Data Warehouse Service

Tools Guide

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HUAWEI CLOUD COMPUTING TECHNOLOGIES CO., LTD.

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1 Overview

This document describes how to use 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 Related Tools**.

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

Table 1-1 Client tools

Tool	Overview
gsql	A command-line interface (CLI) SQL client tool running on the Linux OS. It is used to connect to the database in a data warehouse cluster and operate and maintain 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 efficiently handles the import and export of data using foreign tables. 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 running on Linux or Windows. It migrates SQL scripts in Teradata or Oracle databases to SQL scripts applicable to DWS, enabling DWS database rebuilding. DSC runs on the Linux OS. You can use it after decompression without installation.

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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 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 recovery 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.

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2 Downloading Related Tools

Procedure

Step 1 Log in to the DWS console.

Step 2 In the navigation tree on the left, choose **Management** > **Client Connections**.

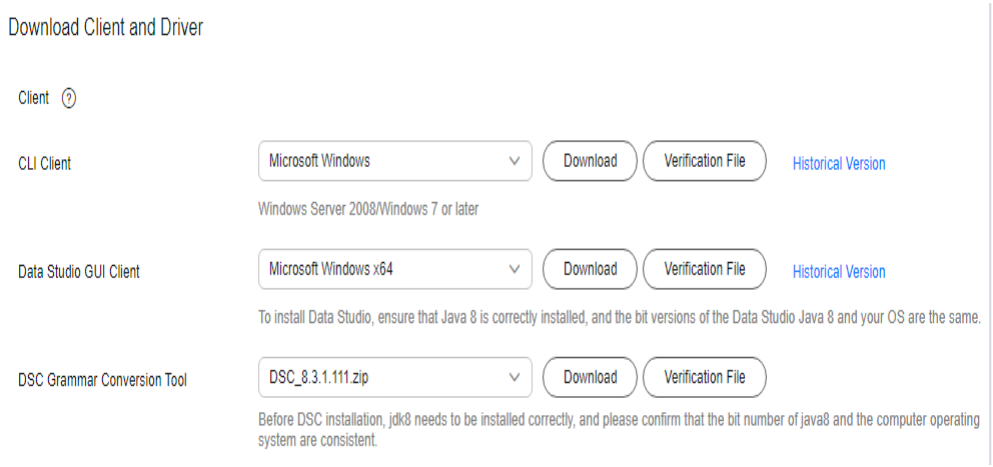
Step 3 In the **Download Client and Driver** area, select the tools corresponding to the cluster version based on the computer OS and download them.

You can download the following tools:

- 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. DWS clusters are compatible with earlier versions of gsql and Data Studio tools. You are advised to download the tool version based on the cluster version.

Figure 2-1 Downloading the client



----End

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3 gsql

3.1 Overview

Basic Functions

- **Connect to the database**: Use the gsql client to remotely connect to the 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.

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Table 3-1 Advanced features of gsql

Feature	Description
Variable	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: **\set** *varname value* To delete a variable, run the following command: **\unset** *varname* **NOTE** • 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. For details about variable examples and descriptions, see **Variable**.
SQL substitution	Common SQL statements can be set to variables using the variable feature of gsql to simplify operations. For details about SQL substitution examples and descriptions, see **SQL substitution**.
Customized prompt	Prompts of gsql can be customized. Prompts can be modified by changing the reserved variables of gsql: *PROMPT1*, *PROMPT2*, and *PROMPT3*. These variables can be set to customized values or the values predefined by gsql. For details, see **Prompt**.
Client operation history record	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. **NOTE** • 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
  ```

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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 3-12**) 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 **${}**. For 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)
```

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```
\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	\set DBNAME *dbname*	Specifies the name of a connected database. This variable is set again when a database is connected.
ECHO	\set ECHO all | queries	• 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.

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Variable	Setting Method	Description
ECHO_HIDDEN	\set ECHO_HIDDEN on | off | noexec	When a meta-command (such as **\dg**) is used to query database information, the value of this variable determines the query behavior. ● 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 *encoding*	Specifies the character set encoding of the current client.
FETCH_COUNT	\set FETCH_COUNT *variable*	● If the value is an integer greater than **0**, for example, *n*, *n* 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. **NOTE** Setting this variable to a proper value reduces memory usage. Generally, values from 100 to 1000 are proper.
HISTCONTROL	\set HISTCONTROL ignorespace | ignoredups | ignoreboth | 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. **NOTE** **none** indicates that **HISTCONTROL** is not set.
HISTFILE	\set HISTFILE *filename*	Specifies the file for storing historical records. The default value is **~/.bash_history**.

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Variable	Setting Method	Description
HISTSIZE	\set HISTSIZE *size*	Specifies the number of commands in the history command. The default value is **500**.
HOST	\set HOST *hostname*	Specifies the name of a connected host.
IGNOREEOF	\set IGNOREEOF *variable*	• 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 *oid*	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	• 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	• **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.
PORT	\set PORT *port*	Specifies the port number of a connected database.
USER	\set USER *username*	Specifies the connected database user.

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Variable	Setting Method	Description
VERBOSITY	\set VERBOSITY terse | default | verbose	This variable can be set to **terse**, **default**, or **verbose** to control redundant lines of error reports. • **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	\set VAR_NOT_FOUND default | null | error	You can set this parameter to **default**, **null**, or **error** to control the processing mode when the referenced variable does not exist. • **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	\set VAR_MAX_LENGTH *variable*	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	\set ERROR_LEVEL transaction | statement	Indicates whether a transaction or statement is successful or not. Value options: **transaction** or **statement**. Default value: **transaction** • **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.

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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	• 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. 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.

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Variable	Setting Method	Description
SQLSTATE	\set SQLSTATE state	• If ERROR_LEVEL is set to **statement**, this parameter indicates the status code of the previous SQL statement. • If ERROR_LEVEL 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. The default value is **00000**. The setting can be updated by executing SQL statements. You are not advised to manually set this parameter.
LAST_SYS_CODE	\set LAST_SYS_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 **\!** to run the system command. You are not advised to manually set this parameter.
DYNAMIC_PARAM_ENABLE	\set DYNAMIC_PARAM_ENABLE true | false	Controls the generation of variables and the variable referencing method **${}** during SQL statement execution. The default value is **false**. • **true**: Generate variables when executing SQL statements, and support the **${}** variable referencing method. • **false**: Do not generate variables when executing SQL statements, and the **${}** variable referencing method is not supported either.

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Variable	Setting Method	Description
CONVERT_QUOTE_IN_DYNAMIC_PARAM	\set CONVERT_QUOTE_IN_DYNAMIC_PARAM true | false	Specifies whether to escape single quotation marks, double quotation marks, and backslashes during dynamic variable parsing. The default value is **true**. • **true**: Indicates that during dynamic variable parsing, single quotation marks, double quotation marks, and backslashes (\) need to be escaped, and SQL substitution automatically escapes quotation marks and backslashes in variables. • **false**: Indicates that during dynamic variable parsing single quotation marks, double quotation marks, and backslashes (\) do not need to be escaped. SQL substitution does not process strings in variables. You need to manually escape them as needed. For details about the usage example, see **CONVERT_QUOTE_IN_DYNAMIC...**.
RESULT_DELIMITER	\set RESULT_DELIMITER delimiter	Controls the delimiter used for concatenating multiple records when variables are generated during SQL statement execution. The default delimiter is comma (,).

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Variable	Setting Method	Description
COMPARE_STRATEGY	\set COMPARE_STRATEGY default | natural | equal	Used to specify the value comparison policy of the **\if** expression. The default value is **default**. • **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 are 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. For details, see **\if conditional block comparison rules and examples**.
COMMAND_ERROR_STOP	\set COMMAND_ERROR_STOP on | off	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. For details, see the **example of using COMMAND_ERROR_STOP**.
INCOMPLETE_QUERY_ERROR	\set INCOMPLETE_QUERY_ERROR true | false	Indicates whether incomplete SQL statements are checked before process control meta-commands, such as **\if** **\goto** and **\for**, are executed. The default value is **false**. If a statement contains the incomplete characters, such as **(**,**'**,**"**,and **$$**, or does not end with a semicolon (;), an error is reported and the system exits. For details about the usage example, see **An example of using the special variable INCOMPLETE_QUERY_ERROR**.

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Variable	Setting Method	Description
INCOMPLETE_QUERY_ERROR_CODE	\set INCOMPLETE_QUERY_ERROR_CODE 12	If **INCOMPLETE_QUERY_ERROR** is set to **true** and an incomplete statement is detected, an error is reported and the statement exits. You can set **INCOMPLETE_QUERY_ERROR_CODE** to configure the exit code. The default value is **-1**. For details about the usage example, see **An example of using the special variable INCOMPLETE_QUERY_ERROR_CODE**.

- 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 an 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 ends 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 an 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 this function is enabled, the execution error of the meta-command can be effectively detected.

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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 error is reported, 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 error is reported, 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)
```

– An example of using the special variable **INCOMPLETE_QUERY_ERROR**:

When **INCOMPLETE_QUERY_ERROR** is set to **true**, incomplete SQL statements are detected before process control meta-commands such as \if \goto \for, an error is reported, and the system exits.

NOTE

The following types of incomplete statements are detected:

- The SQL statement does not end with a semicolon (;).
- The brackets in the SQL statement do not match.
- The single quotation marks in the SQL statement do not match.
- The double quotation marks in the SQL statement do not match.
- **$$** in the SQL statement does not match.

Detection method:

- If the command does not end with a semicolon (;) or if the brackets are mismatched, the system will analyze the character string before executing process control meta-commands such as **\if**, **\goto**, and **\for**. Additionally, C-style comments (**/* */**) and any whitespace characters will be removed. If any characters follow the escape sequences [\f\n\r\t\v] (including spaces, tabs, and form feeds), the system will treat the statement as incomplete. In this case, an error will be reported, and the system exits.
- Single quotation marks, double quotation marks, and $$ do not match. If the **\if**, **\elif**, **\else**, **\endif**, **\goto**, **\label**, **\for**, **\loop**, **\exit-for**, and **\end-for** meta-commands are detected, an error is reported and the system exits.

The following is an example of SQL statements that do not end with a semicolon (;):

```
\set INCOMPLETE_QUERY_ERROR true
select 1 as id
\if ${ERROR}
    \echo 'find error'
    \q 12
\endif
```

In the preceding example, an SQL statement that does not end with a semicolon (;) exists before the \if meta-command. In this case, an error is reported when the \if command is executed.

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```
$ gsql -X -d postgres -p 13500 --dynamic-param -a -f test.sql
\set INCOMPLETE_QUERY_ERROR true
select 1 as id
\if ${ERROR}
gsql:test.sql:3: ERROR: An incomplete SQL statement exists before the \if command.
gsql:test.sql:3: DETAIL: The SQL statement may not end with a semicolon. Please check.
```

The following is an example of SQL statements in which the brackets do not match:

```
\set INCOMPLETE_QUERY_ERROR true
insert into student values (1, 'jack';
\if ${ERROR}
    \echo 'find error'
    \q 12
\endif
```

In the preceding example, an SQL statement in which the brackets do not match exists before the \if meta-command. In this case, an error is reported when the \if command is executed.

```
$ gsql -X -d postgres -p 13500 --dynamic-param -a -f test.sql
\set INCOMPLETE_QUERY_ERROR true
insert into student values (1, 'jack';
\if ${ERROR}
gsql:test.sql:3: ERROR: An incomplete SQL statement exists before the \if command.
gsql:test.sql:3: DETAIL: There may be an unmatched ( in the SQL statement. Please check.
```

The following is an example of SQL statements in which the single quotation marks do not match:

```
\set INCOMPLETE_QUERY_ERROR true
select 'jack as name;
\if ${ERROR}
    \echo 'find error'
    \q 12
\endif
```

In the preceding example, an SQL statement in which the single quotation marks do not match exists before the \if meta-command. In this case, an error is reported when the \if command is executed.

```
$ gsql -X -d postgres -p 13500 --dynamic-param -a -f test.sql
\set INCOMPLETE_QUERY_ERROR true
select 'jack as name;
\if ${ERROR}
gsql:test.sql:3: ERROR: An incomplete SQL statement exists before the \if command.
gsql:test.sql:3: DETAIL: There may be an unmatched ' in the SQL statement. Please check.
```

The following is an example of SQL statements in which the double quotation marks do not match:

```
\set INCOMPLETE_QUERY_ERROR true
select 10001 as "ID;
\if ${ERROR}
    \echo 'find error'
    \q 12
\endif
```

In the preceding example, an SQL statement in which the double-brackets are incomplete exists before the **\if** meta-command. In this case, an error is reported and the system exits when the **\if** command is executed.

```
$ gsql -X -d postgres -p 13500 --dynamic-param -a -f test.sql
\set INCOMPLETE_QUERY_ERROR true
select 10001 as "ID;
\if ${ERROR}
gsql:test.sql:3: ERROR: An incomplete SQL statement exists before the \if command.
gsql:test.sql:3: DETAIL: There may be an unmatched " in the SQL statement. Please check.
```

The following is an example of SQL statements in which $$ does not match:

```
\set INCOMPLETE_QUERY_ERROR true
create or replace function gsql_dollar_quote_test()
```

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```
returns integer
as
$BODY$
declare
    query text;
    dest text;
begin
    query := 'select count(*) from pg_class';
    execute immediate query into dest;
end;
$BODY
language 'plpgsql' not fenced;
call gsql_dollar_quote_test();
\if ${ERROR}
    \echo 'find error'
    \q 12
\endif
```

In the preceding example, an SQL statement in which $$ does not match exists before the **\if** meta-command. In this case, an error is reported and the system exits when the **\if** command is executed.

```
$ gsql -X -d postgres -p 13500  --dynamic-param -a -f test.sql
\set INCOMPLETE_QUERY_ERROR true
create or replace function gsql_dollar_quote_test()
returns integer
as
$BODY$
declare
    query text;
    dest text;
begin
    query := 'select count(*) from pg_class';
    execute immediate query into dest;
end;
$BODY
language 'plpgsql' not fenced;
call gsql_dollar_quote_test();
\if ${ERROR}
gsql:test.sql:16: ERROR: An incomplete SQL statement exists before the \if command.
gsql:test.sql:16: DETAIL: There may be an unmatched $$ in the SQL statement. Please check.
```

– An example of using the special variable **INCOMPLETE_QUERY_ERROR_CODE**:

If **INCOMPLETE_QUERY_ERROR** is **true**, you can set **INCOMPLETE_QUERY_ERROR_CODE** to configure the exit code when an incomplete statement is detected. The following is an example:

```
\set INCOMPLETE_QUERY_ERROR true
\set INCOMPLETE_QUERY_ERROR_CODE 20
insert into student values (1, 'jack';
\if ${ERROR}
    \echo 'find error'
    \q 12
\endif
```

In the preceding test case, if **INCOMPLETE_QUERY_ERROR_CODE** is set to **20**, the \ifcommand will exit when an incomplete statement is detected, and the exit code is the value of **INCOMPLETE_QUERY_ERROR_CODE**.

```
$ gsql -X -d postgres -p 13500  --dynamic-param -a -f test.sql
\set INCOMPLETE_QUERY_ERROR true
\set INCOMPLETE_QUERY_ERROR_CODE 20
insert into student values (1, 'jack';
\if ${ERROR}
gsql:test.sql:4: ERROR: An incomplete SQL statement exists before the \if command.
gsql:test.sql:4: DETAIL: There may be an unmatched ( in the SQL statement. Please check.
$ echo $?
20
```

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- 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.

  – The following is an example of using the special variable **CONVERT_QUOTE_IN_DYNAMIC_PARAM**:

  If **CONVERT_QUOTE_IN_DYNAMIC_PARAM** is set to **true**, quotation marks and backslashes in variables are automatically escaped during SQL substitution.

```
 \set DYNAMIC_PARAM_ENABLE true
 \set CONVERT_QUOTE_IN_DYNAMIC_PARAM true
 select '"'abc'"\\' as "SpecialCharacters";
   test
-----------
 "'abc"\\
(1 row)

-- Single quotation marks are escaped, but still displayed in the result.
 select '${SpecialCharacters}' as "test";
   test
-----------
 "'abc"\\
(1 row)

-- Single quotation marks and backslashes are escaped, but still displayed in the result.
 select E'${SpecialCharacters}' as "test";
   test
-----------
 "'abc"\\
(1 row)

-- Double quotation marks are escaped, but still displayed in the result.
-- The column name contains characters other than letters, digits, and underscores (_). Therefore, an error occurred.
 select 'test' as "${SpecialCharacters}";
error while saving the value of "'abc"\\, please check the column name which can only contain upper and lower case letters, numbers and '_'.
 "'abc"\\
-----------
 test
(1 row)
```

When **CONVERT_QUOTE_IN_DYNAMIC_PARAM** is set to false, strings in the variable are not processed during SQL substitution. You need to manually escape the strings as needed

NOTE

You are advised to use the default value **true**.

During SQL substitution, single quotation marks need to be escaped in **''**, single quotation marks and backslashes need to be escaped in **E''**, and double quotation marks need to be escaped in **""**. Quotation marks and backslashes need to be handled based on variable positions. This makes the variable logics in SQL substitution complex and error-prone.

```
\set DYNAMIC_PARAM_ENABLE true
\set CONVERT_QUOTE_IN_DYNAMIC_PARAM false
select '""abc""\\' as "SpecialCharacters";
  test
-----------
 ""abc''\\
(1 row)

-- Single quotation marks are not escaped. The result contains only one single quotation mark.
select '${SpecialCharacters}' as "test";
  test
----------
 ""abc'\\
(1 row)

-- Single quotation marks and backslashes are not escaped. The result contains only one single quotation mark and one backslash.
select E'${SpecialCharacters}' as "test";
 test
---------
 ""abc'\
(1 row)

-- Double quotation marks are not escaped. The result contains only one double quotation mark.
-- The column name contains characters other than letters, digits, and underscores (_). Therefore, an error occurred.
select 'test' as "${SpecialCharacters}";
error while saving the value of "abc''\\, please check the column name which can only contain upper and lower case letters, numbers and '_'.
 "abc''\\
----------
 test
(1 row)
```

- Prompt

  The gsql prompt can be set using the three variables in **Table 3-3**. These variables consist of characters and special escape characters.

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Table 3-3 Prompt variables

Variable	Description	Example

PROMPT1	Specifies the normal prompt used when gsql requests a new command.
	The default value of *PROMPT1* is:
	`%/%R%#`
		PROMPT1 can be used to change the prompt.
		• 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.	*PROMPT2* 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.	*PROMPT3* 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.

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Symbol	Description
%>	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	• Normally uses **=** for *PROMPT1*, but **^** in single-line mode and **!** if the session is disconnected from the database (which may occur if **\connect** fails). • For PROMPT2, 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. • 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 *name* variable of gsql.
%command	Specifies command output, similar to ordinary "back-tick" ("^") substitution.
%[. . . %]	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: postgres=> \set PROMPT1 '%[%033[1;33;40m%]%n@%/%R%[%033[0m%]%#' The output is a boldfaced (1;) yellow-on-black (33;40) prompt on VT100-compatible, color-capable terminals.

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Environment Variables

Table 3-5 Environment variables related to gsql

Name	Description
COLUMNS	If **\set columns** 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	If the query result cannot be displayed within one page, the query result will be redirected to the command. You can use the **\pset** 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. **NOTE** Display of the **less** command is affected by the *LC_CTYPE* environmental variable.
PSQL_EDITOR	The **\e** and **\ef** 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	When the **\e** or **\ef** 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:
	`PSQL_EDITOR_LINENUMBER_ARG = '+'`
	`PSQL_EDITOR_LINENUMBER_ARG='--line '`
	A plus sign (+) is used by default on Unix.

PSQLRC	Specifies the location of the user's .gsqlrc file.
SHELL	Has the same effect as the **\!** command.
TMPDIR	Specifies the directory for storing temporary files. The default value is **/tmp**.

3.2 Downloading the Client

DWS provides client tool packages that match the cluster versions. You can download the desired client tool package on the DWS console.

The client tool package contains the following:

- **Linux database connection tool gsql and the script for testing sample data**

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Linux gsql is a Linux command line client running in Linux. It is used to connect to the database in a DWS cluster.

The script for testing sample data is used when you start an example.

- **Windows gsql**

  Windows gsql is a command line client running on the Windows OS. It is used to connect to the database in a DWS cluster.

  NOTE

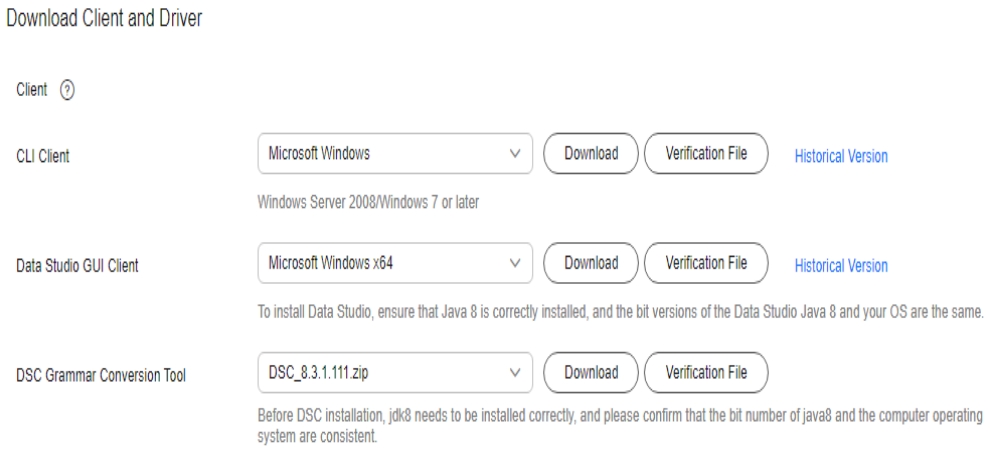
  Only 8.1.3.101 and later cluster versions can be downloaded from the console.

Downloading the Client

Step 1 Log in to the DWS console. In the navigation pane, choose **Connections**.

Step 2 Select the DWS client of the required version from the drop-down list of **gsql CLI Client**.

Figure 3-1 Downloading the client



Step 3 Click **Download** to download the gsql tool matching the 8.1.x cluster version. Click **Historical Version** to download the gsql tool corresponding to the cluster version.

- You are advised to download the gsql tool that matches the cluster version. That is, use gsql 8.1.x for clusters of 8.1.0 or later, and use gsql 8.2.x for clusters of 8.2.0 or later.
- Table 3-6 describes the files and folders in the Linux gsql tool package.

Table 3-6 Files and folders in the Linux gsql tool package

File or Folder	Description
bin	This folder contains the executable files of gsql in Linux. It contains the gsql client tool, GDS parallel data loading tool, and gs_dump, gs_dumpall, and gs_restore tools.

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File or Folder	Description
gds	This folder contains the files of the GDS data service tool. The GDS tool is used for parallel data loading and can import the data files stored in a common file system to a DWS database.
lib	This folder contains the **lib** library required for executing the gsql client.
sample	This folder contains the following directories and files: – **setup.sh**: script file for configuring the AK/SK before using gsql to import sample data – **tpcds_load_data_from_obs.sql**: script file for importing the TPC-DS sample data using the gsql client – **query_sql** directory: script file for querying the TPC-DS sample data
gsql_env.sh	Script file for configuring environment variables before running the gsql client.

- Table 3-7 describes the files and folders in the Windows gsql tool package.

  Table 3-7 Files and folders in the Windows gsql tool package

File or Folder	Description
x64	This folder contains the 64-bit Windows gsql execution binary file and the dynamic library.
x86	This folder contains the 32-bit Windows gsql execution binary file and the dynamic library.

  NOTE

  – In the cluster list on the **Clusters** page, click the name of the specified cluster to go to the **Cluster Information** page and view the cluster version.

----End

3.3 Instruction

3.3.1 Using the Linux gsql Client to Connect to a Cluster

This section describes how to connect to a database through an SQL client after you create a data warehouse cluster and before you use the cluster's database. DWS provides the Linux gsql client that matches the cluster version for you to access the cluster through the cluster's public or private network address.

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The gsql command line client provided by DWS runs on Linux. Before using it to remotely connect to a DWS cluster, you need to prepare a Linux server for installing and running the gsql client. If you use a public network address to access the cluster, you can install the Linux gsql client on your own Linux server. Ensure that the Linux server has a public network address. If no EIPs are configured for your DWS cluster, you are advised to create a Linux ECS for convenience purposes. For more information, see **(Optional) Preparing an ECS as the gsql Client Server**.

(Optional) Preparing an ECS as the gsql Client Server

For how to create an ECS, see "Getting Started" > "Creating an ECS" in the *Elastic Cloud Server User Guide*.

The created ECS must meet the following requirements:

- The ECS and data warehouse cluster must belong to the same region and AZ.
- If you use the gsql client provided by DWS to connect to the DWS cluster, the ECS image must meet the following requirements:

  The image's OS must be one of the following Linux OSs supported by the gsql client:

  - The **Redhat x86_64** client can be used on the following OSs:
    - RHEL 6.4 to RHEL 7.6
    - CentOS 6.4 to CentOS 7.4
    - EulerOS 2.3
  - The **SUSE x86_64** client can be used on the following OSs:
    - SLES 11.1 to SLES 11.4
    - SLES 12.0 to SLES 12.3
  - The **Euler Kunpeng_64** client can be used on the following OS:
    - EulerOS 2.8
- If the client accesses the cluster using the private network address, ensure that the created ECS is in the same VPC as the DWS cluster.

  For details about VPC operations, see "VPC and Subnet" in the *Virtual Private Cloud User Guide*.
- If the client accesses the cluster using the public network address, ensure that both the created ECS and DWS cluster have an EIP.

  When creating an ECS, set **EIP** to **Automatically assign** or **Specify**.
- The security group rules of the ECS must enable communication between the ECS and the port that the DWS cluster uses to provide services.

  For details about security group operations, see "Security Group" in the *Virtual Private Cloud User Guide*.

  Ensure that the security group of the ECS contains rules meeting the following requirements. If the rules do not exist, add them to the security group:

  - **Transfer Direction**: **Outbound**

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  - **Protocol/Application**: The value must contain **TCP**, for example, **TCP** and **All**.
  - **Port**: The value must contain the database port that provides services in the data warehouse cluster. For example, set this parameter to **1-65535** or a specific DWS database port.
  - Destination: The IP address set here must contain the IP address of the DWS cluster to be connected. **0.0.0.0/0** indicates any IP address.
- The security group rules of the data warehouse cluster must ensure that DWS can receive network access requests from clients.

  Ensure that the DWS cluster's security group contains rules meeting the following requirements. If the rules do not exist, add them to the security group:
  - **Transfer Direction**: **Inbound**
  - **Protocol/Application**: The value must contain **TCP**, for example, **TCP** and **All**.
  - **Port**: Set this parameter to the database port that provides services in the DWS cluster, for example, **8000**.
  - **Source**: The IP address set here must contain the IP address of the DWS client server, for example, **192.168.0.10/32**.

Downloading the Linux gsql Client and Connecting to a Cluster

Step 1 Download the Linux gsql client by referring to **Downloading the Client**, and use an SSH file transfer tool (such as WinSCP) to upload the client to a target Linux server.

You are advised to download the gsql tool that matches the cluster version. That is, use gsql 8.1.x for clusters of 8.1.0 or later, and use gsql 8.2.x for clusters of 8.2.0 or later. To download gsql 8.2.x, replace **dws_client_8.1.x_redhat_x64.zip** with **dws_client_8.2.x_redhat_x64.zip**. The **dws_client_8.1.x_redhat_x64.zip** is used as an example.

The user who uploads the client must have the full control permission on the target directory on the host to which the client is uploaded.

Step 2 Use the SSH tool to remotely manage the server where the client is installed.

For details about how to log in to an ECS, see "ECSs> Logging In to a Linux ECS > Login Using an SSH Password" in the *Elastic Cloud Server User Guide*.

Step 3 (Optional) To connect to the cluster in SSL mode, configure SSL authentication parameters on the host where the client is installed. For details, see **Establishing Secure TCP/IP Connections in SSL Mode**.

NOTE

The SSL connection mode is more secure than the non-SSL mode. You are advised to connect the client to the cluster in SSL mode.

Step 4 Run the following commands to decompress the client:

```
cd <Path for saving the client>
unzip dws_client_8.1.x_redhat_x64.zip
```

In the preceding commands:

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- <*Path_for_storing_the_client*>: Replace it with the actual path.
- *dws_client_8.1.x_redhat_x64.zip*: This is the client tool package name of **RedHat x86**. Replace it with the actual name.

Step 5 Run the following command to configure the client:

```
source gsql_env.sh
```

If the following information is displayed, the client is successfully configured:

```
All things done.
```

Step 6 Connect to the database in the DWS cluster using the gsql client.

```
gsql -d <Database name> -h <Cluster address> -U <Database user> -p <Database port> -W <Cluster password> -r
```

The parameters are described as follows:

- *Database_name*: Enter the name of the database to be connected. If you use the client to connect to the cluster for the first time, enter the default database **gaussdb**.
- **Cluster Address**: For details about how to obtain the cluster address, see "Connecting to a Cluster > Obtaining the Cluster Connection Address" in the *Data Warehouse Service User Guide*. If a public network address is used for connection, set this parameter to **Public Network Address**. If a private network address is used for connection, set this parameter to **Private Network Address**.
- *Database_user*: Enter the username of the cluster's database. If you use the client to connect to the cluster for the first time, set this parameter to the default administrator configured during cluster creation, for example, **dbadmin**.
- *Database_port*: Enter the database port set during cluster creation.

For example, run the following command to connect to the default database **gaussdb** in the DWS cluster:

```
gsql -d gaussdb -h 10.168.0.74 -U dbadmin -p 8000 -W password -r
```

If the following information is displayed, the connection succeeded:

```
gaussdb=>
```

----End

gsql Command Reference

For details about gsql commands, see **Meta-Command Reference**.

(Optional) Importing TPC-DS Sample Data Using gsql

DWS users can import data from external sources to data warehouse clusters. This section describes how to import sample data from OBS to a data warehouse cluster and perform querying and analysis operations on the sample data. The sample data is generated based on the standard TPC-DS benchmark test.

TPC-DS is the benchmark for testing the performance of decision support. With TPC-DS test data and cases, you can simulate complex scenarios, such as big data set statistics, report generation, online query, and data mining, to better understand functions and performance of database applications.

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Step 1 Use the SSH remote connection tool to log in to the server where the gsql client is installed and go to the gsql directory. The **/opt** directory is used as an example for storing the gsql client.

```
cd /opt
```

Step 2 Switch to the specified directory and set the AK and SK for importing sample data and the OBS access address.

If the following information is displayed, the settings are successful:

```
setup successfully!
```

NOTE

<Access_Key_Id> and *<Secret_Access_Key>*: indicate the AK and SK, respectively. For details about how to obtain the AK and SK, see "Data Import > Concurrently Importing Data from OBS > Creating Access Keys (AK and SK)" in the *Data Warehouse Service (DWS) Developer Guide*. Then, replace the parameters in the statements with the obtained values.

Step 3 Go back to previous directory and run the gsql environment variables.

```
cd ..
source gsql_env.sh
cd bin
```

Step 4 Import the sample data to the data warehouse.

Command format:

```
gsql -d <Database name> -h <Public network address of the cluster> -U <Administrator> -p <Data warehouse port number> -f <Path for storing the sample data script> -r
```

Sample command:

```
gsql -d gaussdb -h 10.168.0.74 -U dbadmin -p 8000 -f /opt/sample/tpcds_load_data_from_obs.sql -r
```

NOTE

In the preceding command, sample data script **tpcds_load_data_from_obs.sql** is stored in the sample directory (for example, **/opt/sample/**) of the DWS client.

After you enter the administrator password and successfully connect to the database in the cluster, the system will automatically create a foreign table to associate the sample data outside the cluster. Then, the system creates a target table for saving the sample data and imports the data to the target table using the foreign table.

The time required for importing a large dataset depends on the current DWS cluster specifications. Generally, the import takes about 10 to 20 minutes. If information similar to the following is displayed, the import is successful.

