory
 - **-E size**
Sets the upper threshold of error logs generated when data is imported.
Value range: $0 < \text{size} < 1 \text{ TB}$. The value must be a positive integer plus the unit. The unit can be KB, MB, or GB.
 - **-S size**
Sets the upper limit of the exported file size.
Value range: $1 \text{ MB} < \text{size} < 100 \text{ TB}$. The value must be a positive integer plus the unit. The unit can be KB, MB, or GB. If KB is used, the value must be greater than 1024 KB.
 - **-R size**
Sets the maximum size of a single GDS log file specified by **-l**.
Value range: $1 \text{ MB} < \text{size} < 1 \text{ TB}$. The value must be a positive integer plus the unit. The unit can be KB, MB, or GB. If KB is used, the value must be greater than 1024 KB.
Default value: **16 MB**
 - **-t worker_num**
Sets the number of concurrent imported and exported working threads.
Value range: The value is a positive integer ranging between 0 and 200 (included).
Default value: **8**
Recommended value: 2 x CPU cores in the common file import and export scenario; in the pipe file import and export scenario, set the value to **64**.
-  **NOTE**
- If a large number of pipe files are imported and exported concurrently, the value of this parameter must be greater than or equal to the number of concurrent services.
- **-s status_file**
Sets the status file. This parameter supports the Linux system only.
 - **-D**
Sets the background GDS. Only the Linux OS is supported.
 - **-r**
Traverse files in the recursion directory and this parameter supports the Linux system only.

- `--enable-ssl`
Uses the SSL authentication mode to communicate with clusters.
- `--ssl-dir cert_file`
Sets the path for storing the authentication certificates when the SSL authentication mode is used.
- `--debug-level`
Sets the debug log level of the GDS to control the output of GDS debug logs.
Value range: 0, 1, and 2
 - **0**: Only the file list related to log import and export is printed. If the log volume is small, set the parameter to this value only when the system is at normal state.
 - **1**: All the log information is printed, including the connection information, session switch information, and statistics on each node. You are advised to set the parameter to this value only during troubleshooting.
 - **2**: Detailed interaction logs and their status are printed to generate a huge number of debug logs to help identify the fault causes. You are advised to set the parameter to this value only during troubleshooting.
- `--pipe-timeout`
Sets the timeout period for GDS to wait for operating a pipe.
Value range: greater than 1s. Use a positive integer with the time unit, seconds (s), minutes (m), or hours (h). Example: **3600s**, **60m**, or **1h**, indicating one hour.
Default value: **1h/60m/3600s**

NOTE

- This parameter is used to prevent the following situation: One end of the pipe file is not read or written for a long time due to human or program problems. As a result, the read or write operation on the other end of the pipe is hung.
- This parameter does not indicate the maximum duration of a data import or export task. It indicates the maximum timeout duration of each read, open, or write operation on the pipe. If the timeout duration exceeds the value of **--pipe-timeout**, an error is reported to the frontend.

Examples

Start a GDS process. Its data files are stored in the **/data** directory, the IP address is 192.168.0.90, and the listening port number is 5000.

```
gds_ctl start --host 192.168.0.90 -d /data/ -p 5000 -H 10.10.0.1/24 -D
```

Start GDS processes in batches. The data files are stored in the **/data** directory, the IP addresses are 192.168.0.90, 192.168.0.91, and 192.168.0.92, and the listening port number is 5000.

```
gds_ctl start --host 192.168.0.90,192.168.0.91,192.168.0.92 -d /data/ -p 5000 -H 0/0 -D
```

Stop GDS processes on nodes 192.168.0.90, 192.168.0.91, and 192.168.0.92 whose port number is 5000 in batches.

```
gds_ctl stop --host 192.168.0.90,192.168.0.91,192.168.0.92 -p 5000
```

Restart GDS processes on nodes 192.168.0.90, 192.168.0.91, and 192.168.0.92 whose port number is 5000 in batches.

```
gds_ctl restart --host 192.168.0.90,192.168.0.91,192.168.0.92 -p 5000
```

7.8 gs_sshexkey

Context

During cluster installation, you need to execute commands and transfer files among hosts in the cluster. Therefore, mutual trust relationships must be established among the hosts before the installation. **gs_sshexkey**, provided by GaussDB(DWS), helps you establish such relationships.

NOTICE

The mutual trust relationships among **root** users have security risks. You are advised to delete the mutual trust relationships among **root** users once operations completed.

Prerequisites

- The SSH service has been enabled.
- You have verified that SSH ports will not be disabled by firewalls.
- Each host name and IP address have been correctly configured in the XML file.
- Communication among all the hosts must be normal.
- If the mutual trust relationship is to be established for common users, the same user needs to be created and password set on each host.
- If the SELinux OS has been installed and started on each host, the security context of the **/root** directory needs to be set to the default value **system_u:object_r:home_root_t:s0** and that of the **/home** directory set to the default value **system_u:object_r:admin_home_t:s0**.

To check whether the SELinux OS has been installed and started, run the **getenforce** command. If the command output is **Enforcing**, the SELinux OS has been installed and started.