```
Time:1845600.524 ms
```

Step 5 In the Linux command window, run the following commands to switch to a specific directory and query the sample data:

```
cd /opt/sample/query_sql/
/bin/bash tpcds100x.sh
```

Step 6 Enter the cluster's public network IP address, access port, database name, user who accesses the database, and password of the user as prompted.

- The default database name is **gaussdb**.
- Use the administrator username and password configured during cluster creation as the username and password for accessing the database.

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After the query is complete, a directory for storing the query result, such as **query_output_20170914_072341**, will be generated in the current query directory, for example, **sample/query_sql/**.

----End

3.3.2 Using the Windows gsql Client to Connect to a Cluster

This section describes how to connect to a database through an SQL client after you create a data warehouse cluster and before you use the cluster's database. DWS provides the Windows gsql client that matches the cluster version for you to access the cluster through the cluster's public or private network address.

Procedure

Step 1 Install and run the gsql client on the local Windows server (in Windows CLI). Windows Server 2008/Windows 7 and later are supported.

Step 2 Download the Windows gsql client by referring to **Downloading the Client** and decompress the package to a local folder.

Step 3 On the local server, click **Start**, search for **cmd**, and run the program as the administrator. Alternatively, press **Win**+**R** to open the Windows CLI.

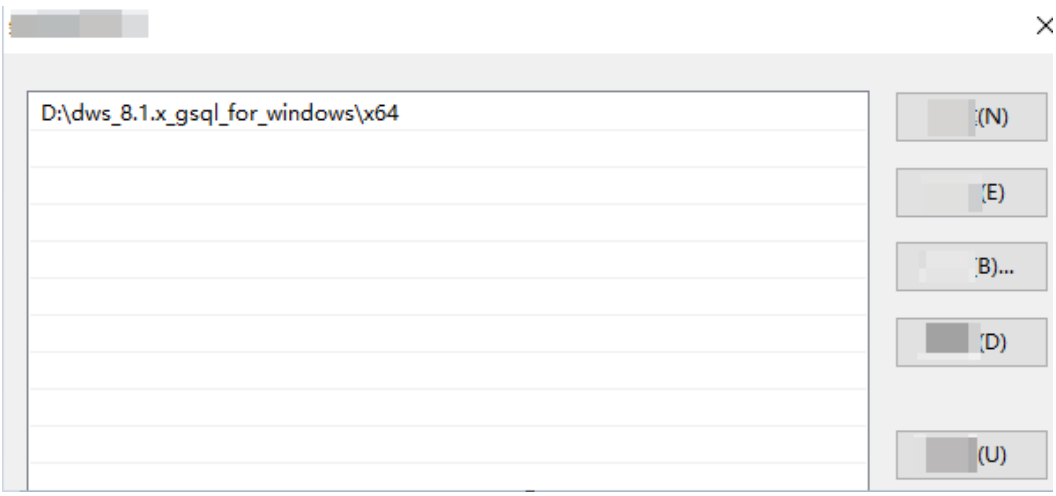
Step 4 Set environment variables. For a 32-bit OS, select the **x86** folder. For a 64-bit OS, select the **x64** folder.

Method 1: Configure environment variables in the Windows CLI. Open the command prompt and run the **set path=***<window_gsql>***;%path%** command, where *<window_gsql>* indicates the folder path where the Windows gsql client was decompressed to in the previous step. For example:

```
set path=C:\Users\xx\Desktop\dws_8.1.x_gsql_for_windows\x64;%path%
```

Method 2: In the **Control Panel** window, search for **System** and click **View advanced system settings**. Click the **Advanced** tab, and click **Environment Variables**. Select the **Path** parameter and click **Edit**. Add the gsql path in the parameter value. For example:

Figure 3-2 Configuring Windows environment variables



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Step 5 (Optional) To connect to the cluster in SSL mode, configure SSL authentication parameters on the host where the client is installed. For details, see **Establishing Secure TCP/IP Connections in SSL Mode**.

NOTE

The SSL connection mode is more secure than the non-SSL mode. You are advised to connect the client to the cluster in SSL mode.

Step 6 In the Windows CLI, run the following command to connect to the database in the DWS cluster using the gsql client:

```
gsql -d <Database name> -h <Cluster address> -U <Database user> -p <Database port> -W <Cluster password> -r
```

The parameters are as follows:

- **Database name**: Enter the name of the database to be connected. If you use the client to connect to the cluster for the first time, enter the default database **gaussdb**.
- **Cluster Address**: For details about how to obtain the cluster address, see "Connecting to a Cluster > Obtaining the Cluster Connection Address" in the *Data Warehouse Service User Guide*. If a public network address is used for connection, set this parameter to the public network domain name. If a private network address is used for connection, set this parameter to the private network domain name.
- **Database user**: Enter the username of the cluster's database. If you use the client to connect to the cluster for the first time, set this parameter to the default administrator configured during cluster creation, for example, **dbadmin**.
- **Database port**: Enter the database port set during cluster creation.

For example, run the following command to connect to the default database **gaussdb** in the DWS cluster:

```
gsql -d gaussdb -h 10.168.0.74 -U dbadmin -p 8000 -W password -r
```

If the following information is displayed, the connection succeeded:

```
gaussdb=>
```

----End

Precautions

1. The default character encoding of the Windows command prompt is GBK, and the default value of **client_encoding** of Windows gsql is **GBK**. Some characters encoded using UTF-8 cannot be displayed in Windows gsql.

   Suggestion: Ensure the file specified using **-f** uses UTF-8 encoding, and set the default encoding format to **UTF-8** (**set client_encoding='utf-8';**).

2. Paths in Windows gsql must be separated by slashes (/), or an error will be reported. In a meta-command, the backslash (\) indicates the start of a meta-command. If the backslash is enclosed in single quotation marks ('\'), it is used for escape.

   ```
   gaussdb=> \i D:\test.sql
   D:: Permission denied
   postgres=> \i D:/test.sql
   id
   ```

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```
----
 1
(1 row)
```

3. To use the **\!** metacommand to run a system command in Windows gsql, be sure to use the path separator required by the system command. Generally, the path separator is a backslash (\).

   ```
   gaussdb=> \! type D:/test.sql
   Incorrect syntax.
   gaussdb=> \! type D:\test.sql
   select 1 as id;
   ```

4. Windows gsql does not support the **\parallel** meta-command.

   ```
   gaussdb=> \parallel
   ERROR: "\parallel" is not supported in Windows.
   ```

5. In Linux shell, single quotation marks (') and double quotation marks ("") can be used to enclose strings. In Windows, only double quotation marks can be used.

   ```
   gsql -h 192.168.233.189 -p 8109 -d postgres -U odbcuser -W password -c "select 1 as id"
    id
   ----
    1
   (1 row)
   ```

   If single quotation marks are used, an error will be reported and the input will be ignored.

   ```
   gsql -h 192.168.233.189 -p 8109 -d postgres -U odbcuser -W password -c 'select 1 as id'
   gsql: warning: extra command-line argument "1" ignored
   gsql: warning: extra command-line argument "as" ignored
   gsql: warning: extra command-line argument "id'" ignored
   ERROR:  unterminated quoted string at or near "'select"
   LINE 1: 'select
   ```

6. If Windows gsql is idle for a long time after a connection is established, the connection session times out, and an SSL error is reported. In this case, you need to log in again. The following error is reported:

   ```
   SSL SYSCALL error: Software caused connection abort (0x00002745/10053), remote datanode <NULL>, error: Result too large
   ```

7. In Windows, press **Ctrl**+**C** to exit gsql. If **Ctrl**+**C** are pressed during input, the input will be ignored and you will be forced to exit gsql.

   Enter **as** and press **Ctrl**+**C**. After **\q** is displayed, exit gsql.

   ```
   gaussdb=> select 1
   gaussdb=> as \q
   ```

8. Windows gsql cannot connect to a database using the LATIN1 character encoding. The error information is as follows:

   ```
   gsql: FATAL: conversion between GBK and LATIN1 is not supported
   ```

9. The location of the **gsqlrc.conf** file:

   The default **gsqlrc** path is **%APPDATA%/postgresql/gsqlrc.conf**. You can also set the path using the **PSQLRC** variable.

   ```
   set PSQLRC=C:\Users\xx\Desktop\dws_8.1.x_gsql_for_windows\x64\gsqlrc.conf
   ```

gsql Command Reference

For details about gsql commands, see **Meta-Command Reference**.

3.3.3 Establishing Secure TCP/IP Connections in SSL Mode

DWS supports the standard SSL. As a highly secure protocol, SSL authenticates bidirectional identification between the server and client using digital signatures and digital certificates to ensure secure data transmission. To support SSL

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connection, DWS has obtained the formal certificates and keys for the server and client from the CA certification center. It is assumed that the key and certificate for the server are **server.key** and **server.crt** respectively; the key and certificate for the client are **client.key** and **client.crt** respectively, and the name of the CA root certificate is **cacert.pem**.

The SSL connection mode is more secure. By default, the SSL feature in a cluster allows SSL and non-SSL connections from the client. For security purposes, you are advised to connect to the cluster via SSL from the client. Ensure the certificate, private key, and root certificate of the DWS server have been configured by default. To forcibly use an SSL connection, configure the **require_ssl** parameter in the **Require SSL Connection** area of the cluster's **Security Settings** page on the DWS console. For more information, see **Configuring SSL Connection** and **Combinations of SSL Connection Parameters on the Client and Server**.

The client or JDBC/ODBC driver needs to use SSL connection. Configure related SSL connection parameters in the client or application code. The DWS console provides the SSL certificate required by the client. The SSL certificate contains the default certificate, private key, root certificate, and private key password encryption file required by the client. Download the SSL certificate to the host where the client is installed, and specify the path of the certificate on the client. For more information, see **Configuring Digital Certificate Parameters Related to SSL Authentication on the gsql Client** and **SSL Authentication Modes and Client Parameters**.

NOTE

Using the default certificate may pose security risks. To improve system security, you are advised to periodically change the certificate to prevent password cracking. If you need to replace the certificate, contact the database customer service.

Configuring SSL Connection

Prerequisites

- Changes made to security configuration parameters require a cluster restart to take effect. Otherwise, the cluster will be temporarily unavailable.
- To modify the cluster's security configuration, ensure that the following conditions are met:
  - The cluster status is **Available**, **To be restarted**, or **Unbalanced**.
  - The **Task Information** cannot be set to **Creating snapshot**, **Scaling out**, **Configuring**, or **Restarting**.

Procedure

Step 1 Log in to the DWS console.

Step 2 Choose **Dedicated Clusters** > **Clusters** in the navigation pane.

Step 3 In the cluster list, click the name of a cluster. On the page that is displayed, click **Security Settings**.

By default, **Configuration Status** is **Synchronized**, which indicates that the latest database result is displayed.

Step 4 In the **SSL Connection** area, enable **Require SSL Connection** (recommended).

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indicates the function is enabled. The **require_ssl** is set to **1**, indicating that the server forcibly requires the SSL connection.

indicates the function is disabled (default value). The **require_ssl** parameter is set to **0**, indicating that the server does not require SSL connections. For how to configure the **require_ssl** parameter, see **require_ssl (Server)**.

NOTE

- If the gsql client or ODBC driver provided by DWS is used, DWS supports the TLSv1.2 SSL protocol.
- If the JDBC driver provided by DWS is used, DWS supports SSL protocols, such as SSLv3, TLSv1, TLSv1.1, and TLSv1.2. The SSL protocol used between the client and the database depends on the Java Development Kit (JDK) version used by the client. Generally, JDK supports multiple SSL protocols.

Step 5 Click **Apply**.

The system automatically saves the SSL connection settings. On the **Security Settings** page, **Configuration Status** is **Applying**. After **Configuration Status** changes to **Synchronized**, the settings have been saved and taken effect.

----End

Configuring Digital Certificate Parameters Related to SSL Authentication on the gsql Client

After a DWS cluster is deployed, the SSL authentication mode is enabled by default. The server certificate, private key, and root certificate have been configured by default. You need to configure the client parameters.

Step 1 Log in to the DWS console. In the navigation pane, choose **Management** > **Client Connections**.

Step 2 In the **Driver** area, click **download an SSL certificate**.

Step 3 Use a file transfer tool (such as WinSCP) to upload the SSL certificate to the host where the client is installed.

For example, save the downloaded certificate **dws_ssl_cert.zip** to the **/home/dbadmin/dws_ssl/** directory.

Step 4 Use an SSH remote connection tool (such as PuTTY) to log in to the host where the gsql client is installed and run the following commands to go to the directory where the SSL certificate is stored and decompress the SSL certificate:

```
cd /home/dbadmin/dws_ssl/
unzip dws_ssl_cert.zip
```

Step 5 Run the export command and configure digital certificate parameters related to SSL authentication on the host where the gsql client is installed.

There are two SSL authentication modes: bidirectional authentication and unidirectional authentication. The client environment variables to be configured vary according to the authentication mode. For details, see **SSL Authentication Modes and Client Parameters**.

The following parameters must be configured for bidirectional authentication:

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```
export PGSSLCERT="/home/dbadmin/dws_ssl/sslcert/client.crt"
export PGSSLKEY="/home/dbadmin/dws_ssl/sslcert/client.key"
export PGSSLMODE="verify-ca"
export PGSSLROOTCERT="/home/dbadmin/dws_ssl/sslcert/cacert.pem"
```

The following parameters must be configured for unidirectional authentication:

```
export PGSSLMODE="verify-ca"
export PGSSLROOTCERT="/home/dbadmin/dws_ssl/sslcert/cacert.pem"
```

NOTICE

- You are advised to use bidirectional authentication for security purposes.
- The environment variables configured for a client must contain the absolute file paths.

Step 6 Change the client private key permissions.

The permissions on the client's root certificate, private key, certificate, and encrypted private key file must be **600**. If the permissions do not meet the requirement, the client cannot connect to the cluster in SSL mode.

```
chmod 600 client.key
chmod 600 client.crt
chmod 600 client.key.cipher
chmod 600 client.key.rand
chmod 600 cacert.pem
```

----End

SSL Authentication Modes and Client Parameters

There are two SSL authentication modes: bidirectional authentication and unidirectional authentication. **Table 3-8** shows the differences between these two modes. You are advised to use bidirectional authentication for security purposes.

Table 3-8 Authentication modes

Authentication Mode	Description	Environment Variables Configured on a Client	Maintenance
Bidirectional authentication (recommended)	The client verifies the server's certificate and the server verifies the client's certificate. The connection can be set up only after the verifications are successful.	Set the following environment variables: • PGSSLCERT • PGSSLKEY • PGSSLROOTCERT • PGSSLMODE	This authentication mode is applicable to scenarios that require high data security. When using this mode, you are advised to set the **PGSSLMODE** client variable to **verify-ca** for network data security purposes.

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Authentication Mode	Description	Environment Variables Configured on a Client	Maintenance
Unidirectional authentication	The client verifies the server's certificate, whereas the server does not verify the client's certificate. The server loads the certificate information and sends it to the client. The client verifies the server's certificate according to the root certificate.	Set the following environment variables: • PGSSLROOTCERT • PGSSLMODE	To prevent TCP-based security attacks, you are advised to use the SSL certificate authentication. In addition to configuring the client root certificate, you are advised to set the **PGSSLMODE** variable to **verify-ca** on the client.

Configure environment variables related to SSL authentication on the client. For details, see **Table 3-9**.

NOTE

The path of environment variables is set to */home/dbadmin***/dws_ssl/** as an example. Replace it with the actual path.

Table 3-9 Client parameters

Environment Variable	Description	Value Description
PGSSLCERT	Specifies the certificate files for a client, including the public key. Certificates prove the legal identity of the client and the public key is sent to the peer end for data encryption.	The absolute path of the files must be specified, for example: export PGSSLCERT='*/home/dbadmin/dws_ssl/sslcert/client.crt*' (No default value)
PGSSLKEY	Specifies the private key file for the client to decrypt digital signatures and data encrypted using the public key.	The absolute path of the files must be specified, for example: export PGSSLKEY='*/home/dbadmin/dws_ssl/sslcert/client.key*' (No default value)

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Environment Variable	Description	Value Description
PGSSLMODE	Specifies whether to negotiate with the server about SSL connection and specifies the priority of the SSL connection.	Values and meanings: • **disable**: only tries to establish a non-SSL connection. • **allow**: tries to establish a non-SSL connection first, and then an SSL connection if the first attempt fails. • **prefer**: tries to establish an SSL connection first, and then a non-SSL connection if the first attempt fails. • **require**: only tries to establish an SSL connection. If there is a CA file, perform the verification according to the scenario in which the parameter is set to **verify-ca**. • **verify-ca**: tries to establish an SSL connection and check whether the server certificate is issued by a trusted CA. • **verify-full**: DWS does not support this mode. Default value: **prefer** **NOTE** When an external client accesses a cluster, the error message "ssl SYSCALL error" is displayed on some nodes. In this case, run **export PGSSLMODE="allow"** or **export PGSSLMODE="prefer"**.
PGSSLROOTCERT	Specifies the root certificate file for issuing client certificates. The root certificate is used to verify the server certificate.	The absolute path of the files must be specified, for example: export PGSSLROOTCERT='*/home/dbadmin/dws_ssl/sslcert/certca.pem*' Default value: null
PGSSLCRL	Specifies the certificate revocation list file, which is used to check whether a server certificate is in the list. If the certificate is in the list, it is invalid.	The absolute path of the files must be specified, for example: export PGSSLCRL='*/home/dbadmin/dws_ssl/sslcert/sslcrl-file.crl*' Default value: null

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Combinations of SSL Connection Parameters on the Client and Server

Whether the client uses the SSL encryption connection mode and whether to verify the server certificate depend on client parameter **sslmode** and server (DWS cluster) parameters **ssl** and **require_ssl**. The parameters are as follows:

- **ssl (Server)**

  The **ssl** parameter indicates whether to enable the SSL function. **on** indicates that the function is enabled, and **off** indicates that the function is disabled.

  - The default value is **on** for clusters whose version is 1.3.1 or later, and you cannot set this parameter on the DWS console.
  - For clusters whose version is earlier than 1.3.1, the default value is **on**. You can set the **require_ssl** parameter in the **Require SSL Connection** area of the cluster's **Security Settings** page on the DWS console.

- **require_ssl (Server)**

  The **require_ssl** parameter specifies whether the server forcibly requires SSL connection. This parameter is valid only when **ssl** is set to **on**. **on** indicates that the server forcibly requires SSL connection. **off** indicates that the server does not require SSL connection.

  - The default value is **off** for clusters whose version is 1.3.1 or later. You can set the **require_ssl** parameter in the **Require SSL Connection** area of the cluster's **Security Settings** page on the DWS console.
  - For clusters whose version is earlier than 1.3.1, the default value is **off**, and you cannot set this parameter on the DWS console.

- **sslmode (Client)**

  You can set this parameter in the SQL client tool.

  - In the gsql command line client, this parameter is the **PGSSLMODE** parameter.
  - On the Data Studio client, this parameter is the **SSL Mode** parameter.

The combinations of client parameter **sslmode** and server parameters **ssl** and **require_ssl** are as follows.

Table 3-10 Combinations of SSL connection parameters on the client and server

ssl (Server)	sslmode (Client)	require_ssl (Server)	Result
on	disable	on	The server requires SSL, but the client disables SSL for the connection. As a result, the connection cannot be set up.
	disable	off	The connection is not encrypted.
	allow	on	The connection is encrypted.
	allow	off	The connection is not encrypted.
	prefer	on	The connection is encrypted.
	prefer	off	The connection is encrypted.

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ssl (Server)	sslmode (Client)	require_ssl (Server)	Result
	require	on	The connection is encrypted.
	require	off	The connection is encrypted.
	verify-ca	on	The connection is encrypted and the server certificate is verified.
	verify-ca	off	The connection is encrypted and the server certificate is verified.
off	disable	on	The connection is not encrypted.
	disable	off	The connection is not encrypted.
	allow	on	The connection is not encrypted.
	allow	off	The connection is not encrypted.
	prefer	on	The connection is not encrypted.
	prefer	off	The connection is not encrypted.
	require	on	The client requires SSL, but SSL is disabled on the server. Therefore, the connection cannot be set up.
	require	off	The client requires SSL, but SSL is disabled on the server. Therefore, the connection cannot be set up.
	verify-ca	on	The client requires SSL, but SSL is disabled on the server. Therefore, the connection cannot be set up.
	verify-ca	off	The client requires SSL, but SSL is disabled on the server. Therefore, the connection cannot be set up.

3.4 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 3-11**.

Table 3-11 gsql online help

Description	Example
View copyright information.	\copyright
View the help information about SQL statements supported by DWS.	View the help information about SQL statements supported by DWS. For example, view all SQL statements supported by DWS. \h Available help: ABORT ALTER DATABASE ALTER DATA SOURCE ... ... For example, view parameters of the **CREATE DATABASE** command: \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]}[...]];
View help information about gsql commands.	For example, view commands supported by **gsql**. \? 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 ... ...

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----End

3.5 Command Reference

For details about gsql parameters, see **Table 3-12**, **Table 3-13**, **Table 3-14**, and **Table 3-15**.

Table 3-12 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 **${}** 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 *FILENAME* 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 *NAME* to *VALUE*. 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 *PSQLRC*.	-

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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 3-13 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.	-

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Parameter	Description	Value Range
-L, --log-file=FILENAME	Writes normal output destination and all query output into the **FILENAME** file. **CAUTION** • 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	Allows a cluster to be connected when a two-phase transaction is being restored. **NOTE** 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.	-
-n, --no-libedit	Closes the command line editing.	-
-o, --output=FILENAME	Puts all query output into the **FILENAME** file.	An absolute path or relative path that meets the OS path naming convention
-q, --quiet	Indicates the quiet mode and no additional information will be printed.	By default, gsql displays various information.
-s, --single-step	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. **CAUTION** When this parameter is used in some SQL statements, sensitive information, such as user passwords, may be disclosed. Use this parameter with caution.	-
-S, --single-line	Runs in single-row mode where a new line terminates an SQL statement in the same manner as a semicolon does.	-

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Table 3-14 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=STRING	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=STRING	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.	-

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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 3-15 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** • If a user is specified to access a database using this parameter, a user password is required for identity authentication. 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.

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Parameter	Description	Value Range
-W, --password=PASSWORD	Specifies a password when the **-U** parameter is used to connect to a remote database. **NOTE** To connect to a database, add an escape character before any backslash (\) or back quote (`) in the password. 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**.	This parameter must meet the password complexity requirement.

3.6 Meta-Command Reference

This section describes meta-commands provided by gsql after the 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 an 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

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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 3-16**, **Table 3-17**, **Table 3-18**, **Table 3-19**, **Table 3-21**, **Table 3-23**, **Table 3-24**, **Table 3-25**, and **Table 3-27**.

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 3-16 Common meta-commands

Parameter	Description	Value Range
\copyright	Displays 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 (*), syntax help on all SQL statements is displayed.

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Parameter	Description	Value Range
\parallel [on [num]|off]	Controls the parallel execution function. • **on**: The switch is enabled and the maximum number of concurrently executed tasks is **num**. • **off**: This switch is disabled. **NOTE** • Parallel execution is not allowed in a running transaction and a transaction is not allowed to be stared 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. • The DISCARD command cannot be used in **\parallel**. • 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, *num* 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. • **\parallel** does not support operations on VOLATILE/GLOBAL global temporary tables.	The default value of *num* is **1024**. **NOTICE** • 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 *num* 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.	-

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Table 3-17 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.
\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 3-18 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]]	After logging in to the database on any **gsql** 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. **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.
\echo [STRING]	Writes a character string to the standard output.
\i FILE	Reads content from *FILE* 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.

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Parameter	Description
\qecho [STRING]	Prints a character string to the query result output.

NOTE

In Table 3-19, **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 3-19 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. `\d`
\d[S+] NAME	Lists the structure of specified tables, views, and indexes.	-	Lists the structure of table **a**. `\dtable+ a`
\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**. `\d+ f*`
\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. `\da f*`

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Parameter	Description	Value Range	Example
\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**. `\db p*`
\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`

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Parameter	Description	Value Range	Example
\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`
\det[+] [PATTERN]	Lists all external tables.	If **PATTERN** is specified, only tables whose names match **PATTERN** are displayed.	Lists all external tables. `\det`
\des[+] [PATTERN]	Lists all external servers.	If **PATTERN** is specified, only servers whose names match **PATTERN** are displayed.	Lists all external servers. `\des`
\deu[+] [PATTERN]	Lists user mappings.	If **PATTERN** is specified, only information whose name matches **PATTERN** is displayed.	Lists user mappings. `\deu`
\dew[+] [PATTERN]	Lists foreign-data wrappers.	If **PATTERN** is specified, only data whose name matches **PATTERN** is displayed.	Lists foreign-data wrappers. `\dew`
\df[antw][S+] [PATTERN]	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. `\df`

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Parameter	Description	Value Range	Example
\dF[+] [PATTERN]	Lists all text search configurations.	If **PATTERN** is specified, only configurations whose names match **PATTERN** are displayed.	Lists all text search configurations. `\dF+`
\dFd[+] [PATTERN]	Lists all text search dictionaries.	If **PATTERN** is specified, only dictionaries whose names match **PATTERN** are displayed.	Lists all text search dictionaries. `\dFd`
\dFp[+] [PATTERN]	Lists all text search parsers.	If **PATTERN** is specified, only analyzers whose names match **PATTERN** are displayed.	Lists all text search parsers. `\dFp`
\dFt[+] [PATTERN]	Lists all text search templates.	If **PATTERN** is specified, only templates whose names match **PATTERN** are displayed.	Lists all text search templates. `\dFt`
\dg[+] [PATTERN]	Lists all database roles. **NOTE** Since the concepts of "users" and "groups" have been unified into "roles", this command is now equivalent to **\du**. 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**. `\dg j?e`
\dl	This is an alias for **\lo_list**, which shows a list of large objects.	-	Lists all large objects. `\dl`
\dL[S+] [PATTERN]	Lists available procedural languages.	If **PATTERN** is specified, only languages whose names match **PATTERN** are displayed.	Lists available procedural languages. `\dL`

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Parameter	Description	Value Range	Example
\dn[S+] [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**. `\dn+ d*`
\do[S] [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. `\do`
\dO[S+] [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. `\dO`
\dp [PATTERN]	Lists tables, views, and related permissions. The following result about **\dp** 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 3-20**.	If **PATTERN** is specified, only tables and views whose names match **PATTERN** are displayed.	Lists tables, views, and related permissions. `\dp`

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Parameter	Description	Value Range	Example
\drds [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. `\drds *`
\dRp[+] [PATTERN]	Lists all publications. This meta-command is supported only by clusters of version 8.2.0.100 or later.	If **PATTERN** is specified, only publications whose names match the pattern are listed.	Lists all publications. `\dRp`
\dRs[+] [PATTERN]	Lists all subscriptions. This meta-command is supported only by clusters of version 8.2.0.100 or later.	If **PATTERN** is specified, only subscriptions whose names match the pattern are listed.	Lists all subscriptions. `\dRs`
\dT[S+] [PATTERN]	Lists all data types.	If **PATTERN** is specified, only types whose names match **PATTERN** are displayed.	Lists all data types. `\dT`
\du[+] [PATTERN]	Lists all database roles. **NOTE** Since the concepts of "users" and "groups" have been unified into "roles", this command is now equivalent to **\dg**. 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. `\du`

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Parameter	Description	Value Range	Example
\dE[S+] [PATTERN] \di[S+] [PATTERN] \ds[S+] [PATTERN] \dt[S+] [PATTERN] \dv[S+] [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, **\dit** 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. `\div`
\dx[+] [PATTERN]	Lists installed extensions.	If **PATTERN** is specified, only extensions whose names match **PATTERN** are displayed.	Lists installed extensions. `\dx`
\l[+]	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. `\l`

\sf[+] FUNCNAME	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:
			`\sf function_a`
			`\sf "func()name"(argtype1, argtype2)`

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Parameter	Description	Value Range	Example
\z [PATTERN]	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. \z

Table 3-20 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.
U	USAGE: • 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.

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Parameter	Description
C	CREATE: • 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.
L	**ALTER**: allows users to modify tables, schemas, or functions.
P	**DROP**: allows users to delete tables, schemas, or functions.
v	**VACUUM**: allows users to perform VACUUM on tables.
arwdDxtA, vLP	ALL PRIVILEGES: grants all available permissions to specified users or roles at a time. The table-level permissions ALTER, DROP, and VACUUM and schema permissions ALTER and DROP are added to the **vLP** permission group in cluster versions 8.1.3 and later.
*	Authorization options for preceding permissions

Table 3-21 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	• If the text format schema is used, switches to the HTML format. • If the HTML format schema is used, switches to the text format.

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Parameter	Description
\pset NAME [VALUE]	Sets options affecting the output of query result tables. For details about the value of **NAME**, see **Table 3-22**.
\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 3-22 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.	• The value is an integer greater than 0 in HTML format. • The value range in other formats is as follows: – 0: no border – 1: internal dividing line – 2: table frame
expanded (or x)	Switches between regular and expanded formats.	• 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.

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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 **\pset fieldsep '\t'**. 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: • **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.

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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.	• **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.	• **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 **\pset border**. 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.	-

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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 3-23 Connection meta-commands

Parameter	Description	Value Range
\[connect] [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 3-24 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.	-

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Parameter	Description	Value Range
\timing [on|off]	Toggles a display of how long each SQL statement takes, in milliseconds.	• The value **on** indicates that the setting is enabled. • The value **off** indicates that the setting is disabled.
\! [COMMAND]	Escapes to a separate Unix shell or runs a Unix command.	-

Table 3-25 Variable meta-commands

Parameter	Description
\prompt [TEXT] NAME	Prompts the user to use texts to specify a variable name.
\set [NAME [VALUE]]	Sets the *NAME* internal variable to **VALUE**. If more than one value is provided, *NAME* 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 underscore. **Table 3-26** describes a list of variables that are processed in a way different from other variables.
\set-multi NAME [VALUE] \end-multi	Sets the internal variable NAME to VALUE 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.
\unset NAME	Deletes the variable name of **gsql**.

\set-multi meta-command example

Sample file **test.sql**:

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

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```
\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 one SQL statement and obtain the variable through dynamic variable parsing.

Sample file **test.sql**:

```
\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 statements 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 3-26 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**

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Command	Description	Value Range
\set ON_ERROR_STOP 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**

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Command	Description	Value Range
\set RETRY [retry_times]	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 **\set RETRY** command again, the retry function will be disabled. 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. The retry function can be used in the following 13 error scenarios: ● 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**

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Command	Description	Value Range
	• 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**. • CG003: Memory allocation error. Print information: **Allocate Error**. • CG004: Fatal error. Print information: **Fatal error**. • F0011: Temporary file reading error. Print information: **File error**. 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.	

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Command	Description	Value Range
	NOTE 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 3-27 Large object meta-commands

Parameter	Description
\lo_list	Displays all DWS large objects currently stored in the database and their descriptions.

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Table 3-28 Flow control meta-commands

Parameter	Description	Value Range
\if EXPR \elif EXPR \else \endif	This set of meta-commands can implement nested conditional blocks: • A conditional block starts with **\if** and ends with **\endif**. • Any number of **\elif** clauses or a single **\else** clause can exist between **\if** and **\endif**. • The **\if** and **\elif** commands support Boolean expression calculations and can check whether two strings are equal. • **\elif** cannot be used between **\else** and **\endif**.	• 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: <, <=, >, >=, ==, !=, and <>.

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Parameter	Description	Value Range
\goto LABEL \label LABEL	This set of meta-commands can be used to implement unconditional redirections: • The **\label** meta-command is used to create a label. • The **\goto** meta-command is used to redirect upward or downward. **NOTE** • 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.	• 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.

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Parameter	Description	Value Range
\for \loop \exit-for \end-for	This set of meta-commands can be used to implement loops: • 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. **NOTE** • 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:

  Sample file **test.sql**:

```
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'
```

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```
\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 a single quotation mark (') is 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 is treated as a string, and the input without quote is treated as a number.
  postgres@> \endif
  ```

  - **natural**: The default comparison policy is supported, and parameters that contain dynamic variables are also 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.

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- 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
```

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```
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:

  Sample file **test.sql**:

```
\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

  Sample file **test.sql**:

```
\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
```

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```
(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.

  Sample file **test.sql**:

```
\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 offset...
                             ^
```

  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.

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

  Sample file **test.sql**:

  ```
  \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

  Sample file **test.sql**:

  ```
  \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.

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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 digit. 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.

3.7 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:

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```
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

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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 3-29**.

  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)
  ```

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Table 3-29 Viewing the numbers of connections

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

- 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

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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.

  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.

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4 GDS

4.1 Installing, Configuring, and Starting GDS

Scenario

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.

Background

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 DWS GDS as instructed in **Procedure**. When the import or export starts, 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 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:

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```
mkdir -p /opt/bin/dws
```

Step 2 Upload the GDS package to the created directory.

Use the SUSE Linux package as an example. Upload the GDS package **dws_client_8.*x.x*_suse_x64.zip** to the directory created in the previous step.

Step 3 (Optional) If SSL is used, upload the SSL certificates to the directory created in **Step 1**.

Step 4 Go to the directory and decompress the package.

```
cd /opt/bin/dws
unzip dws_client_8.x.x_suse_x64.zip
```

Step 5 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 6 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 7 Switch to user **gds_user**.

```
su - gds_user
```

If the current cluster version is 8.0.*x* or earlier, skip **Step 8** and go to **Step 9**.

If the current cluster version is 8.1.*x*, go to the next step.

Step 8 Execute the script on which the environment depends (applicable only to version 8.1.*x*).

```
cd /opt/bin/dws/gds/bin
source gds_env
```

Step 9 Start GDS.

GDS is eco-friendly software that can be launched once it is decompressed. You can start GDS in two ways: by using the **gds** command to configure startup parameters or by writing the parameters into the **gds.conf** configuration file and running the **gds_ctl.py** command to initiate 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:

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Run the following command to upload the SSL certificate mentioned in **Step 3** 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 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 DWS cluster to access GDS for data import. Ensure that the network segment covers all hosts in a 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. The default value is **8**. The value is a positive integer ranging between 0 and 200 (included). If the data server and DWS have available I/O resources, you can increase the number of concurrent 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 3**.

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 4-1**.

  ```
  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**.

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- 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 200. If
without setting, the default value is 8.
 -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 4-1 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**

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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 Setting this to **true** will recursively read all files with the same name in the directory specified by **location**.	Value range: • **true**: recursive • **false**: not recursive Default value: **false**
daemon	Whether the process is running in daemon mode	Value range: • **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 200 (integer) Default value: **8**

4.2 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/
  ```

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```
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
```

----End

4.3 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/***.

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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,
   ```

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```
  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:

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- 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
    ```

4.4 gds

Context

gds is used to import and export data of DWS. For details, see "Importing Data" and "Exporting Data" in the *Developer Guide*.

Syntax

```
gds [ OPTION ] -d DIRECTORY
```

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The **-d** and -**H** parameters are mandatory and **option** is optional. gds provides the file data of **DIRECTORY** for 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

  Sets 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

  Sets the IP address and port for listening to 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

  Sets 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.

  NOTE

  If the number of GDS process logs in the current directory exceeds the value of --**log-filecount**, old logs will be reclaimed. To save a large number of logs, you are advised to set an independent directory for each GDS process and increase the value of --**log-filecount**.

- -H address_string

  Sets the hosts that can be connected to the GDS. This parameter must be the CIDR format. Only the Linux OS is supported. 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**

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- -E size

  Sets the upper threshold of error logs generated when data is imported.

  Value range: 0 < size < 1 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 MB < size < 100 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 1,024 KB.

- -R size

  Sets the maximum size of a single GDS log file specified by **-l**.

  Value range: 1 MB < size < 100 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 1,024 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

  Recursively traverses files in a directory (subdirectories in the foreign table directory) and recursively reads all files with the same name in the directory specified by location. Only the Linux system is supported.

- -h

  Shows help information.

- --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**

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  - **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: **1**

- --log-filecount

  Specifies the maximum number of log files that can be retained. When the number of log files exceeds the value of this parameter, the latest created log files are retained.

  Value range: 5<=**log-filecount**<=1024 (positive integer)

  Default value: **50**

- --pipe-timeout

  Sets 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: The value should be greater than 1s and must be a positive integer plus the unit. The unit can be s, m, or h. For example, 1 hour can be set to **3600s**, **60m**, or **1h**.

  Default value: **1h**/**60m**/**3600s**

- --pipe-size

  Specifies the size of the GDS pipe file to be imported or exported.

  Value range: greater than 1K

  Default value: maximum value allowed by the operating system. You can run the **cat /proc/sys/fs/pipe-max-size** command to view the default value.

  NOTE

  This parameter can be used only when the Linux kernel version is 2.6.35 or later.

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
```

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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 using **-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.

4.5 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

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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

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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
```

4.6 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 4-2 lists the columns of the *error_table_name* table.

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Table 4-2 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
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.

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Table 4-3 Handling data import errors

Error Information	Cause	Solution
missing data for column "r_reason_desc"	1. The number of columns in the source data file is less than that in the foreign table. 2. 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`	1. If an error is reported due to missing columns, perform the following operations: • 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. 2. 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.	• 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.

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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.	• 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. **INSERT INTO** reasons **SELECT DISTINCT * FROM** foreign_tpcds_reasons;
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).

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5 DSC

5.1 About This Document

5.1.1 Intended Audience

This document is intended for the following DSC users:

- Database migration engineers
- Database administrators
- Technical support engineers

DSC users need to have a basic knowledge of:

- Basic concepts and policies of database migration
- Teradata/MySQL(ADB For MySQL)
- DWS

5.1.2 Document Conventions

This section describes the content, symbol, and command conventions of this document.

Symbol Convention\

Symbols that may be found in this document are defined as follows:

Symbol	Description
	Indicates an imminently hazardous situation which, if not avoided, will result in serious injury or death.
	Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.

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Symbol	Description
NOTICE	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
NOTE	Provides additional information to emphasize or supplement important points of the main text. **NOTE** is used to address information not related to personal injury, equipment damage, or environment damage.

Command Conventions

Commands in this document comply with the following conventions:

Table 5-1 Command conventions

Format	Description
Boldface	The keywords of a command are in **Boldface**.
Italic	Command arguments, paths, files, or folders are in italics.
[ ]	Square brackets enclose syntax choices (keywords or arguments) that are optional.
{ x | y | ... }	Braces enclose a set of required syntax choices separated by vertical bars (|), from which you select one.
[x | y | ...]	Square brackets enclose a set of optional syntax choices separated by vertical bars, from which you select one or none.
{ x | y | ... }*	Asterisk marked braces enclose a set of required syntax choices separated by vertical bars, from which you select at least one.
[x | y | ...]*	Asterisk marked square brackets enclose optional syntax choices separated by vertical bars, from which you select one choice, multiple choices, or none.
&<1-n>	The argument or keyword and argument combination before the ampersand (&) sign can be entered 1 to n times.

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Format	Description
#	A line that starts with a pound (#) sign is comments.

5.1.3 Third-party Licenses

This section lists the applicable third-party licenses.

- ANTLR v4.9.3
- Apache Commons IO 2.11
- Apache Commons CLI 1.5
- Apache Log4j 2.17.2
- JSON.org json 20220320
- postgresql 42.4.1
- sql-formatter 2.0.3

5.2 Introduction to DSC

5.2.1 Overview

After switching to 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.

DSC is a CLI tool running on Linux or Windows. It is dedicated to providing customers with simple, fast, and reliable application SQL script migration services. It parses the SQL scripts of source database applications using the built-in syntax migration logic, and converts them to SQL scripts applicable to 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.

CAUTION

The syntax parser built in DSC can identify only standard SQL syntax. If the input script contains texts in other languages, syntax parsing will fail. You need to clean such input script before using DSC.

Migration Objects

DSC supports migration of Teradata, MySQL, SQL-Server, Oracle, Netezza, and Greenplum databases. For details, see **Table 5-2**. The following database objects can be migrated:

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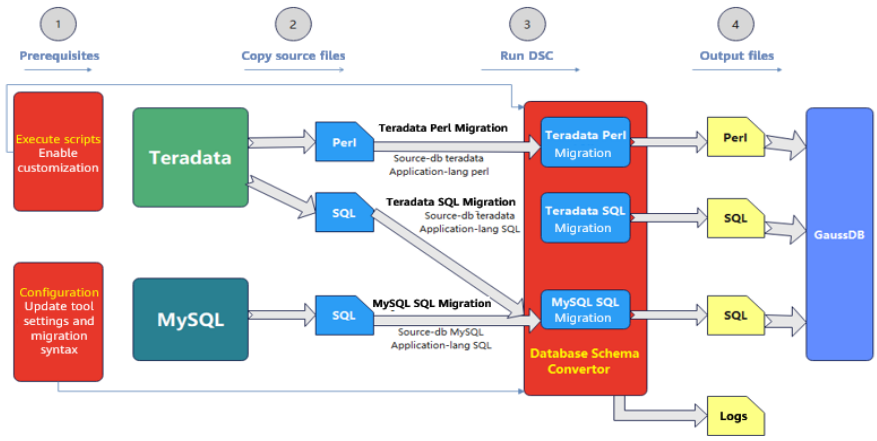
- DDL statements: schemas, tables, views, stored procedures, and user-defined functions
- DML statements: SELECT, UPDATE, DELETE, INSERT, and TRUNCATE

Migration Process

The process of using DSC to migrate SQL scripts is as follows:

1. Export the SQL scripts from the source database to the Linux or Windows server installed with DSC.
2. Execute DSC to migrate the syntax. In the command, specify the paths of the input file, output file, and logs.
3. DSC automatically archives the migrated SQL scripts and the logs into the specified paths.

Figure 5-1 DSC migration process



5.2.2 Operating Environment

Supported Databases

The following table lists the source databases supported by DSC.

Table 5-2 Source databases supported by DSC

Database	Version
Teradata	17.20
MySQL	8.0
Oracle	11g Release 2, 12c Release 1
AnalyticDB for MySQL	-

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Database	Version
BigQuery	-
Postgres	9.2.*x*, 11.*x*
Redshift	-
Greenplum	7.0.0
Hologres	3.1.17
Netezza	-
Hive	-
Other source databases: Doris, StarRocks, SQL Server, Synapse, and Impala	-

The following table lists the destination databases supported by DSC.

Table 5-3 Destination databases supported by DSC

Database	Version
DWS	DWS 8.1.0 or later

Hardware Requirements

Table 5-4 lists the hardware requirements of DSC.

Table 5-4 Hardware requirements of DSC

Hardware	Configuration
CPU	AMD or Intel Pentium (minimum frequency: 500 MHz)
Min memory	1 GB
Disk space	1 GB

Software Requirements

OS

Table 5-5 lists the operating systems compatible with DSC.

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Table 5-5 OSs compatible with DSC

Server	OS	Version
x86 servers	SUSE Linux Enterprise Server 11	SP1 (SUSE 11.1)
		SP2 (SUSE 11.2)
		SP3 (SUSE 11.3)
		SP4 (SUSE 11.4)
	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)

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Server	OS	Version
		7.4 (CentOS 7.4)
	Windows	7.0, 10, 11

Other software requirements

Table 5-6 lists the requirements of DSC on other software versions.

Table 5-6 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 5.28.2 and later	Used to migrate Perl files in Windows.
Python 3.8.2	Used to verify post migration script.

5.3 Using DSC

5.3.1 Overview

This chapter describes how to use DSC, including how to install and configure DSC and how to use DSC to migrate data.

NOTICE

Use the latest patches to update the operating system and related software 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.

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NOTE

DSC is a standalone application that can run without any network or database connection. It can run on any machine that is isolated from any network.

5.3.2 Downloading and 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 **Table 5-5**.

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 **Operating Environment**.

  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.

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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**.

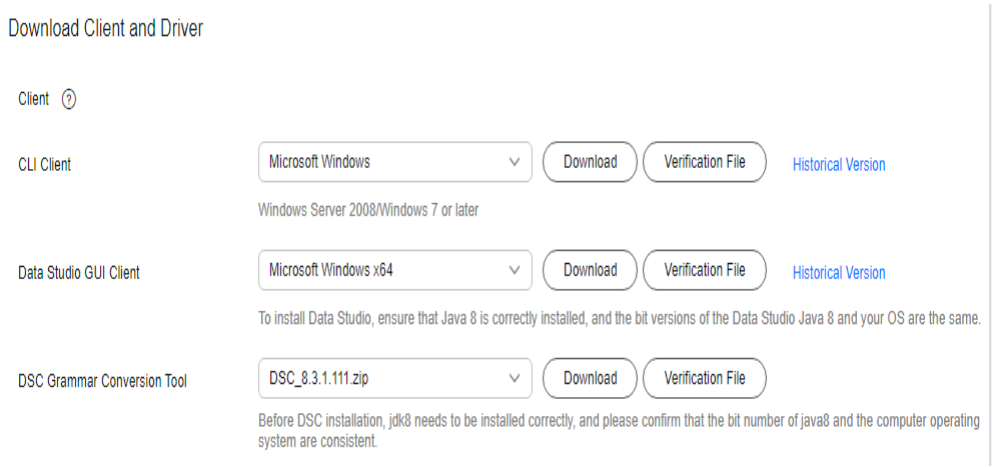
   Assume that the Java installation path is **C:\Program Files\Java\jdk1.8.0_141\bin** and the environment variable in **Path** is *c:|windows|system32;*. Set **Path** to *c:|windows|system32;***C:\Program Files\Java\jdk1.8.0_141\bin;**.

Downloading DSC Using the GUI

Step 1 Log in to the DWS console. In the navigation pane, choose **Management** > **Client Connections**. The **Download Client and Driver** page is displayed.

Step 2 On the **Download Client and Driver** page, click **here** to download the **DSC** software package.

Figure 5-2 Downloading the DSC client



Step 3 Decompress the downloaded client software package to a user-defined path.

----End

Installing DSC

DSC is a command line tool running on the Linux or Windows operating system. It can be used without installation. After downloading the software package, you can decompress it to use it.

Windows

Step 1 Decompress the **DSC.zip** package.

The **DSC** folder is generated.

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NOTE

You can decompress **DSC.zip** to any folder you need.

Step 2 Go to the **DSC** directory.

Step 3 Find and check the files in the **DSC** directory.

Table 5-7 describes the obtained folders and files.

----End

Linux:

Step 1 Go to the directory where **DSC.zip** is stored and decompress **DSC.zip**. (Replace **DSC.zip** with the actual package name.)

```
unzip DSC.zip
```

Step 2 Go to the **DSC** directory.

```
cd DSC
```

Step 3 Check the files in the **DSC** directory.

```
ls
config   lib   scripts   bin  input output runDSC.sh  runDSC.bat
```

----End

Table 5-7 DSC directory

Folder or File	Description
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

NOTE

If you do not need DSC, you can uninstall it by deleting the **DSC** folder.

5.3.3 Configuring DSC

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5.3.3.1 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 DSC behavior parameters, which 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 5-8 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 5-8 Parameters in the application.properties file

Parameter	Description	Value Range	Default Value	Example
• formatterrequired	If there are any changes in this configuration item, then the tool will not function as expected.	• true • false	true	formatterrequired=true
• prevalidationFlag	If there are any changes in this configuration item, then the tool will not function as expected.	• true • false	true	prevalidationFlag=true

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Parameter	Description	Value Range	Default Value	Example
• commentSeparatorFlag	If there are any changes in this configuration item, then the tool will not function as expected.	• true • false	true	commentSeparatorFlag=true
• queryDelimiter	If there are any changes in this configuration item, then the tool will not function as expected.	N/A	N/A	queryDelimiter=;
• blogicDelimiter	If there are any changes in this configuration item, then the tool will not function as expected.	N/A	N/A	blogicDelimiter=/
• Timeout	Tool migration timeout duration. If there are any changes in this configuration item, then the tool will not function as expected.	-	4 hours	Timeout=4

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Parameter	Description	Value Range	Default Value	Example
• fileExtension	Valid file extension separated by comma. If there are any modifications in this configuration item, then the tool will not function as expected. **NOTE** The exported scripts must be with the following postfix such as: • .sql • .txt • .fnc • .proc • .tbl • .tbs • .pl • .dsql and so on.	• csv • txt • SQL	SQL	fileExtension=SQL
• formattedSourceRequired	Whether to use SQL Formatter to format the source SQL files. If this parameter is set to **true**, the copies of the input files are formatted and saved to the *Output path*/**formattedSource** directory.	• true • false	true	formattedSourceRequired=true

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Parameter	Description	Value Range	Default Value	Example
• target_files	Specifies the operations to be performed on the output folder. **Overwrite**: This option specifies whether the files in the output folder must be overwritten. **Delete**: deletes all files in the output folder. **Cancel**: cancels an operation on the output folder that contains files.	• overwrite • delete • cancel	overwrite	target_files=overwrite
• encodingFormat	Encoding format of input files. If this parameter is not set (or is commented out), DSC uses the default encoding format based on locale settings. **NOTE** • The auto detection of file encoding is inaccurate. To ensure that the correct encoding format is used, specify the format using this parameter.	• UTF8 • UTF16 • UTF32 • GB2312 • ASCII and others	Default based on locale	encodingFormat=UTF8

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Parameter	Description	Value Range	Default Value	Example
• NoOfThreads	Number of threads used for migration	Depending on available system resources	3	NoOfThreads=3
• MaxFileSizeWarning	Warning threshold for the input file size (unit: KB, MB, or GB). If an invalid value is specified, the default value is used. The following warning will be displayed if the specified source file size exceeds the threshold: ********** [WARNING] : Migration of the following files(>100KB) will take more time: bigfile001.SQL bigfile008.SQL **********	10 KB~1 GB	10MB	MaxFileSizeWarning=10MB
• MaxFileSize	Maximum size of the input file allowed. If crossing this limit, the file migration will be skipped.	-	20MB	MaxFileSize=20MB

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Parameter	Description	Value Range	Default Value	Example

• MaxSqlLen	Maximum size of a query to be migrated.
	If an invalid value is specified, DSC resets it to the default value and displays the following warning:
	`The query length parameter (MaxSqlLen) value is out of range. Resetting to default value.`
	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:
	`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`
		1 .. 52,428,800 bytes
		(1 byte to 50 MB)
			1048576
			(1 MB)
				MaxSqlLen=1048576

• initialJVMMemory	Initial memory	N/A	256 MB	initialJVMMemory=256MB This indicates that the process will start up with 256 MB of memory

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Parameter	Description	Value Range	Default Value	Example
• maxJVMMemory	Maximum memory	N/A	1024 MB	maxJVMMemory=2048m This indicates that the process will use up to 2048 MB of memory.
• executesqlingauss	Migrated scripts are executed on DWS. The value can be true or false. The script can be executed only on the server running the Linux operating system.	• true • false	false	executesqlingauss=false

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.

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Table 5-9 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**

Open the **gaussdb.properties** file in the **config** folder of the verification file and configure parameters by referring to **Table 5-10** to connect to DWS.

Table 5-10 Parameters in the gaussdb.properties file

Parameter	Description	Value Range	Default	Example
gaussdb-user	DWS database user who has all permissions	N/A	N/A	user1
gaussdb-port	Port of the DWS database	N/A	N/A	8000
gaussdb-name	Name of the DWS database	N/A	N/A	gaussdb
gaussdb-ip	IP address of the DWS database	N/A	N/A	10.XX.XX.XX

5.3.3.2 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 5-11** as required.

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Table 5-11 Parameters in the **features-teradata.properties** file

Parameter	Description	Value Range	Default Value	Example
• deleteToTruncate	Rule for migrating **DELETE** statements without a **WHERE** clause. **true**: enables the migration of **DELETE** to **TRUNCATE**. **false**: disables the migration of **DELETE** to **TRUNCATE**.	• true • false	false	deleteToTruncate=true
• distributeByHash	Which columns specified in the primary index will be used for data distribution across nodes in the cluster. **one**: Data is distributed based on the first column specified in the primary index. **many**: Data is distributed based on all the columns specified in the primary index. This function is addressed by using the **DISTRIBUTE BY** clause. **NOTE** This parameter is set to **one** in V100R002C60 because this version does not support multiple columns in the **DISTRIBUTE BY** clause.	• one • many	many	distributeByHash =many

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Parameter	Description	Value Range	Default Value	Example
• extendedGroupByClause	This parameter is used to enable or disable the migration of **Group By** (GROUPING SETS, CUBE, and ROLLUP). **true**: enables the migration of **GROUP BY()**. **false**: disables the migration of **GROUP BY()**.	• true • false	false	extendedGroupByClause=false
• inToExists	This parameter can be used to enable and disable query optimization from **IN/NOT IN** to **EXISTS/NOT EXISTS**.	• true • false	false	inToExists=false
• rowstoreToColumnstore	Whether to convert row-store tables to **column-store** tables. If this parameter is set to **true**, all row-store tables are converted to column-store tables during script migration.	• true • false	false	rowstoreToColumnstore=false
• session_mode	Default table type (**SET**/**MULTISET**) for **CREATE TABLE**. **Teradata**: The default table type is **SET**. **ANSI**: The default table type is **MULTISET**.	• Teradata • ANSI	Teradata	session_mode=ANSI

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Parameter	Description	Value Range	Default Value	Example
• tdMigrateALIAS	Whether to enable the migration of **ALIAS**. **true**: enables the migration of **ALIAS**. **false**: disables the migration of **ALIAS**.	• true • false	false	tdMigrateALIAS=true
• tdMigrateDOLLAR	Whether to enable the migration of static objects whose name starts with a dollar sign ($). This parameter is not applicable to dynamic objects, in format of ${}. **true**: Enclose the name of a static object with double quotation marks ("). **false**: Disable the migration of static objects. **NOTE** For details, see **Object name starting with $**.	• true • false	true	tdMigrateDOLLAR=true

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Parameter	Description	Value Range	Default Value	Example
• tdMigrateLOCKoption	Whether to enable the migration of queries with the **LOCK** keyword. **true**: enables the migration of such queries and comments out the **LOCK** keyword. **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. **NOTE** For details, see **ACCESS LOCK**.	• true • false	false	tdMigrateLOCKoption=true
• tdMigrateNULLIFZERO	Whether to enable the migration of **NULLIFZERO()**. **true**: enables the migration of **NULLIFZERO()**. **false**: disables the migration of **NULLIFZERO()**.	• true • false	true	tdMigrateNullIFZero=true

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Parameter	Description	Value Range	Default Value	Example
• tdMigrateVIEWCHECKOPTION	Whether to enable the migration of views containing **CHECK OPTION**. **true**: comments out such views during migration. If this parameter is set to **false**, such views are not migrated. The tool will copy the query as it is and record the following message: 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.	• true • false	false	tdMigrateVIEWCHECKOPTION=true
• tdMigrateZEROIFNULL	Whether to enable the migration of **ZEROIFNULL**. **true**: enables the migration of **ZEROIFNULL()**. **false**: disables the migration of **ZEROIFNULL()**.	• true • false	true	tdMigrateZEROIFNULL=true

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Parameter	Description	Value Range	Default Value	Example
• volatile	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. A volatile table can be a **Migrating Tables** table or an unlogged table. **NOTE** **unlogged** is supported in V100R002C60 and **local temporary** is not.	• local temporary • unlogged	local temporary	volatile=unlogged
• tdMigrateCharsetCase	Whether to enable the migration of **CHARACTER SET** and **CASESPECIFIC**. **true**: comments out **CHARACTER SET** and **CASESPECIFIC** during script migration. **false**: disables 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.	• true • false	false	tdMigrateCharsetCase=false **NOTE** If **tdminatecharsetcase** is set to **true**, comment out the special keyword of the character.

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Parameter	Description	Value Range	Default Value	Example
• terdataUtilities	Specifies whether the Teradata command line tool can be migrated. The following options are supported: • true • false	• true • false	true	terdataUtilities=true
• unique_primary_index_in_column_table	Specifies whether unique indexes can be created for column-store tables.	• true • false	true	unique_primary_index_in_column_table=true
• default_charset	Specifies whether default_charset can be migrated. The following options are supported: • LATIN • UNICODE • GRAPHIC	• LATIN • UNICODE • GRAPHIC	LATIN	default_charset=LATIN
• mergeImplementation	**mergeImplementation** has the following two types: • using WITH clause • splitting the queries The following options are supported: • With • Split • None	• With • Split • None	None	mergeImplementation=None
• dsqlSupport	Specifies whether dsql is supported. The following options are supported: • true • false	• true • false	false	dsqlSupport=false

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Parameter	Description	Value Range	Default Value	Example
• tdcolumnInSensitive	Whether to remove column names that contain double quotes during migration. The following options are supported: • true • false	• true • false	false	tdcolumnInSensitive=false
• tdMigrateCASE_N	Specifies the migration mode of the CASE_N for partitioning. Gauss does not support multilevel (nested) partitioning: The following options are supported: • comment • none	• comment • none	comment	tdMigrateCASE_N=comment
• tdMigrateRANGE_N	Specifies the migration mode of the RANGE_N for partitioning. Gauss does not support multilevel (nested) partitioning: The following options are supported: • comment • none • range	• comment • none • range	range	tdMigrateRANGE_N=range

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Parameter	Description	Value Range	Default Value	Example
• tdMigrateAddMonth	Specifies whether addMonth can be migrated. The following options are supported: • true • false If this parameter is set to **true**, **ADD_MONTHS** changes into **mig_td_ext.ADD_MONTHS** (added **mig_td_ext**) after the migration. Otherwise, migration is not supported.	• true • false	false	tdMigrateAddMonth=false

5.3.3.3 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 5-12** as required.

NOTE

- Parameter values are case-insensitive.
- You can modify the values of the following two parameters **db-bteq-tag-name** and **db-tdsql-tag-name** parameters in the following table:

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Table 5-12 Parameters in the perl-migration.properties file

Parameter	Description	Value Range	Default	Example
• db-bteq-tag-name	Scripts to be processed in Perl files. **BTEQ**: Only the scripts under the **BTEQ** tag are processed.	• bteq	bteq	db-bteq-tag-name=bteq
• db-tdsql-tag-name	Only the scripts under the **db-tdsql-tag-name** tag are processed. **SQL_LANG:** Only the scripts under the **SQL_LANG** tag are processed.	sql_lang	sql_lang	db-tdsql-tag-name=sql_lang
• add-timing-on	Whether to enable the insertion of scripts to calculate execution time. If it is enabled, the script will be added to each input file.	• true • false	false	add-timing-on=true

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Parameter	Description	Value Range	Default	Example
• remove-intermediate-files	Whether to delete the intermediate SQL file generated by the DSC after the migration is complete. The intermediate files contain the **BTEQ** and **SQL_LANG** syntax in SQL files. These files are used as input for DSC. **true**: deletes the intermediate files. **false**: does not delete the intermediate files.	• true • false	true	remove-intermediate-files=true

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Parameter	Description	Value Range	Default	Example

• migrate-variables	Whether to enable the migration of Perl variables containing SQL statements.
	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.
	true: enables the migration of **Perl** variables containing SQL statements.
	false: disables the migration of **Perl** variables containing SQL statements.
	Example 1:
	If **migrate-variables** is set to **true** and the target table is:
	`$V_SQL = "CT X1(C1 INT,C2 CHAR(30))";`
	Output
	`CREATE TABLE X1(C1 INT,C2 CHAR(30));`
	Example 2:
	Input
	`$onesql ="SELECT trim(tablename) from dbc.tables WHERE databasename = '${AUTO_DQDB}' and`
		• true
		• false
			true	migrate-variables=true

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Parameter	Description	Value Range	Default	Example
	tablename like 'V_%' order by 1;''; $sth_rundq = $dbh->execute_query($onesql); **Output** $onesql =''SELECT TRIM(tablename) FROM dbc.tables WHERE databasename = '${AUTO_DQDB}' AND tablename LIKE 'V_%' ORDER BY 1 ; ''; $sth_rundq = $dbh->execute_query($onesql);			
• logging-level	Logging level of Teradata Perl migration log files. **error**: Log only errors. **warning**: Log errors and warnings. **info**: Log errors, warnings, and activity information. This level contains all log information.	• error • warning • info	info	logging-level=info

Parameter	Description	Value Range	Default	Example
• log-file-count	Maximum number of log files retained, including the log files in use and archived log files. If the number of log files exceeds the upper limit, the earliest files will be deleted until the new log files are successfully archived.	3 - 10	5	log-file-count=10
• log-file-size	Maximum file size. Upon reaching the specified size, a file is archived by adding a timestamp to the file name. **Example:** perlDSC_2018-07-08_16_12_08.log After the archiving, a new log file *perlDSC.log* with a timestamp is generated.	1MB - 10MB	5MB	log-file-size=10MB

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Parameter	Description	Value Range	Default	Example

• migrate-executequery	Whether to enable the migration of **execute_query** containing SQL statements.
	true: enables the migration of **execute_query** containing SQL statements.
	false: disables the migration of **execute_query** containing SQL statements.
	The following is an example:
	migrate-executequery is set to **true** and input is as follows:
	`my $rows1=$conn1->execute_query("sel ${selectclause} from ${databasename}.${tablename};");`
	Output
	`my $rows1=$conn1->execute_query("SELECT ${selectclause} FROM ${databasename}.${tablename};");`
		• true
		• false
			true	migrate-executequery=true

5.3.3.4 MySQL 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.

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Table 5-13 Parameters in the **features-mysql.properties** file

Parameter	Description	Value Range	Default Value	Example
• table.databaseAsSchema • table.defaultSchema	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.	• true • false • public	• true • public	• table.databaseAsSchema=true • table.defaultSchema=public
• table.schema	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.	• schemaName	• null	• table.schema=

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Parameter	Description	Value Range	Default Value	Example
• table.orientation	Default data storage mode. Value **ROW** means row storage, and value **COLUMN** means column storage.	• ROW • COLUMN	• ROW	• table.orientation=ROW
• table.type	Default table type, which can be partitioned table, replication table, or round-robin table. **REPLICATION**, **HASH**, and **ROUND-ROBIN**	• HASH • REPLICATION • ROUND-ROBIN	• HASH	• table.type=HASH
• table.tablespace	Tablespace options	• COMMENT • RESERVE	• RESERVE	• table.tablespace=RESERVE
• table.partition-key.choose.strategy	Policy for selecting the partition key	• partitionKeyChooserStrategy	• partitionKeyChooserStrategy	• table.partition-key.choose.strategy=partitionKeyChooserStrategy

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Parameter	Description	Value Range	Default Value	Example
• table.partition-key.name	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.	• Reserved parameter	• null	• table.partition-key.name=
• table.compress.mode	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.	• COMPRESS • NOCOMPRESS	• NOCOMPRESS	• table.compress.mode=NOCOMPRESS

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Parameter	Description	Value Range	Default Value	Example
• table.compress.row • table.compress.column	Compression level of table data. It determines the compression ratio and duration.	• YES • NO • YES • NO • LOW • MIDDLE • HIGH	• NO • LOW	• table.compress.row=NO • table.compress.column=LOW
• 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.	• 0 • 1 • 2 • 3	• 0	• table.compress.level=0
• table.database.template	Database template	• Reserved parameter	• template0	table.database.template=template0
• table.database.encoding	A database code.	• UTF8 • SQL_ASCII • GBK • Latin1 codes	• UTF8	table.database.encoding=UTF8

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Parameter	Description	Value Range	Default Value	Example
• table.index.rename	Whether to rename an index during its creation.	• true • false	false	table.index.rename=false
• table.database.onlyFullGroupBy	Whether all non-aggregated columns in a **SELECT** statement are included in the **GROUP BY** clause.	• true • false	true	table.database.onlyFullGroupBy=true
• table.database.realAsFloat	This parameter allows you to convert the REAL data type. By default, it is set to **false**, which means that the data type is converted to **DOUBLE PRECISION**. However, if you set it to **true**, the data type will be converted to **REAL**.	• true • false	false	table.database.realAsFloat=false

5.3.3.5 SQL Server Configuration

You can customize the behavior of the migration tool when migrating SQL Server database scripts by setting SQL Server configuration parameters.

Open the **features-mysql.properties** file in the **config** folder. When migrating SQL Server databases, change the data type of the source database to SQL Server and set the parameters listed in **Table 5-14** as required.

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Table 5-14 Parameters in the **features-mysql.properties** file

Parameter	Description	Value Range	Default Value	Example
table.origin.database.type	Source database type	bigquery,doris,sqlserver,mysql,adb	mysql	table.origin.database.type=sqlserver
table.orientation	Default data storage mode	ROW,COLUMN	ROW	table.orientation=ROW
table.type	Default table type	REPLICATION,HASH,ROUND-ROBIN	HASH	table.type=ROUND-ROBIN

5.3.3.6 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 5-15** as needed.

Table 5-15 Parameters in the **features-oracle.properties** file

Parameter	Description	Value Range	Default Value	Example
• exceptionHandler	Whether to comment out exception blocks in PL/SQL. **true**: Comment out the exception blocks. **false**: Retain the exception blocks as they are. **NOTE** **exceptionHandler** is not supported in V100R002C60.	• true • false	false	exceptionHandler=TRUE

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Parameter	Description	Value Range	Default Value	Example
• TxHandler	Whether to comment out COMMIT and ROLLBACK operations in PL/SQL. **true**: Comment out the operations. **false**: Retain the operations as they are.	• True • False	True	TxHandler=True
• foreignKeyHandler	Whether to comment out foreign key constraints. **true**: Comment out the constraints. **false**: Retain the constraints as they are.	• true • false	true	foreignKeyHandler=true
• globalTempTable	Valid values are **GLOBAL** and **LOCAL**. Currently, the target database does not support **GLOBAL**.	• GLOBAL • LOCAL	LOCAL	encodingFormat=LOCAL
• onCommitDeleteRows	Valid values are **DELETE** and **PRESERVE**. Current Version V100R008	• DELETE • PRESERVE	DELETE	onCommitDeleteRows=DELETE

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Parameter	Description	Value Range	Default Value	Example
• maxValInSequence	Maximum sequence value supported by the database. Currently, the maximum value supported by the database is **9223372036854775807**.	1-9223372036854775807	9223372036854775807	maxValInSequence=9223372036854775807
• mergeImplementation	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.	• WITH • SPLIT • None	WITH	mergeImplementation=None
• RemoveHashPartition	Whether to comment out **HASH PARTITION** statements. **true**: Comment out the constraints. **false**: Retain the **HASH PARTITION** statements as they are.	• true • false	true	RemoveHashPartition=false

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Parameter	Description	Value Range	Default Value	Example
• RemoveHashSubPartition	Whether to comment out **HASH SUBPARTITION** statements. **true**: Comment out the constraints. **false**: Retain **HASH SUBPARTITION** statements as they are.	• true • false	true	RemoveHashSubPartition=false
• RemoveListPartition	Whether to comment out **LIST PARTITION** statements. **true**: Comment out the constraints. **false**: Retain **LIST PARTITION** statements as they are.	• true • false	true	RemoveListPartition=false
• RemoveListSubPartition	Whether to comment out **LIST SUBPARTITION** statements. **true**: Comment out the constraints. **false**: Retain the **LIST SUBPARTITION** statements as they are.	• true • false	true	RemoveListSubPartition=false

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Parameter	Description	Value Range	Default Value	Example
• RemoveRangeSubPartition	Whether to comment out **RANGESUBPARTITION** statements. **true**: Comment out the constraints. **false**: Retain the **RANGESUBPARTITION** statements as they are.	• true • false	true	RemoveRangeSubPartition=false
• MigSupportSequence	Whether to enable the migration of **SEQUENCE** statements. **true**: enables the conversion of **CREATE** to **INSERT**. **false**: disables the migration of **CREATE**.	• true • false	true	MigSupportSequence=false
• RemovePartitionTS	Whether to comment out **PartitionTS** statements. **true**: Comment out the **PartitionTS** statements. **false**: Retain the **PartitionTS** statements as they are.	• true • false	true	RemovePartitionTS=true

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Parameter	Description	Value Range	Default Value	Example
• BitmapIndexSupport	Whether to comment out for BitmapIndex **COMMENT** will comment the entire input script **BTREE** will retain as they are	• comment • btree	comment	BitmapIndexSupport=comment
• pkgSchemaNaming	The following options are supported: **TRUE** - schema1.package1#procedure1 should be changed to package1.procedure1 **FALSE** - schema1.package1#procedure1 will not be removed	• true • false	true	pkgSchemaNaming=true
• plsqlCollection	The following options are supported: • varray • localtable • none	• varray • localtable • none	varray	plsqlCollection=varray
• commentstorageparameter	Whether to comment out the storage parameters in a table or index. **true**: Comment out the storage parameters. **false**: Retain the storage parameters as they are.	• true • false	true	commentStorageParameter=true

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Parameter	Description	Value Range	Default Value	Example
• MigSupportForListAgg	Whether to enable the migration of **ListAgg** statements. **true**: enables the migration of **ListAgg**. **false**: disables the migration of **ListAgg**.	• true • false	true	MigSupportForListAgg=false
• MigSupportForRegexReplace	Whether to enable the migration of **RegexReplace**statements. **true**: enables the migration of **RegexReplace**. **false**: disables the migration of **RegexReplace**.	• true • false	true	MigSupportForRegexReplace=false
• commentPragmaAutomationTrans	Whether to comment out the AutomationTrans parameters in a table or index. **true**: Comment out the AutomationTrans. **false**: Retain the AutomationTrans parameters as they are.	• true • false	true	commentPragmaAutomationTrans=true

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Parameter	Description	Value Range	Default Value	Example
• supportJoinOperator	Indicates whether the left/right outer join operator (+) is supported. The following options are supported: • true • false	• true • false	false	supportJoinOperator=false
• migInsertWithTableAlias	The following options are supported: • true • false	• true • false	true	migInsertWithTableAlias=true
• varraySize	Varray datatype size	• NA	1024	varraySize=1024
• varrayObjectSize	VarrayObject datatype size	• NA	10240	varrayObjectSize= 10240
• migrationScope	Whether to package split or migrate completely.	• pkgSplit • completeMigration	completeMigration	migrationScope=completeMigration
• migSupportConnectBy	The following options are supported: • true • false **true**: enables the migration of **connectBy**.	• true • false	true	migSupportConnectBy = true

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Parameter	Description	Value Range	Default Value	Example
• migrate_ConnectBy_Unnest	Whether to migrate **connectBy** and **Unrest**. **true**: enables the migration of **connectBy** and **Unnest**. **false**: retains the original value.	• true • false	true	migrate_ConnectBy_Unnest=true
• extendedGroupByClause	Whether to migrate the following extended functions of **GROUP BY**: • grouping sets • cube • rollup	• true • false	false	extendedGroupByClause=false
• supportDupValOnIndex	Whether to migrate **DUP_VAL_ON_INDEX**.	• UNIQUE_VIOLATION(V1R8) • OTHERS(older versions)	UNIQUE_VIOLATION	supportDupValOnIndex=UNIQUE_VIOLATION
• pkgvariable	Whether to migrate **pkgvariable**.	• localtable • sys_set_context • none	localtable	pkgvariable = localtable

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Parameter	Description	Value Range	Default Value	Example
• addPackageNameList	The following options are supported: • true • false Set **package_name_list** to <***schema_name***> and invoke this schema.	• true • false	false	addPackageNameList = false
• addPackageTag	The following options are supported: • true • false If this parameter is set to **true**, **PACKAGE** is added in front of **AS|IS** in the stored procedure/function declaration.	• true • false	false	addPackageTag = true
• addGrantLine	The following options are supported: • true • false **true**: adds **GRANT** rows to each stored procedure/function at the end of the file.	• true • false	false	addGrantLine = true

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Parameter	Description	Value Range	Default Value	Example
• MigDbmsLob	The following options are supported: • true • false • **TRUE** - DBMS_LOB is migrated. • **FALSE** - DBMS_LOB is not migrated	• true • false	false	MigDbmsLob=false
• uniqueConsForPartitonedTable	Unique or primary key constraint for partitioned table.	• comment_partition • comment_unique • none	comment_partition	uniqueConsForPartitonedTable = comment_partition
• MigSupportForRegexFunc	Possible values for **MigSupportForRegexReplace**.	• true • false	false	MigSupportForRegexFunc=false
• migSupportUnnest	Possible values for **migSupportUnnest**.	• true • false	true	migSupportUnnest = true
• MDSYS.MBRCOORDLIST	Replace the unsupported datatype **MDSYS.MBRCOORDLIST** with a user-defined datatype.	• None • Can enter any free text	None	MDSYS.MBRCOORDLIST=None
• MDSYS.SDO_GEOMETRY	Replace the unsupported datatype **MDSYS.SDO_GEOMETRY** with a user-defined datatype.	• None • Can enter any free text	None	MDSYS.SDO_GEOMETRY=None

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Parameter	Description	Value Range	Default Value	Example
• GEOMETRY	Replace the unsupported datatype **GEOMETRY** with a user-defined datatype.	• None • Can enter any free text	None Input should not migrate.	GEOMETRY=None
• tdMigrateAddMonth	Possible values for **addMonth**.	• 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.

5.3.3.7 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 5-16** as required.

Table 5-16 Parameters in the **features-netezza.properties** file

Parameter	Description	Value Range	Default Value	Example
• rowstoreToColumnstore	Whether to convert row-store tables to column-store tables.	• true • false	false	rowstoreToColumnstore=false
• cstore_blob	The options are as follows: • bytea • none	• bytea • none	bytea	cstore_blob=bytea

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Parameter	Description	Value Range	Default Value	Example
• keywords_addressed_using_as	The options are as follows: • OWNER • ATTRIBUTE • SOURCE • FREEZE	• OWNER • ATTRIBUTE • SOURCE • FREEZE	OWNER	keywords_addressed_using_as=OWNER
• keywords_addressed_using_doublequote	Possible values of **addressed_using_doublequote**	FREEZE	FREEZE	keywords_addressed_using_doublequote=FREEZE

5.3.4 Migration Process

5.3.4.1 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 5-17 describes the custom scripts in the **DSC/scripts/** directory. For details about how to execute custom scripts, see **Custom DB Script Configuration**.

Table 5-17 Custom DB scripts

Script	Description
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

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:

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- 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 5-18** lists the folders and files in the **scripts** folder.

The SQL files contain the scripts for the custom migration functions. The DWS database needs to use these functions to support specific features of Teradata.

Table 5-18 Custom DB scripts for DSC

Folder	Script File	Description
-- scripts	-	Folder: all scripts
------ 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

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Folder	Script File	Description
-X	mig_fn_get_datatype_short_name.sql	Script: used to enable migration of Teradata DBC.COLUMNS
-	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.COLUMNS
--------core	-	Folder: Teradata core scripts
-	teradatacore.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 5-19** describes the parameters.

Table 5-19 Parameters for configuring DSC

Migration	Configuration File	Parameter
Teradata SQL Migration	• DSC: *application.properties* • **Teradata SQL Configuration**: *features-teradata.properties*	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
Teradata Perl Migration	• DSC: *application.properties* • **Teradata Perl Configuration**: *perl-migration.properties*	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

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Migration	Configuration File	Parameter
MySQL SQL Migration	• DSC: *application.properties* • MySQL Configuration: *features-mysql.properties*	table.databaseAsSchema=true table.defaultSchema=public table.schema= table.orientation=ROW table.type=HASH table.partition-key.choose.strategy=partitionKeyChooserStrategy table.partition-key.name= table.compress.mode=NOCOMPRESS table.compress.level=0 table.compress.row=NO table.compress.column=LOW table.database.template=template0 table.index.rename=false table.database.onlyFullGroupBy=true table.database.realAsFloat=false

5.3.4.2 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:
  1. Open the **application.properties** file in the **config** folder.
  2. 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

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5.3.4.3 Executing DSC

Important Notes

- 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 and files cannot be restored by 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**.
- The maximum size of a single SQL statement is 20 KB. If the size exceeds 20 KB, the execution may be slow and the conversion may fail.

Migration Methods

You can run the **runDSC.sh** or **runDSC.bat** command to perform a migration task on Windows and Linux. For details, see **Table 5-20**.

Table 5-20 Migration on Windows and Linux

Migration	CLI Parameter
Teradata SQL Migration	**> ./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]

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Migration	CLI Parameter
Teradata Perl Migration	> **./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]
MySQL SQL Migration	> **./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**]

NOTE

- The CLI parameters are described as follows:
  - **source-db** specifies the source database. The value can be **Teradata**, 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.
  - **target-db** specifies the target database. The parameter value is **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.

Examples

- Example: Migrate the SQL files of the Teradata database to the SQL scripts of DWS on Linux.

  ./runDSC.sh --source-db *Teradata* **--input-folder** D:\test\conversion\input **--output-folder** *D:|test|conversion|output* **--log-folder** *D:|test|conversion|log* **--conversion-type** *ddl* **--targetdb** gaussdb
- Example: Migrate the SQL file of the Teradata database to the SQL script of DWS on Windows.

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```
runDSC.bat --source-db Teradata --input-folder D:\test\conversion\input --output-folder D:|test
|conversion|output --log-folder D:|test|conversion|log --conversion-type ddl --targetdb gaussdb
```