To check the security contexts of the directories, run the following commands:

```
ls -ldZ /root | awk '{print $4}'  
ls -ldZ /home | awk '{print $4}'
```

To restore the security contexts of the directories, run the following commands:



```
restorecon -r -vv /home/  
restorecon -r -vv /root/
```

Syntax

- Establish mutual trust relationships.
`gs_sshexkey -f HOSTFILE [-W PASSWORD] [...] [--skip-hostname-set] [-l LOGFILE]`

- Show help information.
`gs_sshexkey -? | --help`
- Show version number.
`gs_sshexkey -V | --version`

Parameter Description

- **-f**
Lists the IP addresses of all the hosts among which mutual trust relationships need to be established.
 **NOTE**
Ensure that **hostfile** contains only correct IP addresses and no other information.
- **-W, --password=PASSWORD**
Specifies the password of the user who will establish mutual trust relationships. If this parameter is not specified, you will be prompted to enter the password when the mutual trust relationship is established. If the password of each host is different, you need to specify multiple **-W** parameters. The password sequence must correspond to the IP address sequence. In interactive mode, you need to enter the password of the host in sequence.
 **NOTE**
The password cannot contain the following characters: ;\$
- **-l**
Specifies the path of saving log files.
Value range: any existing, accessible absolute path
- **--skip-hostname-set**
Specifies whether to write the mapping relationship between the host name and IP address of the **-f** parameter file to the **/etc/hosts** file. If this parameter is specified, the relationship is not written to the file.
- **-?, --help**
Shows help information.
- **-V, --version**
Shows version number.

Examples

The following examples describe how to establish mutual trust relationships for user **root**:

- In non-interactive mode, if the user passwords are the same, run the following commands to establish mutual trust.

Gauss@123 indicates the password of user **root**.

```
./gs_sshexkey -f /opt/software/hostfile -W Gauss@123
Checking network information.
All nodes in the network are Normal.
Successfully checked network information.
Creating SSH trust.
Creating the local key file.
Appending local ID to authorized_keys.
```



```
Successfully appended local ID to authorized_keys.  
Updating the known_hosts file.  
Successfully updated the known_hosts file.  
Appending authorized_key on the remote node.  
Successfully appended authorized_key on all remote node.  
Checking common authentication file content.  
Successfully checked common authentication content.  
Distributing SSH trust file to all node.  
Successfully distributed SSH trust file to all node.  
Verifying SSH trust on all hosts.  
Successfully verified SSH trust on all hosts.  
Successfully created SSH trust.
```

- In non-interactive mode, if the user passwords are different, run the following commands to establish mutual trust.

Gauss@234 indicates the **root** password of the first host in the host list, and **Gauss@345** indicates the **root** password of the second host in the host list.

```
./gs_sshexkey -f /opt/software/hostfile -W Gauss@123 -W Gauss@234 -W Gauss@345  
Checking network information.  
All nodes in the network are Normal.  
Successfully checked network information.  
Creating SSH trust.  
Creating the local key file.  
Appending local ID to authorized_keys.  
Successfully appended local ID to authorized_keys.  
Updating the known_hosts file.  
Successfully updated the known_hosts file.  
Appending authorized_key on the remote node.  
Successfully appended authorized_key on all remote node.  
Checking common authentication file content.  
Successfully checked common authentication content.  
Distributing SSH trust file to all node.  
Successfully distributed SSH trust file to all node.  
Verifying SSH trust on all hosts.  
Successfully verified SSH trust on all hosts.  
Successfully created SSH trust.
```

- In interactive mode, if the user passwords are the same, run the following commands to establish mutual trust.

```
gs_sshexkey -f /opt/software/hostfile  
Please enter password for current user[root].  
Password:  
Checking network information.  
All nodes in the network are Normal.  
Successfully checked network information.  
Creating SSH trust.  
Creating the local key file.  
Appending local ID to authorized_keys.  
Successfully appended local ID to authorized_keys.  
Updating the known_hosts file.  
Successfully updated the known_hosts file.  
Appending authorized_key on the remote node.  
Successfully appended authorized_key on all remote node.  
Checking common authentication file content.  
Successfully checked common authentication content.  
Distributing SSH trust file to all node.  
Successfully distributed SSH trust file to all node.  
Verifying SSH trust on all hosts.  
Successfully verified SSH trust on all hosts.  
Successfully created SSH trust.
```

- In interactive mode, if the user passwords are different, run the following commands to establish mutual trust.

```
gs_sshexkey -f /opt/software/hostfile  
Please enter password for current user[root].  
Password:  
Notice :The password of some nodes is incorrect.  
Please enter password for current user[root] on the node[10.180.10.112].
```

```
Password:
Please enter password for current user[root] on the node[10.180.10.113].
Password:
Checking network information.
All nodes in the network are Normal.
Successfully checked network information.
Creating SSH trust.
Creating the local key file.
Appending local ID to authorized_keys.
Successfully appended local ID to authorized_keys.
Updating the known_hosts file.
Successfully updated the known_hosts file.
Appending authorized_key on the remote node.
Successfully appended authorized_key on all remote node.
Checking common authentication file content.
Successfully checked common authentication content.
Distributing SSH trust file to all node.
Successfully distributed SSH trust file to all node.
Verifying SSH trust on all hosts.
Successfully verified SSH trust on all hosts.
Successfully created SSH trust.
```

8 Change History

Released On	Description
2023-02-02	This issue is the first official release. Applicable to DWS 8.1.1.202.