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 **********
```

5.3.4.4 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 not, contact technical 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**.

5.3.4.5 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 more information about known issues and their solutions, see **Troubleshooting**.
- Migration syntax issues: DSC did not correctly recognize or migrate the migration syntax. For details, see **Constraints and Limitations**.

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5.3.5 Database Schema Conversion

Functionality

runDSC.sh and runDSC.bat are used to migrate the schemas and queries of Teradata and MySQL to DWS, respectively.

5.3.5.1 Migration Parameters

Parameter Description

Table 5-21 Parameters

Long	Short	Data Type	Description	Value Range	Default Value	Example
--source-db	-S	String	Source database	• Teradata • MySQL	N/A	--source-db Teradata(or) -S Teradata
--input-folder	-I	String	Input folder containing Teradata or Oracle scripts	N/A	N/A	--input-folder */home/testmigration/Documentation/input* (or) -I */home/testmigration/Documentation/input*
--output-folder	-O	String	Output folder where the migrated scripts are saved	N/A	N/A	--output-folder */home/testmigration/Documentation/output*(or)-O */home/testmigration/Documentation/output*

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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.	• SQL • Perl	SQL	--application-lang Perl or -A *Perl*
--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.	• Bulk • BLogic	Bulk	--conversion-type *ddl* or -M *ddl*
--log-folder	-L	String	Log file Path	N/A	N/A	--log-folder */home/testmigration/Documentation*(or)-L */home/testmigration/Documentation*

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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	• gaussdbA	gaussdbA	--target-db gaussdbA (or) *-T gaussdbA*

Usage Guideline

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 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.

Examples

./runDSC.sh --source-db Teradata **--input-folder** opt/DSC/DSC/input/oracle/ --output-folder /opt/DSC/DSC/output/ --log-folder /opt/DSC/DSC/log/ **--application-lang** SQL **--conversion-type** ddl **--targetdb** gaussdbA

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 is no sql file present in the input folder, then the following message is displayed in 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.
```

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Environment Creation and Restoration Procedure (database and database user)

Creating a DWS database and schema

Step 1 Log in to postgres:

```
gsql -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
gsql -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>;
gsql -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 -I input/ -S oracle -M ddl -L log_temp -P input/bulk/1_table/
```

5.3.5.2 Teradata SQL Migration

DSC supports the migration from Teradata to DWS, including the migration of schemas, DMLs, 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 paths, 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:

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```
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 will be recorded in **SQL Migration Logs**.

```
********** 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 **Executing DSC**.

NOTE

During the migration, the metadata of the input script can be called and is stored in the following files:

- Teradata migration

  1.teradata-set-table.properties

Clear the preceding files in the following scenarios:

- Migration of different files
- Migration of the same file with different parameter settings

5.3.5.3 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 DWS. After migrating Perl files, you can verify the migration by comparing the output file with its input file using a comparison tool.

The process of migrating Perl files is as follows:

1. Complete the steps in section **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.

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b. DSC invokes the Teradata SQL to migrate the extracted SQL scripts. For details about Teradata SQL migration, see **Teradata SQL 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**.

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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 $sSQL=<<SQL_LANG;
TRUNCATE TABLE employee;
SQL_LANG
```

- Comment must not contain the following information:
  - print BTEQ <<ENDOFINPUT

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- ENDOFINPUT
- close(BTEQ)
- my $sSQL=<<SQL_LANG
- SQL_LANG

5.3.5.4 MySQL SQL Migration

DSC supports the migration from MySQL to DWS, including the migration of schemas, DMLs, 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 is SQL.

```
./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.

```
./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/
********** 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.

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```
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
********** 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 **********
```

5.3.5.5 Oracle SQL Migration

DSC supports the migration from Oracle to 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 to set **conversion-type** to **Bulk**. The commands include the folder paths in the example.

  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 will be recorded in **SQL Migration Logs**.

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```
********************* 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 to set **conversion-type** to **BLogic**. The command includes the folder paths in the example.

  ```
  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
  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 will be recorded in **SQL Migration Logs**.

  ```
  ********************* 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(
```

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```
        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 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 **Executing DSC**.

5.3.5.6 Netezza SQL Migration

DSC supports the migration from Netezza to 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
```

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During the execution of DSC, the migration summary, including the progress and completion status, is displayed on the console. Execution information and errors will be recorded in **SQL Migration Logs**.

```
********** 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 **Executing DSC**.

5.3.5.7 Verification

Verification After Migration

After DSC converts the source SQL files, execute the converted files on the destination DWS database 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 on the gsql client:

   a. Script execution on GaussDB depends on gsql (DWS). To ensure that DSC runs properly, you need to run it on the node where the GaussDB instance or client (gsql) is installed, and the user to be verified has the permission to run gsql commands.

   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.

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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

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 ****************************
```

5.3.6 Version Command Migration

Functionality

The **version** command is used to display the version number of the DSC.

Syntax

Linux:

```
./runDSC.sh --version
```

Windows:

```
runDSC.bat --version
```

How to Use

Linux:

```
./runDSC.sh --version
```

Windows:

```
runDSC.bat --version
```

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System Response

```
Version: DSC (Gauss Tools v2.0.0)
```

5.3.7 Help Command Migration

Functionality

The **help** command is used to provide the help information for the commands supported by DSC.

Syntax

Linux:

```
./runDSC.sh --help
```

Windows:

```
runDSC.bat --help
```

Examples

Linux:

```
./runDSC.sh --help
```

Windows:

```
runDSC.bat --help
```

System Response

Linux:

```
./runDSC.sh --help
To migrate teradata/oracle/netezza/mysql/db2 database scripts to DWS
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.
```

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```
   -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.

  " -P | --pre-execution-path%n" + "
   Path containig the dependent Objects scripts which needs to be executed before the verification step.%n"
+ "%n" +



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 DWS
runDSC.bat -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.
```

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```
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.
```

5.3.8 Log Reference

5.3.8.1 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

5.3.8.2 SQL Migration Logs

The SQL DSC (DSC.jar) supports the following types of logging:

- Activity logging
- Error logging
- successRead
- successWrite

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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 xxxxx
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 xxxxx
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
```

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```
2020-01-22 09:35:13,605 INFO MigrationService:148 Total number of queries : 1
22020-01-22 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
```

successRead

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.
```

successWrite

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

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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 writelogger:595 /home/testmigration/Documentation/is not in.sql has written successfully.
2017-07-21 14:13:01,055 INFO writelogger:595 /home/testmigration/Documentation/date quotes.sql has written successfully.
2017-07-21 14:13:01,569 INFO writelogger:595 /home/testmigration/Documentation/column alias replace.sql has written successfully.
2017-07-21 14:13:02,055 INFO writelogger:595 /home/testmigration/Documentation/sampleRownum.sql has written successfully.
2017-07-21 14:13:02,597 INFO writelogger:595 /home/testmigration/Documentation/samp.sql has written successfully.
2017-07-21 14:13:03,178 INFO writelogger:595 /home/testmigration/Documentation/testWithNodataSamples.sql has written successfully.
```

5.3.8.3 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** parameter.

Logging

DSC saves all logs, 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 teradatacore.pm:1316 Extracting SQL contents from perl files started
2018-07-08 13:35:10 INFO teradatacore.pm:1329 Extracting SQL contents from perl files completed
2018-07-08 13:35:10 INFO teradatacore.pm:1331 Migrating SQL files
2018-07-08 13:35:12 INFO teradatacore.pm:1348 Migrating SQL files completed
2018-07-08 13:35:12 INFO teradatacore.pm:1349 Merging migrated SQL contents to perl files started
2018-07-08 13:35:12 INFO teradatacore.pm:1362 Merging migrated SQL contents to perl files completed
2018-07-08 13:35:12 INFO teradatacore.pm:1364 Perl file migration completed
2018-07-08 13:35:32 INFO teradatacore.pm:1316 Extracting SQL contents from perl files started
2018-07-08 13:35:58 ERROR teradatacore.pm:426 opendir ../../../../perltest/ failed
2018-07-08 13:36:17 INFO teradatacore.pm:1316 Extracting SQL contents from perl files started
2018-07-08 13:38:21 INFO teradatacore.pm:1329 Extracting SQL contents from perl files completed
2018-07-08 13:38:21 INFO teradatacore.pm:1331 Migrating SQL files
2018-07-08 13:38:22 INFO teradatacore.pm:1348 Migrating SQL files completed
2018-07-08 13:38:22 INFO teradatacore.pm:1349 Merging migrated SQL contents to perl files started
```

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```
2018-07-08 13:38:37 ERROR teradatacore.pm:1044 Directory ../../../../../perltest/ should have 700, but has  0 permission
2018-07-08 13:38:53 ERROR teradatacore.pm:1241 Another migration process is running on same folder, re-execute after the process has completed
2018-07-08 13:39:01 INFO teradatacore.pm:1316 Extracting SQL contents from perl files started
2018-07-08 13:39:51 INFO teradatacore.pm:1329 Extracting SQL contents from perl files completed
2018-07-08 13:39:51 INFO teradatacore.pm:1331 Migrating SQL files
2018-07-08 13:39:53 INFO teradatacore.pm:1348 Migrating SQL files completed
2018-07-08 13:39:54 INFO teradatacore.pm:1349 Merging migrated SQL contents to perl files started
2018-07-08 13:39:55 INFO teradatacore.pm:1362 Merging migrated SQL contents to perl files completed
2018-07-08 13:39:57 INFO teradatacore.pm:1364 Perl file migration completed
```

5.4 Teradata Syntax Migration

5.4.1 Supported Keywords and Features

Table 5-22 lists the Teradata keywords and features that can be migrated.

- The **Version** column contains the earliest versions that support the keywords or features.
- The **Remarks** column contains the configuration parameters to customize how the migration tool migrates the corresponding keywords or features.

Table 5-22 Supported Teradata keywords and features

Section	Object->Keyword/ Feature		Version	Remarks
Data Type	Data Type		6.5.1, 18.2.0	-
Functions and Operators	Analytical Functions	Analytical Functions in ORDER BY	18.0.0	-
		Analytical Functions in PARTITION BY	18.1.0	-
	Math Functions	• ** • MOD • NULLIFZERO • ZEROIFNULL	V100R003C00	Configurable: tdMigrateNULLIFZERO and tdMigrateZEROIFNULL (18.0.0)
	String Functions	CHAR Function CHARACTERS INDEX STRREPLACE OREPLACE	V100R003C00	-

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Section	Object->Keyword/ Feature		Version	Remarks
	Date and Time Functions	DATE TIMESTAMP NEXT	V100R003C00 18.0.0 V100R003C00	-
	Comparison and List Operators	• ^= and GT • EQ and NE • LE and GE • NOT= and LT • IN and NOT IN • IS NOT IN • LIKE ALL/NOT LIKE ALL • LIKE ANY/NOT LIKE ANY	V100R003C00	-
	Table Operators	-	18.0.0	-
	Query Optimization Operators	IN and NOT IN Conversion	V100R003C00	Configurable: inToExists
	QUALIFY	-	V100R003C00	Configurable: rowstoreToColumn-store
	ALIAS		V100R003C00	Configurable: tdMigrateALIAS
	FORMAT and CAST		V100R003C00	-
	Short Keys Migration		V100R003C00	-

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Section	Object->Keyword/ Feature		Version	Remarks
	Migration of Object Names Starting with $		18.0.0	Configurable: tdMigrateDollar
Migrating Tables	-	CREATE TABLE	V100R003C00	Configurable: session_mode
		CHARACTER SET and CASESPECIFIC	18.1.0	Configurable: tdMigrateCharset-Case
		VOLATILE	V100R003C00	Configurable: volatile and session_mode
		SET	V100R003C00	-
		MULTISET	V100R003C00	-
		TITLE	V100R003C00	-
		Indexes	V100R003C00	-
		CONSTRAINT	V100R003C00	-
		COLUMN STORE	V100R003C00	Configurable: rowstoreToColumn-store
		PARTITION	18.0.0	-
		ANALYZE	V100R003C30	-
		Support for Specified Columns	18.0.0	-
Migrating Indexes	-		V100R003C00	-

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Section	Object->Keyword/ Feature	Version	Remarks
Migrating Views	REPLACE VIEW CHECK OPTION VIEW WITH RECURSIVE VIEW WITH ACCESS LOCK	V100R003C00	-
COLLECT STATISTICS	-	V100R003C00	-
ACCESS LOCK	-	V100R003C00	Configurable: tdMigrateLOCKOption
DBC.COLUMNS	-	18.0.0	Custom DB scripts
DBC.TABLES	-	18.1.0	-
DBC.INDICES	-	18.1.0	-
Data Manipulation Language (DML)	SELECT	V100R003C00	-
Data Manipulation Language (DML)	UPDATE	V100R003C00	-
Data Manipulation Language (DML)	DELETE	V100R003C00	-
Data Manipulation Language (DML)	MERGE	V100R003C00	-
Data Manipulation Language (DML)	NAMED	18.0.0	-

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Section	Object->Keyword/ Feature	Version	Remarks
Type Casting and Formatting	CHAR COLUMNS and COLUMN ALIAS Expression INT DATE DAY to SECOND DECIMAL Time Interval NULL Implicit Type Casting Issues	V100R003C00	-

5.4.2 Constraints and Limitations

The restrictions on using DSC to migrate data from TD are as follows:

- 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**, the migration may fail.

Teradata

- If a **case** statement containing **FORMAT** is not enclosed in parentheses, this statement will not be processed.

  Examples are as follows:

  ```
  case when column1='0' then column1='value' end (FORMAT 'YYYYMMDD')as alias1
  ```

  In this example, **case when column1='0' then 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;
  ```

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In the migrated query, the **ROW_NUMBER( ) OVER(PARTITION BY Agt_Num ,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
                   );
```

- The database with the schema name should be changed to **SET SESSION CURRENT_SCHEMA**.

TD Syntax	Syntax After Migration
DATABASE SCHTERA	SET SESSION CURRENT_SCHEMA TO SCHTERA

- The table-specific keyword **MULTISET VOLATILE** is provided in the input file, but the keyword is not supported by 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.

5.4.3 Data Type

Data Type	Input	Output
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	CHAR[(n)] / CHARACTER [(n)]	CHAR(n)
	CLOB	CLOB
	LONG VARCHAR	TEXT

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Data Type	Input	Output
	VARCHAR(n) / CHAR VARYING(n) / CHARACTER VARYING(n)	VARCHAR(n)
Date/ Time	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
Range	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
Binary	BLOB[(n)]	blob
	BYTE[(n)]	bytea
	VARBYTE[(n)]	bytea

BYTEINT

Input

```
SELECT cast(col as byteint) FROM tab;
```

Output

```
SELECT CAST( col AS SMALLINT ) FROM tab ;
```

5.4.4 Functions and Operators

5.4.4.1 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.

Analytical Functions in ORDER BY

Input: Analytic function in ORDER BY clause

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```
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;
```

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
;
```

Window Functions

Window functions perform calculations across rows of the query result. DSC supports the following Teradata window functions:

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NOTE

The DSC supports only single occurrence of window function in QUALIFY clause. Multiple window functions in a QUALIFY may result in invalid migration.

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 GSIS_SUM.DW_DAT71 (
  col1
 ,PROD_GROUP
)
  SELECT
    CSUM(1, T1.col1)
    ,T1.PROD_GROUP
   FROM tab1  T1
  WHERE T1.col1 = 'ABC'
;
```

Output:

```
INSERT
    INTO
        GSIS_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:

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```
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;
```

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;
```

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 ...;
```

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:

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```
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
;
```

COMPRESS (specified with *****)

Input

```
ORDCADBRN VARCHAR(6) CHARACTER SET LATIN CASESPECIFIC TITLE '    ' COMPRESS '******'
```

Output:

```
ORDCADBRN VARCHAR( 6 ) /* CHARACTER SET LATIN*/ /* CASESPECIFIC*/ /*TITLE '    '*/ /* COMPRESS
'******' */
```

5.4.4.2 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:

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```
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' ;
```

5.4.4.3 String Functions

CHAR Function

Input: CHAR

```
CHAR( expression1 )
```

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Output:

```
LENGTH( expression1 )
```

CHARACTERS

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 ... ;
```

STRTOK

Input

```
LENGTH(STRTOK(STRTOK(JOB_NAME_TADD,'-',4),'_',2))
```

Output:

```
LENGTH(split_part(split_part(JOB_NAME_TADD,'-',4),'_',2))
```

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5.4.4.4 Date and Time Functions

DATE

DSC supports the migration of Teradata SELECT statements that contain DATE FORMAT, 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
;
```

DSC supports 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
```

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```
 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:

```
mig_td_ext.ADD_MONTHS(CAST(substr(T1.GRANT_DATE,1,8)||'01'AS DATE FORMAT 'YYYY-MM-DD'),1)-1
```

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TIMESTAMP

Input: TIMESTAMP

```
select CAST('20190811'||' '||'01:00:00'
AS TIMESTAMP(0)
FORMAT 'YYYYMMDDBHH: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_F3EABCTLP.CTLREGTIM,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          /*      */
```

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```
  ,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
```

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```
        )
         )
/
```

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);
```

5.4.4.5 Comparison and List Operators

The following comparison and list operators are supported:

NOTE

The comparison operators LT, LE, GT, GE, EQ, and NE must not be used as TABLE alias or COLUMN alias.

^= 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;
```

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;
```

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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;
```

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;
```

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

DWS does not support **IN** and **NOT IN** operators in some specific scenarios.

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);
```

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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%' ]);
```

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%' ]);
```

5.4.4.6 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);
```

5.4.4.7 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**.

When being converted to 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

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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' )
```

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```
                  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;
```

5.4.4.8 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
```

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```
        ,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 anltfn
            FROM raw_material_t m LEFT JOIN supplies_t s
```

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```
                ON s.material_id = m.material_id
        ) Q1
    WHERE  Q1.vendor_cnt < 5 OR Q1.anltfn IS NULL
;
```

TITLE with QUALIFY

Input:

```
REPLACE VIEW ${STG_VIEW}.LP06_BMCLIINFP${v_Table_Suffix_Inc}
(
  CLICLINBR
, CLICHNNAM
, CLICHNSHO
, CLICLIMNE
, CLIBNKCOD
)
AS
LOCKING ${STG_DATA}.LP06_BMCLIINFP${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
  ${STG_DATA}.LP06_BMCLIINFP${v_Table_Suffix_Inc} s1
QUALIFY
    ROW_NUMBER() OVER(PARTITION BY  CLICLINBR ORDER BY CLICLINBR  ) = 1
;
```

Output:

```
CREATE OR REPLACE VIEW ${STG_VIEW}.LP06_BMCLIINFP${v_Table_Suffix_Inc}
(
  CLICLINBR
, CLICHNNAM
, CLICHNSHO
, CLICLIMNE
, CLIBNKCOD
)
AS
/* LOCKING ${STG_DATA}.LP06_BMCLIINFP${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
  ${STG_DATA}.LP06_BMCLIINFP${v_Table_Suffix_Inc} s1 ) Q1
WHERE Q1.ROWNUM1 = 1
;
```

5.4.4.9 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.

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NOTE

- The comparison operators LT, LE, GT, GE, EQ, and NE must not be used as TABLE alias or COLUMN alias.
- The tool supports column ALIAS. If the ALIAS is the same as the column name, the ALIAS is specified only for that column and not for other columns in the table. In the following example, the column name **DATA_DT** conflicts with the alias **DATA_DT**, which 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
;
```

5.4.4.10 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**.

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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 'ZZZZZ9') (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
```

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```
        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 DWS 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;
```

5.4.4.11 Short Keys Migration

Table 5-23 lists the short keys supported by Teradata and their equivalent syntax in DWS.

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Table 5-23 List of short keys

Teradata Short Key	DWS Syntax
SEL	SELECT
INS	INSERT
UPD	UPDATE
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;
```

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```
  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;
```

5.4.4.12 Migration of 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 and NOT IN Conversion**.

Table 5-24 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

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tdMigrateDollar Setting	Object Name	Migrated To
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 = TRUE)

```
SELECT
	"$C1"
FROM
	p11
WHERE
	"$C1" NOT LIKE ANY (
	ARRAY[ "$sql1" ]
	)
;
```

Output (tdMigrateDollar = 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
	*
```

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```
    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= '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= 'DEVDMD' 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
```

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```
 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=
'DEVPMD'    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=
'DEVDMD' 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 = 'DEVDMD' 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 = 'DEVDMD' 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 ;
```

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5.4.5 Migrating Tables

5.4.5.1 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 **CREATE tab2 AS tab1** is executed, the structure copied from **tab1** is used to create table tab2. If the CREATE TABLE statement includes WITH DATA operator, then the data from *tab1* is also copied into *tab2*. When CREATE AS is used, the CONSTRAINT row in the source table is retained in the new table.

- If **session_mode** is set to *Teradata*, duplicate records in the target table must be deleted. This is done by adding the **MINUS** operator in the migrated scripts.
- If **session_mode** is set to *ANSI*, duplicate records are allowed in the target table.

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

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```
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;
```

5.4.5.2 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 DWS, strings are byte-based (not character-based). VARCHAR (100) and VARCHAR2 (100) can store up to 100 bytes (not characters). However, NVARCHAR2 (100) can store up to 100 characters.

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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) /* CHARACTER SET UNICODE*/
            ,COL2 NVARCHAR2( 1 )
        ) ;

b) when default_charset = LATIN
CREATE
    TABLE
        tab1 (
            col1 NVARCHAR2 (10) /* CHARACTER SET UNICODE*/
            ,COL2 CHAR(1)
        ) ;
```

5.4.5.3 VOLATILE

The table-specific keyword **VOLATILE** is provided in the input file, but the keyword is not supported by 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
```

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```
   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
;
/
```

5.4.5.4 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 ;
```

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5.4.5.5 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
     )
;
```

5.4.5.6 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:

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```
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
;
```

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
;
```

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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;
```

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};
```

5.4.5.7 Indexes

The CREATE TABLE statement supports creation of an index. Migration tool supports the TABLE statement with PRIMARY INDEX and UNIQUE INDEX.

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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 from 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 )
  )
;
```

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Creating a Partition Table with an Index

If **tdMigrateRANGE_N** is set to **true**,

Input:

```
CREATE SET TABLE SC.TAB , NO FALLBACK,
NO BEFORE JOURNAL,
NO AFTER JOURNAL,
CHECKSUM=DEFAULT,
DEFAULT MERGEBLOCKRATIO
(
ACCOUNT_NUM VARCHAR(255) CHARACTER SET LATIN NOT CASESPECIFIC NOT NULL
,ACCOUNT_MODIFIER_NUM CHAR(18) CHARACTER SET LATIN NOT CASESPECIFIC NOT NULL
,END_DT DATE FORMAT 'YYYY-MM-DD'
,UPD_TXF_BATCHTD INTEGER COMPRESS
)
PRIMARY INDEX XPKT0300_AGREEMENT (ACCOUNT_NUM,ACCOUNT_MODIFIER_NUM)
PARTITION BY RANGE_N(END_DT BETWEEN '2001-01-01' AND '2020-12-31' EACH INTERVAL '1' DAY, NO
RANGE ,UNKNOWN)
INDEX (UPD_TXF_BATCHTD)
;
```

Output:

```
CREATE
    TABLE
        SC.TAB (
            ACCOUNT_NUM VARCHAR( 255 ) /* CHARACTER SET LATIN*/
             /* NOT CASESPECIFIC*/              NOT NULL
            ,ACCOUNT_MODIFIER_NUM CHAR( 18 ) /* CHARACTER SET LATIN*/              /* NOT
CASESPECIFIC*/              NOT NULL
            ,END_DT DATE
            ,UPD_TXF_BATCHTD INTEGER /* COMPRESS */
        ) DISTRIBUTE BY HASH (
            ACCOUNT_NUM
            ,ACCOUNT_MODIFIER_NUM
        ) PARTITION BY RANGE (END_DT) (
            PARTITION TAB_1 start ('2001-01-01')
        END ('2020-12-31') EVERY (
            INTERVAL '1' DAY )
        ) ;
CREATE INDEX ON SC.TAB (UPD_TXF_BATCHTD) LOCAL;
```

5.4.5.8 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,
```

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```
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.

5.4.5.9 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);
```

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5.4.5.10 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** and **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 a 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
```

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```
        , 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)
```

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```
        , 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 script for creating a table with a 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
```

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```
        , 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 )
                ) */
;
```

Partition of RANGE_N in the String Columns

Input:

```
CREATE SET TABLE SC.TAB , NO FALLBACK,
NO BEFORE JOURNAL,
NO AFTER JOURNAL,
CHECKSUM=DEFAULT,
DEFAULT MERGEBLOCKRATIO
(
ACCOUNT_NUM VARCHAR(255) CHARACTER SET LATIN NOT CASESPECIFIC NOT NULL
,ACCOUNT_MODIFIER_NUM CHAR(18) CHARACTER SET LATIN NOT CASESPECIFIC NOT NULL
,DATA_SOURCE_ID CHAR(10) CHARACTER SET LATIN NOT CASESPECIFIC
,END_DT DATE FORMAT 'YYYY-MM-DD'
,UPD_TXF_BATCHTD INTEGER COMPRESS
)
PRIMARY INDEX XPKT0300_AGREEMENT (ACCOUNT_NUM,ACCOUNT_MODIFIER_NUM)
PARTITION BY ( RANGE_N(DATA_SOURCE_ID BETWEEN
'A','B','C','D','E','F','G','H','I','J','K','L','M','N','O','P','Q','R','S','T','U','V','W','X','Y','Z' AND 'ZZ', NO
RANGE ,UNKNOWN) ,CASE_N(END_DT IS NULL , NO CASE , UNKNOWN))
;
```

Output:

```
CREATE
    TABLE
        SC.TAB (
            ACCOUNT_NUM VARCHAR( 255 ) /* CHARACTER SET LATIN*/       /* NOT
CASESPECIFIC*/               NOT NULL
            ,ACCOUNT_MODIFIER_NUM CHAR( 18 ) /* CHARACTER SET LATIN*/              /* NOT
CASESPECIFIC*/               NOT NULL
            ,DATA_SOURCE_ID CHAR( 10 ) /* CHARACTER SET LATIN*/              /* NOT CASESPECIFIC*/
            ,END_DT DATE
            ,UPD_TXF_BATCHTD INTEGER /* COMPRESS */
        ) DISTRIBUTE BY HASH (
            ACCOUNT_NUM
            ,ACCOUNT_MODIFIER_NUM
```

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```
        )/* PARTITION BY (
            RANGE_N (
                DATA_SOURCE_ID BETWEEN 'A'
                ,'B'
                ,'C'
                ,'D'
                ,'E'
                ,'F'
                ,'G'
                ,'H'
                ,'I'
                ,'J'
                ,'K'
                ,'L'
                ,'M'
                ,'N'
                ,'O'
                ,'P'
                ,'Q'
                ,'R'
                ,'S'
                ,'T'
                ,'U'
                ,'V'
                ,'W'
                ,'X'
                ,'Y'
                ,'Z' AND 'ZZ'
                ,NO RANGE
                ,UNKNOWN
            )
            ,*/
/* CASE_N(END_DT IS NULL , NO CASE , UNKNOWN))  */
            ;
```

RANGE_N with different partition INTERVAL

Input:

```
CREATE MULTISET TABLE tab1
    ( TICD                VARCHAR(10)
    , TCIT                VARCHAR(10)
    , TCCM                 VARCHAR(50)
    , DW_Stat_Dt          DATE
   )
PRIMARY INDEX ( TICD )
PARTITION BY RANGE_N
  ( DW_Stat_Dt BETWEEN DATE '0001-01-01' AND DATE '0001-01-04' EACH INTERVAL '1' DAY,
    DATE '0001-01-05' AND DATE '1899-12-31',
    DATE '1900-01-01' AND DATE '1900-01-01',
    DATE '1900-01-02' AND DATE '1999-12-31',
    DATE '2000-01-01' AND DATE '2009-12-31' EACH INTERVAL '1' YEAR,
    DATE '2010-01-01' AND DATE '2021-12-31' EACH INTERVAL '1' DAY,
    DATE '9999-12-31' AND DATE '9999-12-31',
    NO RANGE );
```

Output:

```
CREATE TABLE tab1
    ( TICD                VARCHAR( 10 )
    , TCIT                VARCHAR( 10 )
    , TCCM                 VARCHAR( 50 )
    , DW_Stat_Dt          DATE
    )
DISTRIBUTE BY HASH (TICD)
PARTITION BY RANGE (DW_Stat_Dt)
  ( PARTITION tab1_0 START (DATE '0001-01-01') END (DATE '0001-01-04') EVERY (INTERVAL '1' DAY),
    PARTITION tab1_1 START (DATE '0001-01-04') END (DATE '1899-12-31'),
    PARTITION tab1_2 START (DATE '1899-12-31') END (DATE '1900-01-01'),
```

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```
    PARTITION tab1_ 3 START (DATE '1900-01-01') END (DATE '1999-12-31'),
    PARTITION tab1_4 START (DATE '1999-12-31') END (DATE '2009-12-31') EVERY (INTERVAL '1' YEAR) ,
    PARTITION tab1_5 START (DATE '2009-12-31') END (DATE '2021-12-31') EVERY (INTERVAL '1' DAY) ,
    PARTITION tab1_6 START (DATE '2021-12-31') END (DATE '9999-12-31')
 );
```

RANGE_N with * for start-date

Input:

```
CREATE MULTISET TABLE Orders5 (
  StoreNo SMALLINT,
  OrderNo INTEGER,
  OrderDate DATE,
  OrderTotal INTEGER
)
PRIMARY INDEX(OrderNo)
PARTITION BY RANGE_N  (
  OrderDate BETWEEN DATE * AND DATE '2016-12-31' EACH INTERVAL '1' YEAR,
    DATE '2017-01-01'  EACH INTERVAL '1' MONTH,
    DATE '2020-01-01' AND DATE '2020-12-31' EACH INTERVAL '1' DAY
);
```

Output:

```
CREATE TABLE Orders5 (
  StoreNo SMALLINT,
  OrderNo INTEGER,
  OrderDate DATE,
  OrderTotal INTEGER
)
DISTRIBUTE BY HASH (OrderNo)
PARTITION BY RANGE (OrderDate)
  ( PARTITION Orders5_0 START (DATE '0001-01-01') END (DATE '2016-12-31') EVERY (INTERVAL '1' YEAR),
PARTITION Orders5_1 START (DATE '2016-12-31') END (DATE '2020-01-01') EVERY (INTERVAL '1' MONTH),
PARTITION Orders5_2 START (DATE '2020-01-01') END (DATE '2020-12-31') EVERY (INTERVAL '1' DAY)
);
```

RANGE_N with * for end-date

Input:

```
CREATE SET TABLE Orders4 (
  StoreNo SMALLINT,
  OrderNo INTEGER,
  OrderDate DATE,
  OrderTotal INTEGER
)
PRIMARY INDEX(OrderNo)
PARTITION BY RANGE_N  (
  OrderDate BETWEEN DATE '2010-01-01' AND '2016-12-31' EACH INTERVAL '1' YEAR,
    DATE '2017-01-01' EACH INTERVAL '1' MONTH,
    DATE '2019-01-01' AND *
);
```

Output:

```
CREATE TABLE Orders4 (
  StoreNo SMALLINT,
  OrderNo INTEGER,
  OrderDate DATE,
  OrderTotal INTEGER
)
DISTRIBUTE BY HASH (OrderNo)
PARTITION BY RANGE (OrderDate)
  ( PARTITION Orders4_0 START (DATE '2010-01-01') END (DATE '2016-12-31') EVERY (INTERVAL '1' YEAR),
PARTITION Orders4_1 START (DATE '2016-12-31') END (DATE '2020-01-01') EVERY (INTERVAL '1' MONTH) ,
```

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```
PARTITION Orders4_2 START (DATE '2020-01-01') END (MAXVALUE)
);
```

RANGE_N with comma separated values

Input:

```
CREATE TABLE orders10
    (storeid INTEGER NOT NULL
    ,productid INTEGER NOT NULL
    ,orderdate DATE NOT NULL
    ,totalorders INTEGER NOT NULL)
    PRIMARY INDEX (storeid, productid)
     PARTITION BY ( RANGE_N(totalorders BETWEEN *, 100, 1000 AND *) );
```

Output:

```
CREATE TABLE orders10
    (storeid INTEGER NOT NULL
    ,productid INTEGER NOT NULL
    ,orderdate DATE NOT NULL
    ,totalorders INTEGER NOT NULL)
DISTRIBUTE BY HASH (storeid, productid)
PARTITION BY RANGE (totalorders)
   ( PARTITION Orders10_0 END (100),
     PARTITION Orders10_1 END (1000),
     PARTITION Orders10_2 END (MAXVALUE)
   );
```

5.4.5.11 ANALYZE

The **ANALYZE** statement of Teradata is used to migrate tables.

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 RELOPTIONS EXCLUDING
DISTRIBUTION )
DISTRIBUTE BY HASH ( EMPNO ) ;
INSERT INTO EMP27
select * from emp21 ;
end ;
/
ANALYZE Emp27 (EmpNo);
```

5.4.5.12 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.

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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 )
            ,accdate 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
            ,accdate
            ,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
;
```

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Output:

```
CREATE
    LOCAL TEMPORARY TABLE
        Convert_Data3 (
            zoneno CHAR( 6 )
            ,brno CHAR( 6 )
            ,currtype CHAR( 4 )
            ,Commuteno CHAR( 4 )
            ,Subcode CHAR( 12 )
            ,accdate 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
            ,accdate
            ,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
```

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```
                    ,zoneno
                    ,brno
                    ,currtype
                    ,commuteno
                    ,subcode
                    ,accdate
                    ,acctime
                    ,quoteno
                    ,quotedate
                    ,tddrbal
                    ,tdcrbal
                FROM
                    CONVERT_DATA3
;
```

5.4.6 Migrating Indexes

The sequence of **CREATE INDEX** columns and table names in Teradata is different from that in 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 )
```

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```
            ,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 )
  )
;
```

5.4.7 Migrating Views

CREATE VIEW (**short key** CV) is used together with **SELECT** to create a view.

The keyword **VIEW** is supported by both Teradata and DWS, but the **SELECT** statements are enclosed in double quotation marks during the migration. For details, see the following figures.

Use the **tdMigrateVIEWCHECKOPTIO....** configuration parameter to configure migration of views containing the WITH CHECK OPTION keyword. If

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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 DWS.

Input - REPLACE VIEW

```
REPLACE VIEW DP_STEDW.MY_PARAM AS SELECT
        RUNDATE
```

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```
    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
$$
SELECT CAST('2017-08-20' AS DATE)
$$
;
```

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CHECK OPTION

Use the **tdMigrateVIEWCHECKOPTIO....** configuration parameter to configure migration of views containing the **CHECK OPTION** keyword.

If a view with **CHECK OPTION** is present in the source, the **CHECK OPTION** is commented out in 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

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 5-3 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
```

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Figure 5-4 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 ) ;
```

dbc.columnsV

Input:

```
SELECT A.ColumnName
 AS V_COLS             ,A.columnname  || ' ' ||CASE WHEN columnType in ('CF','CV')
THEN CASE WHEN columnType='CV' THEN 'VAR' ELSE ''             END||'CHAR('||TRIM(columnlength
(INT))||                ') CHARACTER SET LATIN'||                  CASE WHEN UpperCaseFlag='N'
THEN ' NOT' ELSE ''
END || ' CASESPECIFIC'
WHEN columnType='DA' THEN 'DATE'
WHEN columnType='TS' THEN 'TIMESTAMP(' || TRIM(DecimalFractionalDigits)||')'
WHEN columnType='AT' THEN 'TIME('|| TRIM(DecimalFractionalDigits)||')'                                WHEN
columnType='I' THEN 'INTEGER'
 WHEN columnType='I1' THEN 'BYTEINT'
WHEN columnType='I2' THEN 'SMALLINT'
```

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```
WHEN columnType='I8' THEN 'BIGINT'
WHEN columnType='D' THEN 'DECIMAL('||TRIM(DecimalTotalDigits)||','||
TRIM(DecimalFractionalDigits)||')'                    ELSE 'Unknown'
END||CASE WHEN Nullable='Y'
THEN '' ELSE ' NOT NULL' END||'0A'XC
AS V_ColT
,D.ColumnName
AS V_PICol -- Obtain the primary index of the target table.
FROM dbc.columnsV A LEFT JOIN dbc.IndicesV B  ON A.columnName = B.columnName AND B.IndexType
IN ('Q','P') AND B.DatabaseName = '${V_TDDLDB}'  AND B.tablename='${TARGET_TABLE}' WHERE
A.databasename='${V_TDDLDB}' AND A.tablename = '${TARGET_TABLE}' AND A.columnname NOT IN
( 'ETL_JOB_NAME'                                                                    ,'ETL_TX_DATE' ,
'ETL_PROC_DATE'
                    )ORDER BY A.columnid;
```

Output:

```
D DECLARE lv_mig_V_COLS    TEXT;          lv_mig_V_ColT         TEXT;          lv_mig_V_PICol        TEXT; BEGIN
SELECT STRING_AGG(A.ColumnName, ',')                    , STRING_AGG(A.columnname  || ' ' ||CASE WHEN
columnType in ('CF','CV')                                THEN CASE WHEN columnType='CV' THEN 'VAR' ELSE
''             END||'CHAR('||TRIM(mig_td_ext.mig_fn_castasint(columnlength))||                ') /*CHARACTER SET
LATIN*/'||                  CASE WHEN UpperCaseFlag='N'                    THEN ' NOT' ELSE ''                    END
|| ' /*CASESPECIFIC*/'                                WHEN columnType='DA' THEN 'DATE'
WHEN columnType='TS' THEN 'TIMESTAMP(' || TRIM(DecimalFractionalDigits)||')'
WHEN columnType='AT' THEN 'TIME('|| TRIM(DecimalFractionalDigits)||')'                                WHEN
columnType='I' THEN 'INTEGER'                              WHEN columnType='I1' THEN
'BYTEINT'                              WHEN columnType='I2' THEN 'SMALLINT'                                WHEN
columnType='I8' THEN 'BIGINT'                              WHEN columnType='D' THEN 'DECIMAL('||
TRIM(DecimalTotalDigits)||','||TRIM(DecimalFractionalDigits)||')'                                ELSE
'Unknown'                              END||CASE WHEN Nullable='Y'        THEN '' ELSE ' NOT NULL' END||E'\x0A',
',')                , STRING_AGG(B.ColumnName, ',')                INTO lv_mig_V_COLS, lv_mig_V_ColT,
lv_mig_V_PICol FROM mig_td_ext.vw_td_dbc_columnsV A LEFT JOIN mig_td_ext.vw_td_dbc_IndicesV B  ON
A.columnName = B.columnName AND B.IndexType IN ('Q','P') AND B.DatabaseName = 'public'  AND
B.tablename='emp2' WHERE A.databasename='public' AND A.tablename = 'emp2'; -- ORDER BY
A.columnid; END; /
```

5.4.8 COLLECT STATISTICS

COLLECT STAT is used in Teradata for collecting optimizer statistics, which will be used for query performance. DWS uses the ANALYZE statement to replace COLLECT STAT.

Learn more information in **ANALYZE**.

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
)
;
```

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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 ;
```

5.4.9 ACCESS LOCK

ACCESS LOCK allows you to read the data from a table that may have been locked for the READ or WRITE.

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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 ...;
```

5.4.10 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 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 to **Operating Environment** and **Prerequisites** respectively.

The DSC migrates the following dbc.columns to their corresponding information_schema columns.

Table 5-25 Migration of dbc.columns to information_schema columns

dbc.columns	information_schema.columns
ColumnName	Column_Name
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

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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'
,''
```

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```
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
```

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```
            WHEN TRIM( '"Test"' ) LIKE '"%'
            THEN REPLACE( SUBSTR( '"Test"' ,2 ,LENGTH( '"Test"' ) - 2 ) ,'""' ,'"' )
            ELSE LOWER( '"Test"' )
        END
    ORDER BY
        information_schema.columns.ordinal_position
;
```

5.4.11 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 > ] ) ) )
;
```

5.4.12 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 (
```

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```
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 usename 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 usename 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();
```

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Output:

```
SELECT pg_backend_pid();
```

5.4.13 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"*/
```

5.4.14 COMMENT

The figure below illustrates the process of simplifying **COMMENT** statements. A complex statement is entered and then simplified through migration.

Input:

```
CREATE MULTISET TABLE PDAT.t_tbl_comment
   (
      Data_Dt  DATE           NOT NULL
     ,Data_Src  VARCHAR(4)    NOT NULL
     ,List_Make_Stat  CHAR(1)
   ) PRIMARY INDEX(Data_Dt,Data_Src) ;
COMMENT ON PDAT.t_tbl_comment IS 'comment test on table';
---------------
REPLACE VIEW  PVW.v_vw_comment AS
LOCKING ROW FOR ACCESS
SELECT Data_Dt, Data_Src, List_Make_Stat
FROM PDAT.t_tbl_comment;
COMMENT ON PVW.v_vw_comment IS 'comment test on view';
COMMENT ON PVW.v_vw_comment.Data_Dt IS 'comment test on view column';
```

Output:

```
COMMENT ON TABLE PDAT.t_tbl_comment IS 'comment test on table';
COMMENT ON VIEW PVW.v_vw_comment IS 'comment test on view';
COMMENT ON COLUMN PVW.v_vw_comment.Data_Dt IS 'comment test on view column';
```

5.4.15 Data Manipulation Language (DML)

5.4.15.1 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 is used in Teradata SQL, but is not supported by DWS. DWS supports only **INSERT INTO table_name**. Therefore, remove the keyword **TABLE** when using DSC.

Input

```
INSERT TABLE tab1
SELECT col1, col2
  FROM tab2
 WHERE col3 > 0;
```

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Output

```
INSERT INTO tab1
SELECT col1, col2
  FROM tab2
 WHERE col3 > 0;
```

5.4.15.2 SELECT

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 DWS for collecting optimizer statistics, which are 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;
```

Order of Clauses

For Teradata migration of **SELECT** statements, all the clauses (**FROM**, **WHERE**, **HAVING** and **GROUP BY**) can be listed in any order. If the **FROM** clause of a statement contains a QUALIFY clause that is used as **ALIAS**, DSC does not migrate the statement.

Use the **tdMigrateALIAS** configuration parameter to configure migration of ALIAS.

Input: Order of Clauses

```
SELECT expr1 AS alias1
     , expr2 AS alias2
     , expr3 AS alias3
```

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```
    , 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
        alias1 <> 'IC'
        AND alias2 <> 'IC'
        AND alias3 <> '' ;
```

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, 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
```

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```
        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
        )
;
```

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, the database produces super-aggregate groupings in addition to the regular groupings. These features are not available in 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'
```

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```
        AND ...
    WHERE
        T1.c7 = '000'
        AND ...
    GROUP BY
        1 ,2 ,3
    HAVING
        alias1 <> 'IC'
        AND alias2 <> 'IC'
        AND alias3 <> '' ;
```

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
       );
```

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SELECT AS

DWS variable names are case insensitive, while Teradata variable names are case sensitive. To ensure that the Teradata script is correct before and after the migration, retain the case of the original variable name in the variable definition of the **SELECT** statement. The converted variable is defined in the **AS** *Variable name*.

Input

```
SELECT  TRIM('${JOB_NAME}')                                                    AS JOB_NAME
      ,CASE WHEN LENGTH(trim(STRTOK('${JOB_NAME}','-',4)))=2
           THEN trim(STRTOK('${JOB_NAME}','-',4))
            ELSE ''
            END                                                                AS EDW_BANK_NM
      ,TRIM('${TX_DATE}')                                                      AS TX_DATE
      ,USER                                                                  AS ETL_USER
      ,CAST( CURRENT_TIMESTAMP(0) AS VARCHAR(19))                                      AS CURR_STIME
      ,'${ETL_DATA}'                                                         AS ETL_DATA
      ,'T61_INDV_CUST_ACCT_ORG_AUM'                                                AS TARGET_TABLE
      ,'CAST(''8999-12-31'' AS DATE)'                                        AS MAXDATE
;
.IF ERRORCODE <> 0 THEN .QUIT 12
```

Output

```
SELECT
        TRIM( '${job_name}' ) AS "JOB_NAME"
        ,CASE
                WHEN LENGTH( TRIM( split_part ( '${job_name}' ,'-' ,4 ) ) ) = 2 THEN TRIM( split_part ( '$
{job_name}' ,'-' ,4 ) )
            ELSE ''
        END AS "EDW_BANK_NM"
        ,TRIM( '${tx_date}' ) AS "TX_DATE"
        ,USER AS "ETL_USER"
        ,CAST( CURRENT_TIMESTAMP( 0 ) AS VARCHAR( 19 ) ) AS "CURR_STIME"
        ,'${etl_data}' AS "ETL_DATA"
        ,'T61_INDV_CUST_ACCT_ORG_AUM' AS "TARGET_TABLE"
        ,'CAST(''8999-12-31'' AS DATE)' AS "MAXDATE" ;
\if ${ERROR} != 'false'
 \q 12
\endif

;
```

Definition nested with **AS** expression is implemented by splitting multiple statements.

Input

```
SELECT  TRIM('${JOB_NAME}')                                                    AS JOB_NAME
      ,'CAST(''0001-01-02'' AS DATE)'                                        AS ILLDATE
      ,'T61_INDV_CUST_HOLD_PROD_IND_AUM'                                           AS
TARGET_TABLE
      ,0                                                                   AS NULLNUMBER
      ,'CAST(''00:00:00.999'' AS TIME(3))'                                   AS NULLTIME
      ,'CAST(''0001-01-01 00:00:00.000000'' AS TIMESTAMP(6))'                      AS NULLTIMESTAMP
      ,'VT_'||TARGET_TABLE                                                 AS VT_TABLE
      ,'V'||SUBSTR(TARGET_TABLE,2,CHAR(TARGET_TABLE)-1)                            AS
TARGET_TABLE_V
      ,'${GDM_DETAIL_DDL}'                                                   AS V_TDDLDB
      ,'${GDM_DETAIL_VIEW}'                                                  AS V_TARGETDB
      ,'${UDF}'                                                            AS V_PUB_UDF

;
.IF ERRORCODE <> 0 THEN .QUIT 12
```

Output

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```
SELECT
        TRIM( '${job_name}' ) AS "JOB_NAME"
        ,'CAST(''0001-01-02'' AS DATE)' AS "ILLDATE"
        ,'T61_INDV_CUST_HOLD_PROD_IND_AUM' AS "TARGET_TABLE"
        ,0 AS "NULLNUMBER"
        ,'CAST(''00:00:00.999'' AS TIME(3))' AS "NULLTIME"
        ,'CAST(''0001-01-01 00:00:00.000000'' AS TIMESTAMP(6))' AS "NULLTIMESTAMP"
        ,'${gdm_detail_ddl}' AS "V_TDDLDB"
        ,'${gdm_detail_view}' AS "V_TARGETDB"
        ,'${udf}' AS "V_PUB_UDF" ;
SELECT
        'VT_' || '${TARGET_TABLE}' AS "VT_TABLE" ;
SELECT
        'V' || SUBSTR( '${TARGET_TABLE}' ,2 ,LENGTH( '${TARGET_TABLE}' ) - 1 ) AS "TARGET_TABLE_V" ;
\if ${ERROR} != 'false'
 \q 12
\endif

;
```

TOP Clauses

DSC also supports the migration of **TOP** statements with dynamic parameters. The **TOP** clauses in Teradata are migrated to the **LIMIT** clauses in DWS.

NOTE

- When migrating a statement with a **TOP** clause that includes **WITH TIES**, it is necessary to include the **ORDER BY** clause as well. Otherwise, the tool will be unable to migrate the statement, and it will be copied 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 allowed: lowercase letters (a-z), uppercase letters (A-Z), digits (0-9), and underscores (_).

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
                  )
```

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```
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 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
```

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```
    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
;
```

SAMPLE clauses

The **SAMPLE** clauses in Teradata are migrated to the **LIMIT** clauses in DWS.

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;
```

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5.4.15.3 UPDATE

DSC supports migration of 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;
```

5.4.15.4 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 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;
```

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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 ;
```

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```
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;
```

5.4.15.5 MERGE

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. *
```

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```
)
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
                    )
;
```

5.4.15.6 NAMED

NAMED is used in Teradata to assign a temporary name to an expression or column. The **NAMED** statements for expressions are migrated to **AS** in 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';
```

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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);
```

5.4.15.7 ACTIVITYCOUNT

ACTIVITYCOUNT

Input

It is a status variable that returns the number of rows affected by an SQL DML statement in an embedded SQL.

```
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;
```

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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 ;
/
```

5.4.15.8 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:SSBMMMBDD,BYYYY');
```

Output

```
SELECT 'StartDTTM' AS a
          ,TO_CHAR( CURRENT_TIMESTAMP ,'HH:MI:SS MON DD, YYYY' ) ;
```

TIMESTAMP Typecasting

Input

```
COALESCE( a.Snd_Tm ,TIMESTAMP '0001-01-01 00:00:00' )
```

Output

```
COALESCE( a.Snd_Tm , CAST('0001-01-01 00:00:00' AS TIMESTAMP) )
```

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5.4.16 Type Casting and Formatting

This section contains the migration syntax for migrating Teradata type casting and formatting syntax. 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 [like (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**
- **Expression**
- **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;
```

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Expression

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;
```

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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

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```
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

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```
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
```

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```
'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
;
```

Hexadecimal Character Literals

Input	Output
'CASE WHEN Nullable='Y' THEN '' ELSE ' NOT NULL' END || '0A'XC	CASE WHEN Nullable='Y' THEN '' ELSE ' NOT NULL' END || E'\x0A'

Hexadecimal Character literal value

Input	Output

'SELECT CASE WHEN Nullable='Y' THEN ''
ELSE NOT NULL
END || '0A'XC AS SP_DATA_DT
FROM tbl_table;
.IF ERRORCODE <> 0 THEN .QUIT 12
	DECLARE lv_mig_errorcode NUMBER (4) ;
	lv_mig_SP_DATA_DT TEXT ;
	BEGIN
	BEGIN
	SELECT
	STRING_AGG (
	CASE
	WHEN Nullable = 'Y' THEN ''
	ELSE NOT NULL
	END || E'\x0A' /* ????????? */
	,''
	) INTO
	lv_mig_SP_DATA_DT
	FROM
	tbl_table ;
	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 ;
	/

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TRIM (Including INT Type Casting)

Input	Output
TRIM(columnlength (INT))	TRIM(mig_td_ext.mig_fn_castasint(columnlength))

5.4.17 BTEQ Utility Command

DWS provides a series of gsql meta-commands, which can replace common BTEQ commands. The mostly used replacements are as follows:

.QUIT | .EXIT | .RETURN

The meta-command **\q [***value***]** can be used to exit the gsql program, and **value** specifies the exit code. The .QUIT, .EXIT, and .RETURN commands can replace each other with the **\q** command.

Input	Output
.QUIT 0	\q 0
.EXIT	\q
.RETURN	\q

.LABEL and .GOTO

The Teradata command .LABEL is used to create tags and is usually used together with .GOTO. .GOTO skips all intermediate BTEQ commands and SQL statements, instructs you to reach the specified label position, and performs corresponding restoration processing.

gsql meta-command **\goto LABEL...** and **\label LABEL** can be replaced with each other with no constraints.

Input	Output
.IF CHECK_PK='' THEN .GOTO NOCHECK ${CHECK_PK}; .LABEL NOCHECK .QUIT 0	\if ${CHECK_PK} == '' \goto NOCHECK \endif ${CHECK_PK} \label NOCHECK \q 0

.RUN FILE

Executing the SQL request of a specified file can be implemented by the gsql meta-command **\i**.

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Input	Output
.RUN FILE=sampfile	\i 'sampfile'

.EXPORT FILE

Exporting the SQL statement execution result to a specified file can be implemented by the gsql meta-command **\o**.

Input	Output
.EXPORT REPORT FILE=resultfile	\o 'resultfile'

..SET ..END

To set a variable to specified value, both a single-line command or a multi-line command ended with ..END can be used. You can run the SELECT command to query a specified variable name or run the **\set** command to convert the variable name.

Input	Output
.SET SEPARATOR ' | '	\set SEPARATOR '|'
..SET NAME 'Jack' ..END	SELECT 'Jack' AS "NAME";

.IF

.IF is one of the important process control commands used to execute parts of an input script. It can be a single-branch command, which is used in pairs with the THEN clause. It can also be a multi-branch command. The multi-branch IF structure allows multiple nested layers, but each layer must start with the IF command and end with the ENDIF command.

The flow control meta-commands **\if...** \else ... **\endif** can be used to replace this BTEQ command.

Input	Output
.IF ERRORCODE <> 0 THEN .QUIT 12;	\if ${ERROR} != 'false' \q 12 \endif

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..FOR

In the loop control command, when the loop condition is met, the script of the loop body can be executed continuously until .QUIT exits the loop. DWS provides **\for...** \loop ... \exit-for ... **\end-for** structure command implements the loop logic.

Input	Output
..IF ACTIVITYCOUNT > 0 THEN ..FOR SEL SqlStr AS V_SqlStr FROM ${ ETL_DATA}.TB_DWDATA_UPDATE WHERE JobName = '${JOB_NAME}' AND TXDATE = ${ TX_DATE} - 19000000 ORDER BY ExcuteSeq ASC; ..DO ${V_SqlStr} .IF ERRORCODE<>0 THEN .QUIT 12 ..END-FOR ..END-IF	\if ${ERROR} != 'false' \q 12 \endif \if ${ACTIVITYCOUNT} != 0 \for SELECT SqlStr AS V_SqlStr FROM ${ETL_DATA}.TB_DWDATA_UPDATE WHERE JobName = '${JOB_NAME}' AND TXDATE = to_date($ {TX_DATE} ,'yyyymmdd') ORDER BY ExcuteSeq ASC \loop ${V_SqlStr} ; \if ${ERROR} != 'false' \q 12 \endif \end-for \endif

5.4.18 Teradata Formats

Date in the YYYYMMDD Format

Input	Output
SELECT 1 FROM tb_dt_fmtyyyymmdd WHERE JobName ='${JOB_NAME}' AND TXDATE = ${TX_DATE} - 19000000;	SELECT 1 FROM tb_dt_fmtyyyymmdd WHERE JobName ='${JOB_NAME}' AND TXDATE = TO_DATE(${TX_DATE}, 'YYYYMMDD');

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Date in the YYYYDDD Format

Input	Output
REPLACE VIEW SC.VIEW_1 (col_1) LOCKING TABLE sc.tab FOR ACCESS AS SEL --tgt.col_1 is date type CAST(CAST(TGT.col_1 AS DATE FORMAT 'YYYYDDD') AS CHAR(7)) AS col_1 FROM sc.tab TGT ;	CREATE OR REPLACE VIEW SC.VIEW_1 (col_1) /*LOCKING TABLE sc.tab FOR ACCESS */ AS (SELECT /* tgt.col_1 is date type */ CAST(TO_DATE(TGT.col_1, 'YYYYDDD') AS CHAR(7)) AS col_1 FROM sc.tab TGT) ;

Column Names Starting with

Input	Output
REPLACE VIEW SC.VIEW_1 (,col_1 ,#_col_2 ,#_col_3) LOCKING TABLE sc.tab FOR ACCESS AS SEL Tgt.col1 ,Tgt.#_col_2 ,Tgt.#_col_3 FROM sc.tab TGT ;	CREATE OR REPLACE VIEW SC.VIEW_1 (,col_1 ,"#_COL_2" ,"#_COL_3") /*LOCKING TABLE sc.tab FOR ACCESS */ AS (SELECT Tgt.col1 ,Tgt."#_COL_2" ,Tgt."#_COL_3" FROM sc.tab TGT) ;

Database Operations First During Type Casting

Input	Output
REPLACE VIEW SC.VIEW_1 (col_1) LOCKING TABLE sc.tab FOR ACCESS AS SEL (COALESCE(TRIM(TGT.col_1),'')) || '_' || (COALESCE(TRIM(TGT.col_1),'')) (CHAR(22)) AS col_1 FROM sc.tab TGT ;	CREATE OR REPLACE VIEW SC.VIEW_1 (col_1) /*LOCKING TABLE sc.tab FOR ACCESS */ AS (SELECT CAST((COALESCE(TRIM(TGT.col_1) ,'')) || '_' || (COALESCE(TRIM(TGT.col_1) ,'')) AS CHAR(22)) AS col_1 FROM sc.tab TGT) ;

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5.4.19 System Views

DSC migrates the system views **dbc.columnsV** and **dbc.IndicesV**, and the resulting output is displayed below.

Input:

```
SELECT A.ColumnName
AS V_COLS
     ,A.columnname  || ' ' ||CASE WHEN columnType in ('CF','CV')
                                  THEN CASE WHEN columnType='CV' THEN 'VAR' ELSE ''
            END||'CHAR('||TRIM(columnlength (INT))||
               ') CHARACTER SET LATIN'||
                CASE WHEN UpperCaseFlag='N'
                  THEN ' NOT' ELSE ''
                END || ' CASESPECIFIC'
                            WHEN columnType='DA' THEN 'DATE'
                            WHEN columnType='TS' THEN 'TIMESTAMP(' || TRIM(DecimalFractionalDigits)||')'
                            WHEN columnType='AT' THEN 'TIME('|| TRIM(DecimalFractionalDigits)||')'
                            WHEN columnType='I' THEN 'INTEGER'
                            WHEN columnType='I1' THEN 'BYTEINT'
                            WHEN columnType='I2' THEN 'SMALLINT'
                            WHEN columnType='I8' THEN 'BIGINT'
                            WHEN columnType='D' THEN 'DECIMAL('||TRIM(DecimalTotalDigits)||','||
TRIM(DecimalFractionalDigits)||')'
                            ELSE 'Unknown'
                        END||CASE WHEN Nullable='Y'
       THEN '' ELSE ' NOT NULL' END||'0A'XC
AS V_ColT           -      ,B.ColumnName
AS V_PICol
 FROM dbc.columnsV A LEFT JOIN dbc.IndicesV B
   ON A.columnName = B.columnName AND B.IndexType IN ('Q','P')
  AND B.DatabaseName = '${V_TDDLDB}'  AND B.tablename='${TARGET_TABLE}'
WHERE A.databasename='${V_TDDLDB}' AND A.tablename = '${TARGET_TABLE}'
  AND A.columnname NOT IN
( 'ETL_JOB_NAME'                                                                                ,'ETL_TX_DATE'
                       ,'ETL_PROC_DATE'
                       )
 ORDER BY A.columnid;
```

Output:

```
DECLARE lv_mig_V_COLS   TEXT;
        lv_mig_V_ColT       TEXT;
        lv_mig_V_PICol      TEXT;
BEGIN
SELECT STRING_AGG(A.ColumnName, ',')
     , STRING_AGG(A.columnname  || ' ' ||CASE WHEN columnType in ('CF','CV')
                                  THEN CASE WHEN columnType='CV' THEN 'VAR' ELSE ''
            END||'CHAR('||TRIM(mig_td_ext.mig_fn_castasint(columnlength))||
               ') /*CHARACTER SET LATIN*/'||
                CASE WHEN UpperCaseFlag='N'
                  THEN ' NOT' ELSE ''
                END || ' /*CASESPECIFIC*/'
                            WHEN columnType='DA' THEN 'DATE'
                            WHEN columnType='TS' THEN 'TIMESTAMP(' || TRIM(DecimalFractionalDigits)||')'
                            WHEN columnType='AT' THEN 'TIME('|| TRIM(DecimalFractionalDigits)||')'
                            WHEN columnType='I' THEN 'INTEGER'
                            WHEN columnType='I1' THEN 'BYTEINT'
                            WHEN columnType='I2' THEN 'SMALLINT'
                            WHEN columnType='I8' THEN 'BIGINT'
                            WHEN columnType='D' THEN 'DECIMAL('||TRIM(DecimalTotalDigits)||','||
TRIM(DecimalFractionalDigits)||')'
                            ELSE 'Unknown'
                        END||CASE WHEN Nullable='Y'
       THEN '' ELSE ' NOT NULL' END||E'\x0A', ',')                , STRING_AGG(B.ColumnName, ',')
INTO lv_mig_V_COLS, lv_mig_V_ColT, lv_mig_V_PICol
FROM mig_td_ext.vw_td_dbc_columnsV A LEFT JOIN mig_td_ext.vw_td_dbc_IndicesV B
  ON A.columnName = B.columnName AND B.IndexType IN ('Q','P')
```

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```
  AND B.DatabaseName = 'public'  AND B.tablename='emp2'
WHERE A.databasename='public' AND A.tablename = 'emp2';
-- ORDER BY A.columnid;
END;
/
```

5.5 Migrating MySQL Syntax

5.5.1 Supported Keywords and Features

Table 5-26 lists the MySQL keywords and features that can be migrated.

- The **Version** column contains the earliest versions that support the keywords or features.
- The **Remarks** column contains the configuration parameters to customize how the migration tool migrates the corresponding keywords or features.

Table 5-26

Section	Object->Keyword/ Feature	Version	Remarks
Data Types	Numeric Types	8.0.0	You can specify the month when the coupon will expire. table.orientation table.type table.compress.mode table.compress.row table.compress.column table.compress.level
	Date/Time Types	8.0.0	
	String Types	8.0.0	
	Spatial Data Types	8.0.0	
	LOB Types	8.0.0	
	Set Types	8.0.0	
	Boolean	8.0.0	
	Binary Types	8.0.0	
	JSON	8.0.0	
Functions and Expressions	Type Mapping	8.0.0	-

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Section	Object->Keyword/ Feature		Version	Remarks
Table (Optional Parameters and Operations)	Table (Optional Parameters and Operations)	• AUTO_INCREMENT • AVG_ROW_LENGTH • CHARSET • CHECKSUM • COLLATE • COMMENT • CONNECTION • DELAY_KEY_WRITE • DIRECTORY • ENGINE • KEY_BLOCK_SIZE • INSERT_METHOD • MAX_ROWS • MIN_ROWS • PACK_KEYS • PASSWORD • ROW_FORMAT • STATS_AUTO_RECALC • STATS_PERSISTENT • STATS_SAMPLE_PAGES • UNION • LIKE Table Cloning	8.0.0	- -

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Section	Object->Keyword/ Feature		Version	Remarks
		• Adding and Deleting a Column • MODIFY: Modifying a Column • CHANGE: Changing a Column • SET|DROP COLUMN DEFAULT VALUE • DROP (Table Deletion) • TRUNCATE (Table Deletion) • LOCK • RENAME (Table Renaming)		
	Indexes	• Unique Indexes • Normal and Prefix Indexes • Hash index • B-tree Indexes • Spatial Indexes • Full-Text Indexes • Deleting an Index • Renaming an Index	8.0.0	-
	Comment		8.0.0	-

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Section	Object->Keyword/ Feature		Version	Remarks
	Databases		8.0.0	-
Data Manipulation Language (DML)	• Quotation Marks • INTERVAL • Division Expressions • Group By Conversion • ROLLUP		8.0.0	-
	INSERT	• HIGH_PRIORITY • LOW_PRIORITY • PARTITION • DELAYED • IGNORE • VALUES • ON DUPLICATE KEY UPDATE • SET	8.0.0	-
	UPDATE	• LOW_PRIORITY • ORDER BY • LIMIT • IGNORE	8.0.0	-
	REPLACE	• LOW_PRIORITY • PARTITION • DELAYED • VALUES • SET	8.0.0	-
Transaction Management and Database Management	Transaction Management	• TRANSACTION • LOCK	8.0.0	-
	Database Management		8.0.0	-

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5.5.2 Data Types

5.5.2.1 Numeric Types

Overview

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. The following table shows how MySQL numeric types can be converted to DWS data types.

Type Comparison

Table 5-27 Numeric type mapping

MySQL Numeric Type	MySQL INPUT	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]	DOUBLE PRECISION DOUBLE PRECISION
DOUBLE	DOUBLE[(M[,D])] [UNSIGNED] [ZEROFILL]	DOUBLE PRECISION
FIXED	FIXED FIXED[(M[,D])] [UNSIGNED] [ZEROFILL]	DECIMAL DECIMAL[(M[,D])]
FLOAT	FLOAT FLOAT [(M[,D])] [UNSIGNED] [ZEROFILL] FLOAT(p) [UNSIGNED] [ZEROFILL]	REAL REAL REAL
INT	INT INT(p) [UNSIGNED] [ZEROFILL]	INTEGER INTEGER(p)
INTEGER	INTEGER INTEGER(p) [UNSIGNED] [ZEROFILL]	INTEGER INTEGER(p)

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MySQL Numeric Type	MySQL INPUT	DWS OUTPUT
MEDIUMINT	MEDIUMINT MEDIUMINT(p) [UNSIGNED] [ZEROFILL]	INTEGER INTEGER(p)
NUMERIC	NUMERIC NUMERIC [(M[,D])] [UNSIGNED] [ZEROFILL]	DECIMAL DECIMAL[(M[,D])]
REAL	REAL[(M[,D])]	REAL/DOUBLE PRECISION
SMALLINT	SMALLINT SMALLINT(p) [UNSIGNED] [ZEROFILL]	SMALLINT
TINYINT	TINYINT TINYINT(n) TINYINT(n) ZEROFILL TINYINT(n) UNSIGNED ZEROFILL	SMALLINT SMALLINT SMALLINT TINYINT

NOTE

- When the TINYINT type is converted, if it is unsigned (UNSIGNED), it is converted to TINYINT. Otherwise, it is converted to SMALLINT.
- The REAL type is converted to DOUBLE PRECISION by default. If **table.database.realAsFlag** in the **features-mysql.properties** configuration file is set to **true** (**false** by default), the type is converted to REAL.

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 IF NOT EXISTS "public"."runoob_datatype_test"
(
  "datatype_1" SMALLINT,
  "datatype_2" SMALLINT,
  "datatype_3" SMALLINT,
  "datatype_4" TINYINT,
  "datatype_5" SMALLINT
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype_1");
```

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5.5.2.2 Date/Time Types

Overview

This section describes the following date and time types: DATETIME, TIME, TIMESTAMP, and YEAR. DWS does not support these types, and DSC will convert them.

Type Mapping

Table 5-28 Date/Time type mapping

MySQL Date/ Time Type	MySQL INPUT	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)]	SMALLINT(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 IF NOT EXISTS "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

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```
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 IF NOT EXISTS "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 IF NOT EXISTS "public"."runoob_datatype_test"
(
  "datatype_1" TIMESTAMP WITH TIME ZONE,
  "datetype_4" TIMESTAMP WITH TIME ZONE DEFAULT '2018-10-12 15:27:33',
  "datetype_5" TIMESTAMP WITH TIME ZONE DEFAULT '2018-10-12 15:27:33.999999',
  "datetype_6" TIMESTAMP WITH TIME ZONE DEFAULT '2018-10-12 15:27:33',
  "datetype_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',
  "datetype_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 IF NOT EXISTS "public"."runoob_datatype_test"
(
```

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```
 "datatype_1" SMALLINT,
 "datatype_2" SMALLINT,
 "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");
```

5.5.2.3 String Types

Overview

MySQL interprets length specifications in character column definitions in character units. This applies to the CHAR, VARCHAR, and TEXT types. DSC supports the following type conversions:

Type Mapping

Table 5-29 String type mapping

MySQL String Type	MySQL INPUT	DWS OUTPUT
CHAR	CHAR[(0)] CHAR[(n)]	VARCHAR[(1)] VARCHAR[(4n)]
CHARACTER	CHARACTER[(0)] CHARACTER[(n)]	CHAR[(1)] CHAR[(4n)]
NCHAR	NCHAR[(0)] NCHAR[(n)]	CHAR[(1)] CHAR[(4n)]
LONGTEXT	LONGTEXT	TEXT
MEDIUMTEXT	MEDIUMTEXT	TEXT
TEXT	TEXT	TEXT
TINYTEXT	TINYTEXT	TEXT
VARCHAR	VARCHAR[(0)] VARCHAR[(n)]	VARCHAR[(1)] VARCHAR[(4n)]
NVARCHAR	NVARCHAR[(0)] NVARCHAR[(n)]	VARCHAR[(1)] VARCHAR[(4n)]
CHARACTE VARYING	CHARACTE VARYING	VARCHAR

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NOTE

- During CHARACTER or NCHAR conversion, if the precision is less than or equal to 0, it is converted to CHAR(1). If the precision is greater than 0, it is converted to a precision level four times that of the CHAR type.
- During VARCHAR, NVARCHAR, or CHAR conversion, if the precision is less than or equal to 0, it is converted to VARCHAR(1). If the precision is greater than 0, it is converted to a precision four times that of the VARCHAR type.

Input: CHAR

In MySQL, the size of a CHAR column is set to a fixed length specified at table creation, ranging from 0 to 255. Stored CHAR values are right-padded with spaces to meet this 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 IF NOT EXISTS "public"."runoob_datatype_test"
(
  "datatype_1" CHAR NOT NULL,
  "datatype_2" CHAR(1) NOT NULL,
  "datatype_3" CHAR(1020) 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 IF NOT EXISTS "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 IF NOT EXISTS "public"."runoob_datatype_test"
(
  "datatype_1" VARCHAR(1),
  "datatype_2" VARCHAR(7380)
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype_1");
```

5.5.2.4 Spatial Data Types

Overview

MySQL has spatial data types corresponding to the OpenGIS class. DSC supports the following type conversions:

Type Mapping

Table 5-30 Spatial type mapping

MySQL Spatial Type	MySQL INPUT	DWS OUTPUT
GEOMETRY	GEOMETRY	GEOMETRY
POINT	POINT	POINT
LINESTRING	LINESTRING	POLYGON
POLYGON	POLYGON	POLYGON
MULTIPOINT	MULTIPOINT	BOX
MULTILINESTRING	MULTILINESTRING	BOX
MULTIPOLYGON	MULTIPOLYGON	POLYGON
GEOMETRYCOLLECTION	GEOMETRYCOLLECTION	CIRCLE

NOTE

- 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,
```

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```
 `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" GEOMETRY 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");
```

5.5.2.5 LOB Types

Overview

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. DSC supports the following type conversions:

NOTE

The BLOB type can store images. Column storage does not support BLOB.

Type Mapping

Table 5-31 LOB type mapping

MySQL LOB Type	MySQL INPUT	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
);
```

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Output

```
CREATE TABLE IF NOT EXISTS "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");
```

5.5.2.6 Set Types

Overview

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.

Type Mapping

Table 5-32 Set type mapping

MySQL Set Type	MySQL INPUT	DWS OUTPUT
ENUM	ENUM	VARCHAR
SET	SET	VARCHAR

NOTE

- The ENUM type is transformed into the VARCHAR type, with a precision quadruple the length of the longest enumeration. The CHECK() function validates the accuracy of the entered values.
- The SET type is converted to the VARCHAR type. The precision is four times the sum of the length of each enumerated value field and the number of separators.

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 IF NOT EXISTS "public"."runoob_datatype_test"
(
  "id" INTEGER(2) PRIMARY KEY,
  "datatype_17" VARCHAR(20) CHECK (dataType_17 IN('dws-1','dws-2','dws-3','', null))
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
```

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```
 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 IF NOT EXISTS "public"."runoob_tbl_test"
(
 "datatype_18" VARCHAR(68)
)
 WITH ( ORIENTATION = ROW, COMPRESSION = NO )
 NOCOMPRESS
 DISTRIBUTE BY HASH ("datatype_18");
```

5.5.2.7 Boolean

Overview

MySQL supports both BOOL and BOOLEAN. DSC supports the following type conversions:

Type Mapping

Input: BOOL/BOOLEAN

```
CREATE TABLE IF NOT EXISTS `runoob_dataType_test`(
   `dataType_1` INT,
   `dataType_2` BOOL,
   `dataType_3` BOOLEAN
);
```

Output

```
CREATE TABLE IF NOT EXISTS "public"."runoob_datatype_test"
(
 "datatype_1" INTEGER,
 "datatype_2" BOOLEAN,
 "datatype_3" BOOLEAN
)
 WITH ( ORIENTATION = ROW, COMPRESSION = NO )
 NOCOMPRESS
 DISTRIBUTE BY HASH ("datatype_1");
```

5.5.2.8 Binary Types

Overview

- In MySQL, the BIT data type is used to store bit values, ranging from 1 to 64.
- MySQL BINARY and VARBINARY types are similar to CHAR and VARCHAR, except that they contain binary strings rather than non-binary strings.

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Type Mapping

Table 5-33 Binary type mapping

MySQL Binary Type	MySQL INPUT	DWS OUTPUT
BIT[(M)]	BIT[(M)]	BIT[(M)]
BINARY[(M)]	BINARY[(M)]	BYTEA
CHAR BYTE[(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 IF NOT EXISTS "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 IF NOT EXISTS "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");
```

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5.5.2.9 JSON Types

Overview

The JSON data type can be used to store JavaScript Object Notation (JSON) data. DSC supports the following type conversions:

Type Mapping

Input Example (JSON)

```
CREATE TABLE IF NOT EXISTS `runoob_dataType_test`(
   `dataType_1` INT,
   `dataType_2` VARCHAR,
   `dataType_3` JSON
);
ALTER TABLE `runoob_dataType_test` ADD COLUMN `dataType_4` JSON NOT NULL;
ALTER TABLE `runoob_dataType_test` CHANGE COLUMN `dataType_4` `dataType_5` JSON NOT NULL;
```

Output

```
CREATE TABLE IF NOT EXISTS "public"."runoob_datatype_test"
(
  "datatype_1" INTEGER,
  "datatype_2" VARCHAR,
  "datatype_3" JSONB
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype_1");
ALTER TABLE
  "public"."runoob_datatype_test"
ADD
  COLUMN "datatype_4" JSONB;
ALTER TABLE
 "public"."runoob_datatype_test" CHANGE COLUMN "datatype_4" "datatype_5" JSONB;
```

5.5.3 Functions and Expressions

Overview

The functions and expressions in MySQL do not exist in DWS or are different from those in DWS. DSC migrates the functions and expressions based on the supported types of DWS. (compatible with ADB for MySQL)

Type Mapping

Table 5-34 Type mapping

MySQL/ADB Function	Description	MySQL INPUT	DWS OUTPUT
CONVERT	Converts a value to a specified data type or character set.	CONVERT(A, B)	CAST(A AS B)

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MySQL/ADB Function	Description	MySQL INPUT	DWS OUTPUT
CURDATE	Specifies the current date. It is synonymous with CURDATE().	CURDATE/CURDATE()	CURRENT_DATE ()
GET_JSON_OBJECT	Parses a field in a JSON string.	GET_JSON_OBJECT(column, '$.obj.arg') GET_JSON_OBJECT(column, '$[i]')	JSON_EXTRACT(column, 'obj', 'arg') JSON_ARRAY_ELEMENT(column, 0)
JSON_EXTRACT	Queries the value of a field in JSON.	JSON_EXTRACT(column, '$.obj')	JSON_EXTRACT(column, 'obj')
REGEXP	Fuzzy match	REGEXP A NOT REGEXP A	~ A !~ A
UUID	Generates a unique value (sequence number).	UUID	SYS_GUID
SPLIT()[]	Splits **string** on **delimiter** and returns the **field**th column (counting from text of the first appeared delimiter).	SPLIT(string text, delimiter text)[field int]	SPLIT(string text, delimiter text)[field int]
RAND	Obtains a random number ranging from 0.0 to 1.0.	RAND()	RANDOM()
SLICE	Concatenates two or more strings, placing a separator between each one. The separator is specified by the first argument.	SLICE()	CONCAT_WS(sep text, str"any" [, str"any" [, ...]])

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MySQL/ADB Function	Description	MySQL INPUT	DWS OUTPUT
TRY_CAST	Converts **x** into the type specified by **y**.	TRY_CAST(X AS Y)	CAST(X AS Y)
CAST	Converts **x** into the type specified by **y**. The second argument of the cast function in the ADB can be forcibly converted to the string or double-precision data type. In DWS, it is converted to the varchar or double precision type.	CAST(X AS Y)	CAST(X AS Y)

Input example: CONVERT

```
SELECT CONVERT (IFNULL (BUSINESS_ID, 0) , DECIMAL(18, 2)) FROM ACCOUNT;
```

Output

```
SELECT cast (ifnull (business_id, 0) AS decimal(18, 2))FROM account;
```

Input example: CURDATE

```
SELECT CURDATE;
SELECT CURDATE();
```

Output

```
SELECT CURRENT_DATE();
SELECT CURRENT_DATE();
```

Input example: GET_JSON_OBJECT

```
SELECT GET_JSON_OBJECT(COL_JSON, '$.STORE.BICYCLE.PRICE');

SELECT GET_JSON_OBJECT(COL_JSON, '$.STORE.FRUIT[0]');
```

Output

```
SELECT
  JSON_EXTRACT_PATH(COL_JSON, 'STORE', 'BICYCLE', 'PRICE');
SELECT
  JSON_ARRAY_ELEMENT(JSON_EXTRACT_PATH(COL_JSON, 'STORE', 'FRUIT'), 0);
```

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Input example: JSON_EXTRACT

```
SELECT JSON_EXTRACT(EVENT_ATTR,'$.TOPIC_ID');
```

Output

```
SELECT JSON_EXTRACT_PATH(EVENT_ATTR, 'TOPIC_ID');
```

Input example: REGEXP

```
SELECT * FROM USERS WHERE NAME NOT REGEXP '^ Wang';
SELECT * FROM USERS WHERE TEL REGEXP '[^4-5]{11}';
```

Output

```
SELECT * FROM USERS WHERE NAME !~ '^ Wang';
SELECT * FROM USERS WHERE TEL ~ '[^4-5]{11}';
```

Input example: UUID

```
SELECT CURDATE(str1), UUID(str2, str3) FROM T1;
SELECT A FROM B WHERE uuid() > 2;
```

Output

```
SELECT current_date (str1),sys_guid (str2, str3) FROM T1;
SELECT A FROM  B WHERE sys_guid () > 2;
```

Input example: SPLIT()[]

```
SELECT split('a-b-c-d-e', '-')[4];
```

Output

```
SELECT split_part('a-b-c-d-e', '-')[4];
```

Input Example RAND

```
SELECT rand();
```

Output

```
SELECT random ();
```

Input Example: SLICE

```
SELECT slice(split('2021_08_01','_'),1,3) from dual;
```

Output

```
SELECT
  concat_ws(
    split_part('2021_08_01', '_', 1),
    split_part('2021_08_01', '_', 2),
    split_part('2021_08_01', '_', 3)
  )
FROM
  dual;
```

Input example: TRY_CAST

```
select * from ods_pub where try_cast(pay_time AS timestamp) >= 1;
select try_cast(pay_time as timestamp) from obs_pub;
```

Output

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```
SELECT * FROM ods_pub WHERE cast (pay_time AS timestamp) >= 1;
SELECT cast (pay_time as timestamp) FROM obs_pub;
```

Input Example: CAST

```
select cast(ifnull(c1, 0) as string) from t1;
select cast(ifnull(c1, 0) as varchar) from t1;
select cast(ifnull(c1, 0) as double) from t1;
select cast(ifnull(c1, 0) as int) from t1;
```

Output

```
SELECT cast (ifnull (c1, 0) as varchar) FROM t1;
SELECT cast (ifnull (c1, 0) as varchar) FROM t1;
SELECT cast (ifnull (c1, 0) as double precision) FROM t1;
SELECT cast (ifnull (c1, 0) as int) FROM t1;
```

5.5.4 Table (Optional Parameters and Operations)

This section describes the migration syntax of tables (optional parameters and operations). The migration syntax determines how the keywords and features are migrated. DWS does not support table migration. Currently, all table migration methods are temporary.

5.5.4.1 ALGORITHM

MySQL has extended the support for **ALTER TABLE... ALGORITHM=INSTANT**: Users can add columns instantly and delete columns instantly anywhere in a table, and evaluate row size limits when adding a column.

It is not supported by DWS and is deleted by DSC during the migration.

Input

```
ALTER TABLE runoob_alter_test ALGORITHM=DEFAULT;
ALTER TABLE runoob_alter_test ALGORITHM=INPLACE;
ALTER TABLE runoob_alter_test ALGORITHM=COPY;
ALTER TABLE runoob_alter_test ADD COLUMN COL_18 VARCHAR(64)  DEFAULT '00', ALGORITHM=INSTANT;
ALTER TABLE runoob_alter_test MODIFY COLUMN dataType7 BIGINT, ALGORITHM=COPY;
ALTER TABLE `runoob_alter_test` ALGORITHM=DEFAULT, ALGORITHM=INPLACE, ALGORITHM=COPY;
ALTER TABLE `runoob_alter_test` ADD COLUMN dataType11 INT, ALGORITHM=DEFAULT,
ALGORITHM=INPLACE, ALGORITHM=COPY;
ALTER TABLE runoob_alter_test CHANGE COLUMN dataType11 dataType12
SMALLINT ,ALGORITHM=INPLACE, ALGORITHM=COPY;
ALTER TABLE runoob_alter_test ALGORITHM=INPLACE, ALGORITHM=COPY, DROP COLUMN dataType12;
```

Output

```
ALTER TABLE
  "public"."runoob_alter_test"
ADD
  COLUMN "col_18" VARCHAR(256) DEFAULT '00';
ALTER TABLE
  "public"."runoob_alter_test" MODIFY "datatype7" BIGINT NULL DEFAULT NULL;
ALTER TABLE
  "public"."runoob_alter_test"
ADD
  COLUMN "datatype11" INTEGER;
ALTER TABLE
  "public"."runoob_alter_test" CHANGE COLUMN "datatype11" "datatype12" SMALLINT NULL DEFAULT
NULL;
ALTER TABLE
  "public"."runoob_alter_test" DROP COLUMN "datatype12" RESTRICT;
DROP TABLE IF EXISTS "public"."runoob_alter_test";
```

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5.5.4.2 ALTER TABLE RENAME

DWS does not allow the **RENAME** clause to contain schema names. DSC supports the **RENAME** clause only within the same schema. Renaming within the same schema omits the schema clause from the conversion result, while attempts to rename across schemas trigger an error report.

Input

```
ALTER TABLE `shce1`.`t1` rename to `t2`;
ALTER TABLE `shce1`.`t1` rename to t2;
ALTER TABLE `charge_data`.`group_shengfen2022` RENAME `charge_data`.`group_shengfen2022_jiu`;
ALTER TABLE `charge_data`.`group_shengfen2022` RENAME `charge_data`.`group_shengfen2022_jiu`,
RENAME `charge_data`.`group_shengfen2023_jiu`, RENAME `charge_data`.`group_shengfen2024_jiu`;
```

Output

```
ALTER TABLE "shce1"."t1" RENAME TO "t2";
ALTER TABLE "shce1"."t1" RENAME TO "t2";
ALTER TABLE "charge_data"."group_shengfen2022" RENAME TO "group_shengfen2022_jiu";
ALTER TABLE "charge_data"."group_shengfen2022" RENAME TO "group_shengfen2022_jiu", RENAME TO
"group_shengfen2023_jiu", RENAME TO "group_shengfen2024_jiu";
```

5.5.4.3 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. DWS does not support this attribute, which will be converted to **SERIAL** and deleted by DSC during migration. For details, see **Table 5-35**.

Table 5-35 Data type conversion

MySQL Numeric Type	MySQL INPUT	DWS OUTPUT
TINYINT	TINYINT	SMALLSERIAL
SMALLINT	SMALLINT UNSIGNED SMALLINT	SERIAL SMALLSERIAL
DOUBLE/FLOAT	DOUBLE/FLOAT	BIGSERIAL
INT/INTEGER	INT/INTEGER UNSIGNED INT/INTEGER	BIGSERIAL SERIAL
BIGINT/SERIAL	BIGINT/SERIAL	BIGSERIAL

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

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```
CREATE TABLE "public"."job_instance"
(
  "job_sche_id" SERIAL NOT NULL,
  "task_name" VARCHAR(400) NOT NULL DEFAULT '',
  PRIMARY KEY ("job_sche_id")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("job_sche_id");
```

DWS does not support table definition modification using the **AUTO_INCREMENT** attribute. DSC will delete this attribute during 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 IF NOT EXISTS "public"."runoob_alter_test"
(
  "datatype1" SERIAL NOT NULL,
  "datatype2" REAL,
  PRIMARY KEY ("datatype1")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype1");
```

5.5.4.4 AVG_ROW_LENGTH

In MySQL, **AVG_ROW_LENGTH** indicates the average length of each row. This is not supported by DWS and is deleted by DSC during the 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)
)AVG_ROW_LENGTH=10000;
```

Output

```
CREATE TABLE "public"."runoob_tbl_test"
(
  "runoob_id" VARCHAR(120),
  "runoob_title" VARCHAR(400) NOT NULL,
  "runoob_author" VARCHAR(160) NOT NULL,
  "submission_date" VARCHAR(120)
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("runoob_id");
```

5.5.4.5 BLOCK_SIZE

In ADB, this parameter specifies the number of values stored in each block in columnar storage, which is also the minimum I/O unit. DWS does not support

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table definition modification using this attribute. DSC will delete the keyword during migration.

Input

```
DROP TABLE IF EXISTS exists unsupport_parse_test;
CREATE TABLE `unsupport_parse_test` (
    `username` int,
    `update` timestamp not null default current_timestamp on update current_timestamp ,
     clustered key clustered_key(shopid ASC, datetype ASC)
)BLOCK_SIZE = 1024 index_ALL = 'y';
DROP TABLE IF EXISTS unsupport_parse_test;
```

Output

```
DROP TABLE IF EXISTS "public"."unsupport_parse_test";
CREATE TABLE "public"."unsupport_parse_test" (
  "username" INTEGER,
  "update" TIMESTAMP WITH TIME ZONE NOT NULL DEFAULT CURRENT_TIMESTAMP
) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("username");
DROP TABLE IF EXISTS "public"."unsupport_parse_test";
```

5.5.4.6 CHARSET

CHARSET specifies the default character set for a table. 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(120),
  "runoob_title" VARCHAR(400) NOT NULL,
  "runoob_author" VARCHAR(160) NOT NULL,
  "submission_date" VARCHAR(120)
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("runoob_id");
```

5.5.4.7 CHECKSUM

In MySQL, **CHECKSUM** maintains a live checksum for all rows. 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;
```

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```
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" REAL,
  "datatype3" DOUBLE PRECISION,
  PRIMARY KEY ("datatype1")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype1");
```

5.5.4.8 CLUSTERED KEY

It is a clustered index in ADB that defines the sorting sequence in a table. The logical sequence of key values in a clustered index determines the physical sequence of rows in the table. DWS does not support table definition modification using this attribute. DSC will delete the keyword during migration.

Input

```
DROP TABLE IF EXISTS unsupport_parse_test;
CREATE TABLE `unsupport_parse_test` (
    `username` int,
     clustered key clustered_key(shopid ASC, datetype ASC)
);
DROP TABLE IF EXISTS unsupport_parse_test;
```

Output

```
DROP TABLE IF EXISTS "public"."unsupport_parse_test";
CREATE TABLE "public"."unsupport_parse_test" (
  "username" INTEGER
) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("username");
DROP TABLE IF EXISTS "public"."unsupport_parse_test";
```

5.5.4.9 COLLATE

In MySQL, **COLLATE** specifies a default database sorting rule. 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(120),
  "runoob_title" VARCHAR(400) NOT NULL,
  "runoob_author" VARCHAR(160) NOT NULL,
```

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```
  "submission_date" VARCHAR(120)
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("runoob_id");
```

5.5.4.10 COMMENT

In MySQL, **COMMENT** is a comment for a table. In DWS, this attribute can be used to modify table definition. During migration using DSC, additional table attribute information is added.

Input

```
CREATE TABLE `public`.`runoob_alter_test`(
    `dataType1` int NOT NULL AUTO_INCREMENT,
`dataType2` FLOAT (10,2) COMMENT'dataType2 column',
    PRIMARY KEY(`dataType1`)
) comment='table comment';

ALTER TABLE `public`.`runoob_alter_test` COMMENT 'table comment after modification';
ALTER TABLE `public`.`runoob_alter_test` ADD INDEX age_index(dataType2) COMMENT' index';
```

Output

```
CREATE TABLE "public"."runoob_alter_test"
(
  "datatype1" SERIAL NOT NULL,
"datatype2" REAL COMMENT 'dataType2 column',
  PRIMARY KEY ("datatype1")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype1")
COMMENT 'Comment of the table';
ALTER TABLE `public`.`runoob_alter_test` COMMENT 'table comment after modification';
CREATE INDEX "age_index" ON "public"."runoob_alter_test" ("dataType2") COMMENT' index';
```

5.5.4.11 CONNECTION

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

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```
CREATE TABLE "public"."runoob_alter_test"
(
  "datatype1" SERIAL NOT NULL,
  "datatype2" DOUBLE PRECISION,
  "datatype3" TEXT NOT NULL,
  "datatype4" SMALLINT NOT NULL DEFAULT '2018',
  PRIMARY KEY ("datatype1")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype1");
```

5.5.4.12 DEFAULT

When ALTER TABLE is used to add a column that contains the NOT NULL constraint, if no default value is available, the default value is inserted in MySQL and an error is reported in DWS. Therefore, for common data types, you need to add **default values in table 1**.

Input

```
DROP TABLE IF EXISTS default_test_1;
CREATE TABLE default_test_1
(
    c1 tinyint,
    c2 smallint,
    c3 MEDIUMINT,
    c4 int,
    c5 bigint
);
INSERT INTO default_test_1
VALUES (1, 1, 1, 1, 1);
SELECT *
FROM default_test_1;
ALTER TABLE default_test_1 add COLUMN (c1_1 tinyint not null, c2_1 SMALLINT not null, c3_1 MEDIUMINT not null, c4_1 int not null, c5_1 BIGINT not null);
SELECT *
FROM default_test_1;
```

Output

```
DROP TABLE IF EXISTS "public"."default_test_1";
CREATE TABLE "public"."default_test_1" (
  "c1" SMALLINT,
  "c2" SMALLINT,
  "c3" INTEGER,
  "c4" INTEGER,
  "c5" BIGINT
) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("c1");
INSERT INTO
  "public"."default_test_1"
VALUES
  (1, 1, 1, 1, 1);
SELECT
  *
FROM
  default_test_1;
ALTER TABLE
  "public"."default_test_1"
ADD
  COLUMN "c1_1" SMALLINT NOT NULL DEFAULT 0,
ADD
  COLUMN "c2_1" SMALLINT NOT NULL DEFAULT 0,
ADD
  COLUMN "c3_1" INTEGER NOT NULL DEFAULT 0,
ADD
  COLUMN "c4_1" INTEGER NOT NULL DEFAULT 0,
ADD
```

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```
  COLUMN "c5_1" BIGINT NOT NULL DEFAULT 0;
SELECT
  *
FROM
  default_test_1;
```

Table 5-36

Data Type	MYSQL	DWS Data Type	Conversion Result
Signed Integer	TINYINT	SMALLINT	0
	SMALLINT	SMALLINT	0
	MEDIUMINT	INT/INTEGER	0
	INT/INTEGER	INT/INTEGER	0
	BIGINT	BIGINT	0
Unsigned Integer	TINYINT UNSIGNED	TINYINT	0
	SMALLINT UNSIGNED	INT	0
	MEDIUMINT UNSIGNED	INT	0
	INT UNSIGNED	BIGINT	0
	BIGINT UNSIGNED	NUMERIC	0
Float	FLOAT	REAL	0
	FLOAT UNSIGNED	REAL	0
	DOUBLE	DOUBLE PRECISION	0
	DOUBLE UNSIGNED	DOUBLE PRECISION	0
	DOUBLE PRECISION (DOUBLE)	DOUBLE PRECISION	0
	DOUBLE PRECISION [UNSIGNED] (DOUBLE)	DOUBLE PRECISION	0

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Data Type	MYSQL	DWS Data Type	Conversion Result
	REAL (Processed as double by default, when set to **REAL_AS_FLOAT**, it is processed as float.)	REAL/DOUBLE PRECISION	0
	REAL [UNSIGNED] (Processed as double by default, when set to **REAL_AS_FLOAT**, it is processed as float.)	REAL/DOUBLE PRECISION	0
	NUMERIC/ DECIMAL	NUMERIC/ DECIMAL	0
Boolean	BOOLEAN/BOOL	BOOLEAN	0
Character Type	CHAR/ CHARACTER	CHAR/ CHARACTER * 4	An empty string will be returned.
	NCHAR	CHAR/ CHARACTER * 4	An empty string will be returned.
	VARCHAR	VARCHAR * 4	An empty string will be returned.
Text	TINYTEXT	TEXT	An empty string will be returned.
	TEXT	TEXT	An empty string will be returned.
	MEDIUMTEXT	TEXT	An empty string will be returned.
	LONGTEXT	TEXT	An empty string will be returned.
Binary	BINARY	BYTEA	An empty string will be returned.
	VARBINARY	BYTEA	An empty string will be returned.
	TINYBLOB	BYTEA (column storage)/BLOB (non-column storage)	An empty string will be returned.

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Data Type	MYSQL	DWS Data Type	Conversion Result
	BLOB	BYTEA (column storage)/BLOB (non-column storage)	An empty string will be returned.
	MEDIUMBLOB	BYTEA (column storage)/BLOB (non-column storage)	An empty string will be returned.
	LONGBLOB	BYTEA (column storage)/BLOB (non-column storage)	An empty string will be returned.
	CHAR BYTE (BINARY)	BYTEA	An empty string will be returned.
Date	DATE	DATE	1970-01-01
	TIME	TIME(P) WITHOUT TIME ZONE	00:00:00
	DATETIME	TIMESTAMP WITHOUT TIME ZONE	1970-01-01 00:00:00
	TIMESTAMP	TIMESTAMP(P) WITH TIME ZONE	1970-01-01 00:00:00
	datetime/ datetime(0)	datetime->timestamp with out time zone datetime(0)->timestamp(0) with out time zone	1970-01-01 00:00:00.xx (The number of x depends on the precision.)
	YEAR	SMALLINT	0000
Bit String	BIT	BIT	DEFAULT 0:: BIT(x)
Set	ENUM	CHARACTER VARYING()	Return the first element by default.
	SET	CHARACTER VARYING()	An empty string will be returned.

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Data Type	MYSQL	DWS Data Type	Conversion Result
Auto Increment	SERIAL (BIGINT UNSIGNED NOT NULL AUTO_INCREMENT UNIQUE)	CREATE SEQUENCE serial_name INCREMENT 2 START 1	No processing is required.
JSON	JSON	jsonb	No processing is required.
Spatial	point	point	No processing is required.
	polygon	polygon	No processing is required.
	geometry	Not supported. The input is returned as it was received	No processing is required.
	linestring	polygon	No processing is required.
	geometrycollection	Not supported. The input is returned as it was received	No processing is required.
	multipoint	box	No processing is required.
	multilinestring	box	No processing is required.
	multipolygon	polygon	No processing is required.

5.5.4.13 DELAY_KEY_WRITE

DELAY_KEY_WRITE is valid only for MyISAM tables. It is used to delay updates until the table is closed. 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;
```

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Output

```
CREATE TABLE "public"."runoob_tbl_test"
(
  "runoob_id" VARCHAR(120),
  "runoob_title" VARCHAR(400) NOT NULL,
  "runoob_author" VARCHAR(160) NOT NULL,
  "submission_date" VARCHAR(120)
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("runoob_id");
```

5.5.4.14 DISTRIBUTE BY

ADB supports distribution keys. During DSC migration, the corresponding distribution keys are retained.

Input

```
CREATE TABLE COPY_DI_DISTRIBUTOR_BUYER_CONTRIBUTION_RANKING_V2 (
    SHOP_ID VARCHAR ,
    DISTRIBUTOR_ID VARCHAR ,
    BUYER_ID VARCHAR ,
    DATE_TYPE BIGINT ,
    PRIMARY KEY (SHOP_ID,DISTRIBUTOR_ID,DATE_TYPE,BUYER_ID)
) DISTRIBUTE BY HASH(SHOP_ID,DISTRIBUTOR_ID,DATE_TYPE);
```

Output

```
CREATE TABLE "public"."copy_di_distributor_buyer_contribution_ranking_v2" (
  "shop_id" VARCHAR,
  "distributor_id" VARCHAR,
  "buyer_id" VARCHAR,
  "date_type" BIGINT,
  PRIMARY KEY (
    "shop_id",
    "distributor_id",
    "date_type",
    "buyer_id"
  )
) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH (SHOP_ID,
DISTRIBUTOR_ID, DATE_TYPE);
```

5.5.4.15 DIRECTORY

DIRECTORY enables a tablespace to be created outside the data directory and index directory. It allows **DATA DIRECTORY** and **INDEX DIRECTORY**. 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

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```
CREATE TABLE "public"."runoob_tbl_test1"
(
  "datatype1" SERIAL NOT NULL,
  "datatype2" DOUBLE PRECISION,
  PRIMARY KEY ("datatype1")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype1");

CREATE TABLE "public"."runoob_tbl_test2"
(
  "datatype1" SERIAL NOT NULL,
  "datatype2" DOUBLE PRECISION,
  PRIMARY KEY ("datatype1")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype1");
```

5.5.4.16 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" DOUBLE PRECISION,
  PRIMARY KEY ("datatype1")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype1");

-- A.

-- B.

-- C.
```

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5.5.4.17 FOREIGN_KEY_CHECKS

FOREIGN_KEY_CHECKS indicates the foreign key constraints in MySQL. DWS does not support table definition modification using this attribute. DSC will delete the attribute during migration.

Input

```
SET foreign_key_checks = 0;
CREATE TABLE mall_order_dc (
    id bigint NOT NULL AUTO_INCREMENT,
    order_id varchar(50) NOT NULL,
    key order_id(order_id)
);
```

Output

```
CREATE TABLE "public"."mall_order_dc" (
  "id" BIGSERIAL NOT NULL,
  "order_id" VARCHAR(200) NOT NULL
) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("id");
CREATE INDEX "order_id" ON "public"."mall_order_dc" USING BTREE ("order_id");
```

5.5.4.18 IF NOT EXISTS

DSC supports the conversion of **IF NOT EXISTS**, which is reserved during the migration.

Input

```
DROP TABLE IF EXISTS `categories`;
CREATE TABLE IF NOT EXISTS `categories`
(
    `CategoryID` tinyint(5) unsigned NOT NULL PRIMARY KEY AUTO_INCREMENT,
    `CategoryName` varchar(15) CHARACTER SET utf8 COLLATE utf8_unicode_ci NOT NULL DEFAULT '' ,
    `Description` mediumtext CHARACTER SET utf8 COLLATE utf8_unicode_ci NOT NULL ,
    `Picture` varchar(50) CHARACTER SET utf8 COLLATE utf8_unicode_ci NOT NULL DEFAULT '',
    UNIQUE   (`CategoryID`)
)ENGINE=InnoDB AUTO_INCREMENT=9 DEFAULT CHARSET=latin1;
DROP TABLE IF EXISTS `categories`;
```

Output

```
DROP TABLE IF EXISTS "public"."categories";
CREATE TABLE IF NOT EXISTS "public"."categories" (
  "categoryid" SMALLSERIAL NOT NULL PRIMARY KEY,
  "categoryname" VARCHAR(60) NOT NULL DEFAULT '',
  "description" TEXT NOT NULL,
  "picture" VARCHAR(200) NOT NULL DEFAULT ''
) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("categoryid");
DROP TABLE IF EXISTS "public"."categories";
```

5.5.4.19 INDEX_ALL

In the ADB, **index_all='Y'** is used to create the full-column index. DWS does not support table definition modification using this attribute. DSC will delete the attribute during migration.

Input

```
DROP TABLE IF EXISTS unsupport_parse_test;
CREATE TABLE `unsupport_parse_test` (
    `username` int,
    `update` timestamp not null default current_timestamp on update current_timestamp ,
     clustered key clustered_key(shopid ASC, datetype ASC)
```

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```
)index_ALL = 'Y';
DROP TABLE IF EXISTS unsupport_parse_test;
```

Output

```
DROP TABLE IF EXISTS "public"."unsupport_parse_test";
CREATE TABLE "public"."unsupport_parse_test" (
  "username" INTEGER,
  "update" TIMESTAMP WITH TIME ZONE NOT NULL DEFAULT CURRENT_TIMESTAMP
) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("username");
DROP TABLE IF EXISTS "public"."unsupport_parse_test";
```

5.5.4.20 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" DOUBLE PRECISION,
  "datatype3" TEXT NOT NULL,
  PRIMARY KEY ("datatype1")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype1");
```

5.5.4.21 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. 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;
```

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Output

```
CREATE TABLE "public"."runoob_tbl_test"
(
  "runoob_id" VARCHAR(120),
  "runoob_title" VARCHAR(400) NOT NULL,
  "runoob_author" VARCHAR(160) NOT NULL,
  "submission_date" VARCHAR(120)
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("runoob_id");
```

5.5.4.22 LOCK

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 IF NOT EXISTS "public"."runoob_alter_test"
(
  "datatype1" SERIAL NOT NULL,
  "datatype2" REAL,
  "datatype4" TEXT NOT NULL,
  "datatype5" SMALLINT NOT NULL DEFAULT '2018',
  "datatype6" TIMESTAMP WITHOUT TIME ZONE NOT NULL,
  "datatype7" CHAR(4) NOT NULL DEFAULT '',
  "datatype8" VARCHAR(200),
  "datatype9" VARCHAR(200) 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.
```

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```
-- C.

-- D.
```

5.5.4.23 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" DOUBLE PRECISION,
  "datatype3" TEXT NOT NULL,
  PRIMARY KEY ("datatype1")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype1");
```

5.5.4.24 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" DOUBLE PRECISION,
  "datatype3" TEXT NOT NULL,
  PRIMARY KEY ("datatype1")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype1");
```

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5.5.4.25 PACK_KEYS

In MySQL, **PACK_KEYS** specifies the index compression mode in the MyISAM storage engine. 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" DOUBLE PRECISION,
  "datatype3" TEXT NOT NULL,
  PRIMARY KEY ("datatype1")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype1");

--A

--B

--C
```

5.5.4.26 PARTITION BY

In MySQL, PARTITION BY is used to create partitioned tables. Currently, DWS supports only range and list partitions of MySQL.

CAUTION

Hash partitions of PARTITION BY are not supported and deleted during migration. The deletion does not affect the current table functions, but may affect the performance slightly.

PARTITION BY RANGE

Input

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```
CREATE TABLE IF NOT EXISTS `runoob_tbl_part_test`(
  `runoob_id` INT NOT NULL,
  `runoob_title` VARCHAR(100) NOT NULL,
  `runoob_author` VARCHAR(40) NOT NULL,
  `submission_date` VARCHAR(30)
)ENGINE=InnoDB DEFAULT CHARSET=utf8
PARTITION BY RANGE (`runoob_id`)(
    PARTITION p0 VALUES LESS THAN(100),
    PARTITION p1 VALUES LESS THAN(200),
    PARTITION p2 VALUES LESS THAN(300),
    PARTITION p3 VALUES LESS THAN(400),
    PARTITION p4 VALUES LESS THAN(500),
    PARTITION p5 VALUES LESS THAN (MAXVALUE)
);

ALTER TABLE `runoob_tbl_part_test` ADD PARTITION (PARTITION p6 VALUES LESS THAN (600));

ALTER TABLE `runoob_tbl_part_test` ADD PARTITION (PARTITION p7 VALUES LESS THAN (700),PARTITION
p8 VALUES LESS THAN (800));
```

Output

```
CREATE TABLE IF NOT EXISTS "public"."runoob_tbl_part_test" (
  "runoob_id" INTEGER NOT NULL,
  "runoob_title" VARCHAR(400) NOT NULL,
  "runoob_author" VARCHAR(160) NOT NULL,
  "submission_date" VARCHAR(120)
) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("runoob_id")
PARTITION BY RANGE ("runoob_id") (
  PARTITION p0
  VALUES
    LESS THAN (100),
    PARTITION p1
  VALUES
    LESS THAN (200),
    PARTITION p2
  VALUES
    LESS THAN (300),
    PARTITION p3
  VALUES
    LESS THAN (400),
    PARTITION p4
  VALUES
    LESS THAN (500),
    PARTITION p5
  VALUES
    LESS THAN (MAXVALUE)
);
ALTER TABLE "public"."runoob_tbl_part_test" ADD PARTITION p6 VALUES LESS THAN (600);
ALTER TABLE "public"."runoob_tbl_part_test" ADD PARTITION p7 VALUES LESS THAN (700), ADD
PARTITION p8 VALUES LESS THAN (800);
```

PARTITION BY LIST

Input

```
CREATE TABLE IF NOT EXISTS `runoob_tbl_part_test`(
    `runoob_id` INT NOT NULL,
    `runoob_title` VARCHAR(100) NOT NULL,
    `runoob_author` VARCHAR(40) NOT NULL,
    `submission_date` VARCHAR(30),
    PRIMARY KEY (`runoob_id`)
    )ENGINE=InnoDB DEFAULT CHARSET=utf8
    PARTITION BY LIST (runoob_id)(
    PARTITION r0 VALUES IN (1, 5, 9, 13, 17, 21),
    PARTITION r1 VALUES IN (2, 6, 10, 14, 18, 22),
    PARTITION r2 VALUES IN (3, 7, 11, 15, 19, 23),
    PARTITION r3 VALUES IN (4, 8, 12, 16, 20, 24)
```

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```
   );
ALTER TABLE `runoob_tbl_part_test` ADD PARTITION (PARTITION p5 VALUES IN(30, 40, 50, 60, 70, 80));
```

Output

```
CREATE TABLE IF NOT EXISTS "public"."runoob_tbl_part_test" (
  "runoob_id" INTEGER NOT NULL,
  "runoob_title" VARCHAR(400) NOT NULL,
  "runoob_author" VARCHAR(160) NOT NULL,
  "submission_date" VARCHAR(120),
  PRIMARY KEY ("runoob_id")
) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("runoob_id")
PARTITION BY LIST (runoob_id) (
  PARTITION r0
  VALUES
    (1, 5, 9, 13, 17, 21),
    PARTITION r1
  VALUES
    (2, 6, 10, 14, 18, 22),
    PARTITION r2
  VALUES
    (3, 7, 11, 15, 19, 23),
    PARTITION r3
  VALUES
    (4, 8, 12, 16, 20, 24)
);
ALTER TABLE "public"."runoob_tbl_part_test" ADD PARTITION p5 VALUES (30, 40, 50, 60, 70, 80);
```

5.5.4.27 PASSWORD

In MySQL, **PASSWORD** indicates the user password. 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" DOUBLE PRECISION,
  "datatype3" TEXT NOT NULL,
  PRIMARY KEY ("datatype1")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype1");
```

5.5.4.28 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

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migrated to **SET COMPRESS**. 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" REAL,
  "datatype3" DOUBLE PRECISION,
  "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.
```

5.5.4.29 STATS_AUTO_RECALC

STATS_AUTO_RECALC specifies whether to automatically recalculate persistent statistics for an InnoDB table. DWS does not support this attribute, which will be deleted by DSC during migration.

Input

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```
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(120),
  "runoob_title" VARCHAR(400) NOT NULL,
  "runoob_author" VARCHAR(160) NOT NULL,
  "submission_date" VARCHAR(120)
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("runoob_id");

-- A.

-- B.

-- C.
```

5.5.4.30 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

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```
CREATE TABLE "public"."runoob_alter_test"
(
  "datatype1" SERIAL NOT NULL,
  "datatype2" DOUBLE PRECISION,
  "datatype3" TEXT NOT NULL,
  PRIMARY KEY ("datatype1")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype1");

-- A.

-- B.

-- C.
```

5.5.4.31 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. 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_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" DOUBLE PRECISION,
  "datatype3" TEXT NOT NULL,
  PRIMARY KEY ("datatype1")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype1");
```

5.5.4.32 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;
```

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```
CREATE TABLE total (
   a INT NOT NULL AUTO_INCREMENT,
   message CHAR(20))
ENGINE=MyISAM UNION=(t1,t2) INSERT_METHOD=LAST;
```

Output

```
CREATE TABLE "public"."t1" (
   "a" SERIAL NOT NULL PRIMARY KEY,
   "message" CHAR(80)
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("a");

CREATE TABLE "public"."t2" (
   a SERIAL NOT NULL PRIMARY KEY,
   message CHAR(80)
)
WITH ( ORIENTATION = ROW, COMPRESSION = NO )
NOCOMPRESS
DISTRIBUTE BY HASH ("a");

CREATE VIEW "public"."total"(a, message) AS
SELECT * FROM "public"."t1"
UNION ALL
SELECT * FROM "public"."t2";
```

5.5.4.33 WITH AS

WITH AS is used in DWS to declare one or more subqueries that can be referenced by name in the main query. It is equivalent to a temporary table. DSC supports this keyword, which is retained in the migration.

Input

```
WITH e AS (
 SELECT city, sum(population) FROM t1 group by city
 ),
 d AS (
 SELECT max(music) as max_music, min(music) as min_music from student
 ),
 s AS (
 SELECT * FROM subject
 )
SELECT * FROM e;
```

Output

```
WITH e AS (
 SELECT
   city, sum(population)
 FROM
   t1
 GROUP BY
   city
),
d AS (
 SELECT
   max(music) AS "max_music", min(music) AS "min_music"
 FROM
   student
),
s AS (
 SELECT
   *
 FROM
```

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```
    subject
)
SELECT
  *
FROM
  e;
```

5.5.4.34 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 DWS 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(512),
  "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" CHANGE COLUMN "datatype1" "datatype1new" VARCHAR(200)
NULL DEFAULT NULL;

-- B.
ALTER TABLE "public"."runoob_alter_test" CHANGE COLUMN "datatype2" "datatype2new" VARCHAR(200)
NOT NULL;

-- C.
ALTER TABLE "public"."runoob_alter_test" CHANGE COLUMN "datatype3" "datatype3new" VARCHAR(400)
NULL DEFAULT NULL;

-- D.
ALTER TABLE "public"."runoob_alter_test" CHANGE COLUMN "datatype4" "datatype4new" VARCHAR(200)
NULL DEFAULT NULL;
```

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5.5.4.35 CHECK Constraint

Specifies an expression producing a Boolean result which new or updated rows must satisfy for an insert or update operation to succeed. Expressions evaluating to **TRUE** or **UNKNOWN** succeed. If any row of an insert or update operation produces a FALSE result, an error exception is raised and the insert or update does not alter the database.

A check constraint specified as a column constraint should reference only the column's values, while an expression appearing in a table constraint can reference multiple columns.

CREATE TABLE CHECK

In DWS, you can run **CHECK (column name > 0)** to define a CHECK constraint for a column when creating a table. The CHECK constraint can be placed after the column name or below the column name. If you want to name a CHECK constraint and define CHECK constraints for multiple columns, run **CONSTRAINT chk_name CHECK (column_namw1 >0 AND column_name2='x>x")**.

CAUTION

The CHECK constraint is also removed if the table is removed.

Input

```
DROP TABLE IF EXISTS `t1`;
CREATE TABLE IF NOT EXISTS t1  (
  id int(25) not null primary key check (id > 1 and id < 100),
city varchar(255) not null unique check (city='city 1' or city='city 2' or city='city 3'),
  population int(25) not null ,
  constraint t1_1 check (population>0 and population<10000)
) ;
```

Output

```
DROP TABLE IF EXISTS "public"."t1";
CREATE TABLE IF NOT EXISTS "public"."t1" (
  "id" INTEGER NOT NULL PRIMARY KEY CHECK (
    id > 1
    and id < 100
  ),
  "city" VARCHAR(1020) NOT NULL CHECK (
city ='City 1'
or city ='City 2'
or city ='City 3'
  ),
  "population" INTEGER NOT NULL,
  CONSTRAINT t1_1 CHECK (
    population > 0
    and population < 10000
  )
) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("id");
```

ALTER TABLE CHECK

When you perform operations on table columns, you can have or have no naming constraint. To create a CHECK constraint in a column, use the **ALTER TABLE** *Table name* **ADD CHECK (<***Check constraint***>);** syntax.

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To name a **CHECK** constraint and define it for multiple columns, use the **ALTER TABLE** *Table name* **ADD CONSTRAINT <***Name of the check constraint***> CHECK(<***Check constraint***>);** syntax.

Input

```
ALTER TABLE t1 add check (id>1 and id > 2  and id < 100 or id =50);
ALTER TABLE student add constraint check02 check (id > 1 and class = '3');
ALTER TABLE t1 add check (class=1 or class =2  or class = 3 or class=4 or class = 5 or class = 6);
ALTER TABLE t1 add check (city='city 1' or city='city 2' or city='city 3');
```

Output

```
ALTER TABLE "public"."t1" ADD CHECK ( id > 1  and id > 2 and id < 100  or id = 50 );
ALTER TABLE "public"."student" ADD CONSTRAINT check02 CHECK (  id > 1  and class = '3');
ALTER TABLE "public"."t1" ADD CHECK ( class = 1 or class = 2 or class = 3  or class = 4 or class = 5 or class
= 6);
ALTER TABLE "public"."t1" ADD CHECK (city ='City 1' or city =' City 2' or city =' City 3');
```

5.5.4.36 DROP (Table Deletion)

Both DWS and MySQL support using the **DROP** statement to delete tables. However, DWS does not support the **RESTRICT | CASCADE** keyword in the **DROP** statement. 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 IF NOT EXISTS "public"."express_elb_server"
(
  "runoob_id" VARCHAR(40),
  "runoob_title" VARCHAR(400) NOT NULL,
  "runoob_author" VARCHAR(160) NOT NULL,
  "submission_date" VARCHAR(40)
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("runoob_id");
DROP TABLE "public"."express_elb_server";
```

5.5.4.37 LIKE (Table Cloning)

In the MySQL database, you can use the **CREATE TABLE .. LIKE ..** method to clone the old table structure to create a table. It is also supported by 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`);
```

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Output

```
CREATE TABLE IF NOT EXISTS "public"."runoob_tbl_old"
(
  "datatype_1" SMALLINT,
  "datatype_2" SMALLINT,
  "datatype_3" SMALLINT 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);
```

5.5.4.38 MODIFY (Modifying a Column)

MySQL uses the **MODIFY** keyword to change column data types and set **NOT NULL** constraints. DSC will perform adaptation based on DWS 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(400),
  "datatype1" BIGINT,
  "datatype2" BIGINT,
  "datatype3" BIGINT
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("datatype0");

-- A.
ALTER TABLE "public"."runoob_alter_test" MODIFY "datatype1" SMALLINT NULL DEFAULT NULL;

-- B.
ALTER TABLE "public"."runoob_alter_test" MODIFY "datatype1" SMALLINT NOT NULL;

-- C.
ALTER TABLE "public"."runoob_alter_test" MODIFY "datatype1" SMALLINT NOT NULL;

-- D.
ALTER TABLE "public"."runoob_alter_test" MODIFY "datatype1" SMALLINT NOT NULL;
```

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5.5.4.39 TRUNCATE (Table Deletion)

In MySQL, the **TABLE** keyword can be omitted when the **TRUNCATE** statement is used to delete table data. DWS does not support this feature. In addition, DSC will add **CONTINUE IDENTITY RESTRICT** to the **TRUNCATE** statement for 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;
```

5.5.4.40 ROUNDROBIN Table

DWS supports the creation of **roundrobin** tables. You can set **table.type** in **Table 5-13**. Set table.type=ROUND-ROBIN.

Input

```
CREATE TABLE charge_snapshot (
    id bigint NOT NULL,
    profit_model integer,
    ladder_rebate_rule text
);
```

Output

```
CREATE TABLE "public"."charge_snapshot" (
  "id" BIGINT NOT NULL,
  "profit_model" INTEGER,
  "ladder_rebate_rule" TEXT
) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY ROUNDROBIN;
```

5.5.4.41 RENAME (Table Renaming)

The RENAME statements for tables in MySQL are slightly different from those in DWS. DSC will perform adaptation based on DWS features during migration.

CAUTION

Currently, DSC does not support original table names prefixed with **DATABASE/SCHEMA.**

1. MySQL allows you to use 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";
   ```

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```
-- 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";
   ```

5.5.4.42 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 DWS 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 IF NOT EXISTS "public"."runoob_alter_test"
(
  "datatype1" SERIAL NOT NULL,
  "datatype2" REAL,
  "datatype3" DOUBLE PRECISION,
  "datatype4" TEXT NOT NULL,
  "datatype5" SMALLINT NOT NULL DEFAULT '2018',
  "datatype6" TIMESTAMP WITHOUT TIME ZONE NOT NULL DEFAULT '2018-10-12 15:27:33.999999',
  "datatype7" CHAR(4) NOT NULL DEFAULT '',
  "datatype8" VARCHAR(200),
  "datatype9" VARCHAR(200) NOT NULL DEFAULT '',
  "datatype10" TIME WITHOUT TIME ZONE NOT NULL DEFAULT '10:20:59',
  PRIMARY KEY ("datatype1")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
```

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```
 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;
```

5.5.4.43 Renaming a Column

Using a Reserved Keyword As a Column Name

In DWS, reserved keywords must be enclosed in double quotation marks when they are used as column names. The following reserved keywords are supported: **desc**, **checksum**, **operator**, and **size**.

Input

```
CREATE TABLE `desc` (
    user char,
    checksum int,
    operator smallint,
    desc char,
    size bigint
);
```

Output

```
CREATE TABLE "public"."desc" (
  "user" CHAR(4),
  "checksum" INTEGER,
  "operator" SMALLINT,
  "desc" CHAR(4),
  "size" BIGINT
) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("user");
```

Using the Name of a Hidden Column of a System Catalog As a Column Name

If the defined column name is the same as that of a hidden column in a DWS system catalog (including **xc_node_id**, **tableoid**, **cmax**, **xmax**, **cmin**, **xmin**, **ctid**, **tid.**), you need to add **_new** at the end of the column name. For example, change **xc_node_id** to **xc_node_id_new**.

Input

```
DROP TABLE IF EXISTS `renameFieldName`;
CREATE TABLE IF NOT EXISTS `renameFieldName`(
    xc_node_id int,
    tableoid char(3),
    cmax smallint,
    xmax bigint auto_increment,
    cmin varchar(10),
    xmin int,
    ctid int auto_increment,
    tid int
);
DROP TABLE IF EXISTS `renameFieldName`;
```

Output

```
DROP TABLE IF EXISTS "public"."renamefieldname";
CREATE TABLE IF NOT EXISTS "public"."renamefieldname" (
  "xc_node_id_new" INTEGER,
  "tableoid_new" CHAR(12),
```

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```
  "cmax_new" SMALLINT,
  "xmax_new" BIGSERIAL,
  "cmin_new" VARCHAR(40),
  "xmin_new" INTEGER,
  "ctid_new" SERIAL,
  "tid_new" INTEGER
) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH
("xc_node_id_new");
DROP TABLE IF EXISTS "public"."renamefieldname";
```

5.5.4.44 Row-Store/Column-Store Table Compression

In DWS, only column-store tables can be compressed. Row-store tables cannot be compressed. The row-column storage compression mechanism is optimized. DSC performs adaptation based on DWS features during migration.

Compression parameters:

table.compress.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.

table.compress.row and **table.compress.column** determine the compression level, which 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.

table.compress.level determines the compression sublevel, which determines the table data compression ratio and duration. A compression level is divided 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.

Input example of a row-store table

```
DROP TABLE IF EXISTS `public`.`runoob_tbl`;
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 example of a row-store table

```
DROP TABLE IF EXISTS "public"."runoob_tbl";
CREATE TABLE IF NOT EXISTS "public"."runoob_tbl" (
  "runoob_id" VARCHAR,
  "runoob_title" VARCHAR(400) NOT NULL,
  "runoob_author" VARCHAR(160) NOT NULL,
  "submission_date" VARCHAR
) WITH (ORIENTATION = ROW, COMPRESSION = YES) COMPRESS DISTRIBUTE BY HASH ("runoob_id");
```

Input example of a column-store table

```
DROP TABLE IF EXISTS `public`.`runoob_tbl`;
CREATE TABLE IF NOT EXISTS `public`.`runoob_tbl`(
   `runoob_id` VARCHAR,
   `runoob_title` VARCHAR(100) NOT NULL,
   `runoob_author` VARCHAR(40) NOT NULL,
```

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```
  `submission_date` VARCHAR
)ENGINE=InnoDB DEFAULT CHARSET=utf8;
```

Output example of a column-store table

```
DROP TABLE IF EXISTS "public"."runoob_tbl";
CREATE TABLE IF NOT EXISTS "public"."runoob_tbl" (
  "runoob_id" VARCHAR,
  "runoob_title" VARCHAR(400) NOT NULL,
  "runoob_author" VARCHAR(160) NOT NULL,
  "submission_date" VARCHAR
) WITH (
  COMPRESSLEVEL = 1,
  ORIENTATION = COLUMN,
  COMPRESSION = LOW
) DISTRIBUTE BY HASH ("runoob_id");
```

5.5.4.45 Adding/Deleting a Column

The statements for adding and deleting columns in MySQL are different from those in DWS. DSC will perform adaptation based on DWS features during migration.

CAUTION

GaussDB does not support the change of column sequence numbers in table definitions. The tool does not support the complete migration of the FIRST and AFTER features. So as a workaround, it simply deletes the keyword.

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)
```

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```
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" REAL,
  "datatype3" DOUBLE PRECISION,
  "datatype4" TEXT NOT NULL,
  "datatype5" SMALLINT NOT NULL DEFAULT '2018',
  "datatype6" TIMESTAMP WITHOUT TIME ZONE NOT NULL DEFAULT '2018-10-12 15:27:33.999999',
  "datatype7" CHAR(4) NOT NULL DEFAULT '',
  "datatype8" VARCHAR(200),
  "datatype9" VARCHAR(200) 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 DEFAULT 0;
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 DEFAULT 0;
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 DEFAULT 0;
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 DEFAULT 0;
ALTER TABLE "public"."runoob_alter_test" DROP COLUMN "datatype1_1" RESTRICT;

-- E.
ALTER TABLE "public"."runoob_alter_test" ADD COLUMN "datatype1_1" INTEGER NOT NULL, ADD
COLUMN "datatype1_2" VARCHAR(800) NOT NULL DEFAULT '';
ALTER TABLE "public"."runoob_alter_test" DROP COLUMN "datatype1_1" RESTRICT, DROP COLUMN
"datatype1_2" RESTRICT;
```

5.5.5 Indexes

5.5.5.1 Unique Indexes

DWS does not support the combination of unique indexes (constraints) and primary key constraints. DSC will perform adaptation based on DWS features during migration.

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. For a unique inline index, if the primary key index and the unique index are the same column, DSC will remove the unique index during migration.

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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 IF NOT EXISTS "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 convert it to a normal index based on DWS 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 IF NOT EXISTS "public"."runoob_alter_test"
(
  "datatype1" INTEGER,
  "datatype2" REAL,
  "datatype3" DOUBLE PRECISION
)
  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");
```

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```
CREATE TABLE IF NOT EXISTS "public"."runoob_alter_test"
(
  "datatype1" INTEGER,
  "datatype2" REAL,
  "datatype3" DOUBLE PRECISION,
  "datatype4" TEXT NOT NULL,
  "datatype5" SMALLINT 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 convert it to a normal index based on DWS 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 NOT NULL,
     "table01_theme" VARCHAR(400) DEFAULT NULL,
     "author_name" CHAR(40) DEFAULT NULL,
     "author_id" INTEGER 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");
   ```

4. If CREATE TABLE has multiple unique indexes, DSC will convert all unique indexes to common indexes based on DWS features during migration.

   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,
      UNIQUE(`TABLE01_ID`),
      UNIQUE(`AUTHOR_ID`)
   );
   ```

   Output

   ```
   CREATE TABLE "public"."test_index_table01" (
     "table01_id" INTEGER NOT NULL,
     "table01_theme" VARCHAR(400) DEFAULT NULL,
     "author_name" CHAR(40) DEFAULT NULL,
     "author_id" INTEGER DEFAULT NULL,
   ```

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```
  "create_time" INTEGER DEFAULT NULL
) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH
("table01_id");
CREATE INDEX "idx_test_index_table01_table01_id" ON "public"."test_index_table01"("TABLE01_ID");
CREATE INDEX "idx_test_index_table01_author_id" ON "public"."test_index_table01"("AUTHOR_ID");
```

5. If CREATE TABLE has a unique index but does not have a primary key index, DSC retains the unique index based on DWS features during migration.

   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,
      UNIQUE(`AUTHOR_ID`)
   );
   ```

   Output

   ```
   CREATE TABLE "public"."test_index_table01" (
     "table01_id" INTEGER NOT NULL,
     "table01_theme" VARCHAR(400) DEFAULT NULL,
     "author_name" CHAR(40) DEFAULT NULL,
     "author_id" INTEGER DEFAULT NULL,
     "create_time" INTEGER DEFAULT NULL,
     UNIQUE ("author_id")
   ) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH
   ("author_id");
   ```

6. If CREATE TABLE has a primary key index, DSC converts all unique indexes to common indexes based on DWS features during migration.

   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`),
      UNIQUE(`AUTHOR_ID`)
   );
   ```

   Output

   ```
   CREATE TABLE "public"."test_index_table01" (
     "table01_id" INTEGER NOT NULL,
     "table01_theme" VARCHAR(400) DEFAULT NULL,
     "author_name" CHAR(40) DEFAULT NULL,
     "author_id" INTEGER DEFAULT NULL,
     "create_time" INTEGER DEFAULT NULL,
     PRIMARY KEY ("table01_id")
   ) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH
   ("table01_id");
   CREATE INDEX "idx_test_index_table01_author_id" ON "public"."test_index_table01"("AUTHOR_ID");
   ```

5.5.5.2 Normal and Prefix Indexes

DWS does not support prefix indexes or inline normal indexes. DSC will replace these indexes with normal indexes based on DWS features.

1. Inline normal/prefix indexes

   Input

   ```
   CREATE TABLE IF NOT EXISTS `public`.`runoob_dataType_test`
   (
     `id` INT PRIMARY KEY AUTO_INCREMENT,
   ```

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```
 `name` VARCHAR(128) NOT NULL,
 INDEX index_single(name(10))
);
```

Output

```
CREATE TABLE IF NOT EXISTS "public"."runoob_datatype_test"
(
 "id" SERIAL PRIMARY KEY,
 "name" VARCHAR(512) 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 NOT NULL,
 "user_name" CHAR(80) DEFAULT NULL,
 "detail" VARCHAR(400) 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 IF NOT EXISTS "public"."customer"
(
 "name" VARCHAR(256) 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");
```

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5.5.5.3 Hash Indexes

DWS does not support hash indexes. DSC will replace these indexes with normal indexes based on DWS features.

1. Inline hash indexes

   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(400) NOT NULL,
  "theme" VARCHAR(800) DEFAULT NULL,
  "send_id" INTEGER DEFAULT NULL,
  "send_name" CHAR(80) 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 IF NOT EXISTS "public"."runoob_alter_test"
(
  "datatype1" SERIAL NOT NULL,
  "datatype2" REAL,
  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. Hash index created by **CREATE INDEX**

   Input

```
CREATE TABLE `public`.`test_index_table06` (
    `ID` INT(11) NOT NULL AUTO_INCREMENT,
```

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```
  `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(120) NOT NULL,
 "iname" VARCHAR(120) 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");
```

5.5.5.4 B-tree Indexes

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 DWS 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(400) NOT NULL,
    "theme" VARCHAR(800) DEFAULT NULL,
    "send_id" INTEGER DEFAULT NULL,
    "send_name" CHAR(80) 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`)
   ```

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```
);

ALTER TABLE runoob_alter_test ADD KEY alterTable_addKey_indexType (dataType1) USING BTREE;
```

Output

```
CREATE TABLE IF NOT EXISTS "public"."runoob_alter_test"
(
  "datatype1" SERIAL NOT NULL,
  "datatype2" REAL,
  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_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 NOT NULL,
  "user_name" CHAR(80) DEFAULT NULL,
  "detail" VARCHAR(400) 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");
```

5.5.5.5 Spatial Indexes

DWS does not support spatial indexes. DSC will perform adaptation based on DWS 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,
```

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```
  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" GEOMETRYCOLLECTION 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" GEOMETRYCOLLECTION 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

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```
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" GEOMETRYCOLLECTION 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");
```

5.5.5.6 Full-Text Indexes

DWS does not support full-text indexes. DSC will perform adaptation based on DWS features during migration.

1. Inline full-text index

   Input

   ```
   ## A.
   CREATE TABLE `public`.`test_create_table02` (
       `ID` INT(11) NOT NULL PRIMARY KEY,
       `TITLE` CHAR(255) NOT NULL,
       `CONTENT` TEXT NULL,
       `CREATE_TIME` DATETIME NULL DEFAULT NULL,
        FULLTEXT (`CONTENT`)
   );

   ## B.
   CREATE TABLE IF NOT EXISTS `public`.`runoob_dataType_test`
   (
     `id` INT PRIMARY KEY AUTO_INCREMENT,
     `name` VARCHAR(128) NOT NULL,
     FULLTEXT INDEX (name)
   );

   ## C.
   CREATE TABLE IF NOT EXISTS `public`.`runoob_dataType_test`
   (
     `id` INT PRIMARY KEY AUTO_INCREMENT,
     `name` VARCHAR(128) NOT NULL,
     FULLTEXT INDEX (name ASC)
   );
   ```

   Output

   ```
   -- A.
   CREATE TABLE "public"."test_create_table02"
   (
   ```

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```
  "id" INTEGER NOT NULL PRIMARY KEY,
  "title" CHAR(1020) NOT NULL,
  "content" TEXT,
  "create_time" TIMESTAMP WITHOUT TIME ZONE DEFAULT NULL
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("id");
CREATE INDEX "idx_test_create_table02_content" ON "public"."test_create_table02" USING
GIN(to_tsvector(coalesce("content","")));

-- B.
CREATE TABLE IF NOT EXISTS "public"."runoob_datatype_test"
(
  "id" SERIAL PRIMARY KEY,
  "name" VARCHAR(512) NOT NULL
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("id");
CREATE INDEX "idx_runoob_datatype_test_name" ON "public"."runoob_datatype_test" USING
GIN(to_tsvector(coalesce("name","")));

-- C.
CREATE TABLE IF NOT EXISTS "public"."runoob_datatype_test"
(
  "id" SERIAL PRIMARY KEY,
  "name" VARCHAR(512) NOT NULL
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("id");
CREATE INDEX "idx_runoob_datatype_test_name" ON "public"."runoob_datatype_test" USING
GIN(to_tsvector(coalesce("name","")));
```

2. Full-text 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 FULLTEXT INDEX USER_ID_INDEX_02(USER_ID);
ALTER TABLE TEST_CREATE_TABLE05 ADD FULLTEXT USER_NAME_INDEX_02(USER_NAME);
```

   Output

```
CREATE TABLE "public"."test_create_table05"
(
  "id" SERIAL NOT NULL,
  "user_id" INTEGER NOT NULL,
  "user_name" CHAR(80) DEFAULT NULL,
  "detail" VARCHAR(400) DEFAULT NULL,
  PRIMARY KEY ("id")
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("id");
CREATE INDEX "user_id_index_02" ON "public"."test_create_table05" USING
GIN(to_tsvector(coalesce("user_id","")));
CREATE INDEX "user_name_index_02" ON "public"."test_create_table05" USING
GIN(to_tsvector(coalesce("user_name","")));
```

3. Full-text index created by **CREATE INDEX**

   Input

```
CREATE TABLE `public`.`test_index_table02` (
    `ID` INT(11) NOT NULL PRIMARY KEY,
```

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```
  `TITLE` CHAR(255) NOT NULL,
  `CONTENT` TEXT NULL,
  `CREATE_TIME` INT(10) NULL DEFAULT NULL
);
CREATE FULLTEXT INDEX CON_INDEX ON TEST_INDEX_TABLE02(CONTENT);
```

Output

```
CREATE TABLE "public"."test_index_table02"
(
 "id" INTEGER NOT NULL PRIMARY KEY,
 "title" CHAR(1020) NOT NULL,
 "content" TEXT,
 "create_time" INTEGER DEFAULT NULL
)
 WITH ( ORIENTATION = ROW, COMPRESSION = NO )
 NOCOMPRESS
 DISTRIBUTE BY HASH ("id");
CREATE INDEX "con_index" ON "public"."test_index_table02" USING
GIN(to_tsvector(coalesce("content",'')));
```

5.5.5.7 Deleting an Index

MySQL supports both **DROP INDEX** and **ALTER TABLE DROP INDEX** for deleting indexes. DSC will perform adaptation based on DWS 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 NOT NULL,
    "demand_name" CHAR(400) NOT NULL,
    "theme" VARCHAR(800) DEFAULT NULL,
    "send_id" INTEGER DEFAULT NULL,
    "send_name" CHAR(80) 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 "public"."demand_name_index" RESTRICT;

   CREATE INDEX "send_id_index" ON "public"."test_create_table03" USING BTREE ("send_id");
   DROP INDEX "public"."send_id_index" RESTRICT;
   ```

2. ALTER TABLE DROP INDEX

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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 NOT NULL,
  "demand_name" CHAR(400) NOT NULL,
  "theme" VARCHAR(800) DEFAULT NULL,
  "send_id" INTEGER DEFAULT NULL,
  "send_name" CHAR(80) 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 "public"."test_create_table03_name_index" RESTRICT;
```

5.5.5.8 Renaming an Index

DSC supports renaming indexes. Prefix a table name to an index name to prevent name conflicts. (Only DDL statements with specific index names can be created. Currently, the name of a renamed index cannot be deleted. Exercise caution when modifying this parameter.)

Modifying the configuration

Open **Table 1 Configuration parameters in the features-mysql.properties file** and change the value of the following parameter to **true**: The default value is **false**, indicating that the file will not be renamed.

```
# Whether to rename an index when creating the index.
table.index.rename=true
```

Input

```
CREATE TABLE IF NOT EXISTS `CUSTOMER`(
    `NAME` VARCHAR(64) PRIMARY KEY,
    ID INTEGER,
    ID2 INTEGER);
CREATE INDEX ID_INDEX USING BTREE ON CUSTOMER (ID);
ALTER TABLE CUSTOMER ADD INDEX ID3_INDEX(ID2);
```

Output

```
CREATE TABLE IF NOT EXISTS "public"."customer" (
    "name" VARCHAR(256) PRIMARY KEY,
    "id" INTEGER,
```

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```
   "id2" INTEGER) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY
HASH ("name");
CREATE INDEX customer_id_index ON "public"."customer" USING BTREE ("id");
CREATE INDEX customer_id3_index ON "public"."customer" ("id2");
```

5.5.6 Comment

MySQL supports single-line comments caused by number signs (#) or double hyphens (--), while DWS supports only single-line comments caused by double hyphens (--). 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 IF NOT EXISTS "public"."runoob_tbl"
(
  "runoob_id" VARCHAR,
  "runoob_title" VARCHAR(400) NOT NULL,
  "runoob_author" VARCHAR(160) NOT NULL,
  "submission_date" VARCHAR
)
  WITH ( ORIENTATION = ROW, COMPRESSION = NO )
  NOCOMPRESS
  DISTRIBUTE BY HASH ("runoob_id");
```

5.5.7 Databases

DATABASE in MySQL is a schema object, which is equivalent to the **SCHEMA** in Oracle and 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

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```
DROP SCHEMA IF EXISTS "test";
CREATE SCHEMA "test";
SET CURRENT_SCHEMA = "test";
```

5.5.8 Data Manipulation Language (DML)

5.5.8.1 INSERT

In MySQL, **INSERT** allows the following keywords: **HIGH_PRIORITY**, **LOW_PRIORITY**, **PARTITION**, **DELAYED**, **IGNORE**, **VALUES**, and **ON DUPLICATE KEY UPDATE**.

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);
```

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');
```

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```
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);
```

PARTITION

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);
```

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);
```

IGNORE

When the **IGNORE** modifier is used, errors that occur during **INSERT** execution are ignored.

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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);
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);
```

VALUES

INSERT statements that use the **VALUES** syntax can insert multiple lines, separated by commas.

Input

```
INSERT INTO  exmp_tb1 (tb1_name,tb1_gender,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_gender","tb1_address","tb1_number") VALUES
('David','male','NewYork','01015827875');
INSERT INTO "public"."exmp_tb1" ("tb1_name","tb1_gender","tb1_address","tb1_number") VALUES
('Rachel','female','NewYork','01015827749');
INSERT INTO "public"."exmp_tb1" ("tb1_name","tb1_gender","tb1_address","tb1_number") VALUES
('Monica','female','NewYork','010158996743');
```

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.)
```

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```
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);
```

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');
```

5.5.8.2 UPDATE

In MySQL, **UPDATE** allows the following keywords: **LOW_PRIORITY**, **ORDER BY**, **LIMIT**, and **IGNORE**.

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;
```

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;
```

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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;
```

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;
```

5.5.8.3 REPLACE

In MySQL, **REPLACE** allows the following keywords: **LOW_PRIORITY**, **PARTITION**, **DELAYED**, **VALUES**, and **SET**. The following examples are temporary migration solutions only.

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> **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.

LOW_PRIORITY

MySQL REPLACE supports the use of **LOW_PRIORITY**, which is converted by DSC.

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);
```

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);
```

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DELAYED

WARNING

- **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);
```

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, INSERT will be performed.
Replace INTO  exmp_tb1 (tb1_id,tb1_name,tb1_gender,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_gender,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_gender,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

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```
-- If data is available, replacement will be performed. Otherwise, INSERT will be performed.
INSERT INTO "public"."exmp_tb1" ("tb1_id","tb1_name","tb1_gender","tb1_address","tb1_number") VALUES
(17,'David','male','NewYork11','01015827875');
INSERT INTO "public"."exmp_tb1" ("tb1_id","tb1_name","tb1_gender","tb1_address","tb1_number") VALUES
(18,'Rachel','female','NewYork22','01015827749');
INSERT INTO "public"."exmp_tb1" ("tb1_id","tb1_name","tb1_gender","tb1_address","tb1_number") VALUES
(20,'Monica','female','NewYork','010158996743');
INSERT INTO "public"."exmp_tb1" ("tb1_id","tb1_name","tb1_gender","tb1_address","tb1_number") VALUES
(17,'David1','male','NewYork11','01015827875');
INSERT INTO "public"."exmp_tb1" ("tb1_id","tb1_name","tb1_gender","tb1_address","tb1_number") VALUES
(21,'Rachel','female','NewYork22','01015827749');
INSERT INTO "public"."exmp_tb1" ("tb1_id","tb1_name","tb1_gender","tb1_address","tb1_number") VALUES
(22,'Monica','female','NewYork','010158996743');
INSERT INTO "public"."exmp_tb1"
("tb1_id","tb1_name","tb1_gender","tb1_address","tb1_number","tb1_date") VALUES
(17,'David2',DEFAULT,'NewYork11','01015827875',DEFAULT);
INSERT INTO "public"."exmp_tb1"
("tb1_id","tb1_name","tb1_gender","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_gender","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');
```

SET

MySQL REPLACE supports the use of **SET** settings, which DSC 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);
```

5.5.8.4 Quotation Marks

Single Quotation Mark (')

Aliases in MySQL contain single quotation marks, which are not supported by DWS. DSC changes them to double quotation marks during migration.

Input

```
select name as 'mingzi' from t1;
```

Output

```
SELECT
  name AS "mingzi"
```

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```
FROM
  t1;
```

Backquote (`)

Aliases and column names in MySQL contain backquotes, which are not supported by DWS. DSC changes them to double quotation marks during migration.

Input

```
select `name` as `mingzi` from t1;
```

Output

```
SELECT
  "name" AS "mingzi"
FROM
  t1;
```

Double Quotation Mark (")

In MySQL, constant strings are enclosed in double quotation marks, which are not supported by DWS. DSC changes them to single quotation marks during migration.

Input

```
select name from t1 where name = "test2";
```

Output

```
SELECT
  name
FROM
  t1
WHERE
  name = 'test2';
```

5.5.8.5 INTERVAL

In MySQL, the interval expression format is **INTERVAL N**, which is not supported by DWS and needs to be converted to **INTERVAL'N'**.

Input

```
SELECT CURRENT_TIME() - INTERVAL 4 DAY;
SELECT NOW() - INTERVAL 5 HOUR;
SELECT CURRENT_TIME() - INTERVAL '4' DAY;
SELECT NOW() - INTERVAL '5' HOUR;
SELECT CURRENT_TIME() - INTERVAL "4" DAY;
SELECT NOW() - INTERVAL "5" HOUR;
```

Output

```
SELECT  (CURRENT_TIME () - INTERVAL '4' DAY);
SELECT  (NOW () - INTERVAL '5' HOUR);
SELECT  (CURRENT_TIME () - INTERVAL '4' DAY);
SELECT  (NOW () - INTERVAL '5' HOUR);
SELECT  (CURRENT_TIME () - INTERVAL '4' DAY);
SELECT  (NOW () - INTERVAL '5' HOUR);
```

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5.5.8.6 Division Expressions

In MySQL, in a division expression, if the divisor is 0, null is returned. DWS reports an error. Therefore, the division expression is converted by adding an if condition expression.

Input

```
select sum(c1) / c2 as result from table_t1;
select sum(c1) / count (c3/c4) as result from table_t1;
```

Output

```
SELECT  (if (c2 = 0, null, sum(c1) / c2)) AS "result" FROM  table_t1;
SELECT  (if (count(if (c4 = 0, null, c3 / c4)) = 0, null, sum(c1) / count(if (c4 = 0, null, c3 / c4)))) AS "result"
FROM  table_t1;
```

5.5.8.7 GROUP BY Conversion

In GROUP BY statements, non-group columns can be queried in MySQL and ADB, but only group columns and aggregate functions can be queried in DWS. To query non-group columns, you need to use the MySQL compatibility mode with **disable_full_group_by_mysql** enabled.

Input

```
SELECT e.department_id, department_name, ROUND(AVG(salary), 0) avg_salary FROM employees e JOIN
departments d on e.department_id = d.department_id GROUP BY department_name ORDER BY
department_name;
```

Output

```
SELECT
  e.department_id,
  department_name,
  ROUND (AVG(salary), 0) AS "avg_salary"
FROM
  employees "e"
  JOIN departments "d" ON e.department_id = d.department_id
GROUP BY
  department_name
ORDER BY
  department_name;
```

5.5.8.8 ROLLUP

group by column with rollup in MySQL needs to be converted to **group by rollup (column)** in DWS.

Input

```
select id,product_id,count(1) from czb_account.equity_account_log
where id in (6957343,6957397,6957519,6957541,6957719)
group by 1, 2 with rollup;
```

Output

```
SELECT
  id,
  product_id,
  count(1)
FROM
  czb_account.equity_account_log
WHERE
  id IN (6957343, 6957397, 6957519, 6957541, 6957719)
```

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```
GROUP BY
  ROLLUP(1, 2);
```

5.5.9 Transaction Management and Database Management

5.5.9.1 Transaction Management

TRANSACTION

When migrating MySQL TRANSACTION statements, DSC performs adaptation based on DWS features.

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;
```

LOCK

When migrating MySQL LOCK statements for tables in transactions, DSC performs adaptation based on DWS features.

Input

```
## A.
START TRANSACTION;
LOCK TABLES `mt`.`runoob_tbl` WRITE,`mt`.`runoob_tb2` READ;
commit;
```

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```
## 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;
```

5.5.9.2 Database Management

DSC will replace MySQL **SET CHARACTER SET** with **SET SESSION NAMES** during migration. The following table lists the character sets.

Table 5-37 Character set comparison table

MySQL CHARACTER SET	DWS 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
HEBREW	ISO_8859_8

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MySQL CHARACTER SET	DWS SESSION NAMES
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';
```

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```
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';.
```

5.6 SQL-Server Syntax Migration

5.6.1 Migrating Tables

Table Name

DWS does not support the *Database name*.*Schema name*.*Table name* format. You need to convert it to the *Schema name*.*Table name* format.

SQL Server Syntax	Syntax After Migration
CREATE TABLE `analytics-di-dev.abase.buyer_location` (id_buyer INT, id_location INT);	CREATE TABLE "abase"."buyer_location" ("id_buyer" INT, "id_location" INT) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("id_buyer");

Migration of Table-Level Parameters

SQL Server supports the creation of row-compressed tables, while DWS does not. The tables are deleted during migration.

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SQL Server Syntax	Syntax After Migration
CREATE TABLE dbo.T1 (c1 INT, c2 NVARCHAR(200)) WITH (DATA_COMPRESSION = ROW);	CREATE TABLE "dbo"."t1" ("c1" INT, "c2" VARCHAR(200)) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("c1");

SQL Server supports the creation of compressed XML tables, while DWS does not. The tables are deleted during migration.

SQL Server Syntax	Syntax After Migration
CREATE TABLE dbo.T1 (c1 INT, c2 XML) WITH (XML_COMPRESSION = ON);	CREATE TABLE "dbo"."t1" ("c1" INT, "c2" TEXT) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("c1");

SQL Server supports the **TEXTIMAGE_ON** parameter, which indicates that some types of data are stored in a specified file group. DWS does not support this parameter and deletes it during migration.

SQL Server Syntax	Syntax After Migration
CREATE TABLE dbo.T1 (c1 INT, c2 text) TEXTIMAGE_ON "default";	CREATE TABLE "dbo"."t1" ("c1" INT, "c2" TEXT) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("c1");

SQL Server supports the **SYSTEM_VERSIONING** parameter, which is used to create a system versioning table. DWS does not support this parameter and deletes it during migration.

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SQL Server Syntax	Syntax After Migration
CREATE TABLE Department (DepartmentNumber CHAR(10) NOT NULL PRIMARY KEY, DepartmentName VARCHAR(50) NOT NULL, ManagerID INT NULL) WITH (SYSTEM_VERSIONING = ON);	CREATE TABLE "department" ("departmentnumber" CHAR(10) NOT NULL PRIMARY KEY, "departmentname" VARCHAR(50) NOT NULL, "managerid" INT) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("departmentnumber");

Migration of Column-Level Parameters

SQL Server supports the creation of tables with sparse columns, but DWS does not. The tables are deleted during migration.

SQL Server Syntax	Syntax After Migration
CREATE TABLE dbo.T1 (c1 INT PRIMARY KEY, c2 VARCHAR(50) SPARSE NULL);	CREATE TABLE "dbo"."t1" ("c1" INT PRIMARY KEY, "c2" VARCHAR(50)) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("c1");

SQL Server supports the **FILESTREAM** keyword, which is used to specify the **FILESTREAM** data location of a table. DWS does not support this keyword and is deleted during migration.

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SQL Server Syntax	Syntax After Migration
CREATE TABLE dbo.EmployeePhoto (EmployeeId INT NOT NULL PRIMARY KEY, Photo VARBINARY(MAX) FILESTREAM NULL, MyRowGuidColumn UNIQUEIDENTIFIER NOT NULL ROWGUIDCOL UNIQUE DEFAULT NEWID());	CREATE TABLE "dbo"."employeephoto" ("employeeid" INT NOT NULL PRIMARY KEY, "photo" BYTEA, "myrowguidcolumn" TEXT NOT NULL) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("employeeid"); CREATE INDEX "idx_employeephoto_myrowguidcolumn" ON "dbo"."employeephoto"("myrowguidcolumn");

SQL Server supports clustered and nonclustered indexes, but DWS does not. The indexes are deleted during migration.

Primary key clustered indexes

SQL Server Syntax	Syntax After Migration
CREATE TABLE Department (DepartmentNumber CHAR(10) NOT NULL PRIMARY KEY CLUSTERED, DepartmentName VARCHAR(50) NOT NULL, ManagerID INT NULL);	CREATE TABLE "department" ("departmentnumber" CHAR(10) NOT NULL PRIMARY KEY, "departmentname" VARCHAR(50) NOT NULL, "managerid" INT) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("departmentnumber");

Unique index and nonclustered indexes

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SQL Server Syntax	Syntax After Migration
CREATE TABLE Department (DepartmentNumber CHAR(10) NOT NULL UNIQUE NONCLUSTERED, DepartmentName VARCHAR(50) NOT NULL, ManagerID INT NULL);	CREATE TABLE "department" ("departmentnumber" CHAR(10) NOT NULL UNIQUE, "departmentname" VARCHAR(50) NOT NULL, "managerid" INT) WITH (ORIENTATION = ROW, COMPRESSION = NO) NOCOMPRESS DISTRIBUTE BY HASH ("departmentnumber");

5.6.2 Migrating Data Types

Overview

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. Otherwise, errors may occur. The following table shows how SQL Server data types can be converted to DWS data types.

Type Comparison

Data Type	SQL Server Type	DWS OUTPUT
Time	datetimeoffset [(n)]	timestamptz(n)
	datetime2 [(n)]	timestamp(n)
	datetime	timestamp
	smalldatetime	timestamp
	date	date
	time [(n)]	time(n)
Number	float [(n)]	float(n)
	real [(n)]	float(n)
	decimal [(precision [, scale])]	decimal
	numeric [(precision [, scale])]	numeric
	money	money

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Data Type	SQL Server Type	DWS OUTPUT
	smallmoney	money
	bigint	bigint
	int	int
	smallint	smallint
	tinyint	tinyint
	bit	bit
Character	nvarchar [(n | max)]	varchar
	nchar [(n)]	nchar(n)
	varchar [(n | max)]	varchar(n)
	char [(n)]	char(n)
Binary	varbinary [(n | max)]	BYTEA
	binary [(n)]	BYTEA
Other	uniqueidentifier	text

5.7 Oracle Syntax Migration

5.7.1 Schema Objects

This section contains the migration syntax for migrating Oracle schema objects. The migration syntax decides how the supported keywords/features are migrated.

This section describes the following:

Tables, temporary tables, global temporaray tables, indexes, views, sequences, PURGE, and database keywords. For details, see **Tables** to **Database Keywords**.

5.7.1.1 Tables

CREATE TABLE

The **CREATE TABLE** statement in Oracle databases is used to create new tables. DWS supports this statement and does not need to be migrated.

ALTER TABLE

The **ALTER TABLE** statement in Oracle databases is used to add, rename, modify, or drop/delete columns in a table. DWS supports this statement and does not need to be migrated.

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PRIMARY KEY

The **ALTER TABLE** statement in Oracle databases 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 constraint

The following **ALTER TABLE** statement contains constraints. If it is directly invoked in DWS, an error is reported "Cannot create index whose evaluation cannot be enforced to remote nodes."

Similar to **PRIMARY KEY**, if the **PRIMARY KEY**/**UNIQUE** constraint already exists, you do not need to migrate it.

Input

```
CREATE
    TABLE
```

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```
        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 ;
```

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```
    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.

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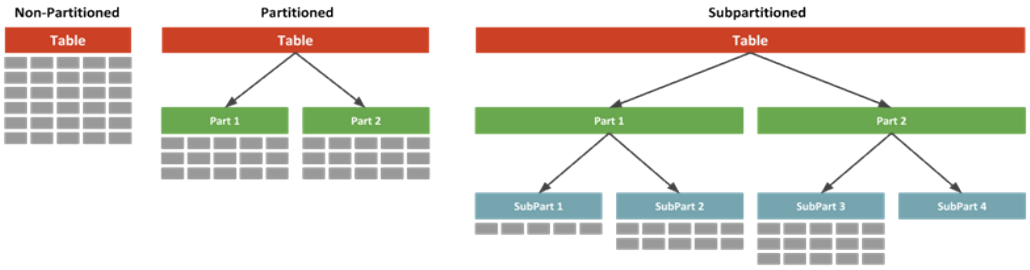
Figure 5-5 Partitioning and sub-partitioning of tables



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)
  ```

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```
 , 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
```

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```
        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_georga 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 PARTITION 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
```

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```
      ( 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 data of different ranges 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*/
         );
```

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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

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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', 'SYYYY-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', 'SYYYY-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', 'SYYYY-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', 'SYYYY-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', 'SYYYY-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', 'SYYYY-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', 'SYYYY-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
```

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```
,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' ,'SYYYY-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' ,'SYYYY-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' ,'SYYYY-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' ,'SYYYY-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' ,'SYYYY-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' ,'SYYYY-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' ,'SYYYY-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,
```

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```
  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', 'SYYYY-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', 'SYYYY-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', 'SYYYY-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', 'SYYYY-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', 'SYYYY-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', 'SYYYY-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', 'SYYYY-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', 'SYYYY-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', 'SYYYY-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', 'SYYYY-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', 'SYYYY-MM-DD
HH24:MI:SS', 'NLS_CALENDAR=GREGORIAN'))
```

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```
   tablespace SDWO_DATA,
  partition SYS_P108153 values less than (TO_DATE(' 2019-02-01 00:00:00', 'SYYYY-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', 'SYYYY-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', 'SYYYY-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
CREATE TABLE TBL_ORACLE (ID Number, Name VARCHAR2(100 BYTE), ADDRESS VARCHAR2(200 BYTE));	CREATE TABLE TBL_ORACLE (ID NUMBER ,Name VARCHAR2 (100) ,ADDRESS VARCHAR2 (200)) ;

Partition (Comment Partition)

In configuration parameter for oracle "#Unique or primary key constraint for partitioned table" to comment_partition.

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Oracle Syntax	Syntax After Migration

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);
	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 */
	;

Partition (Comment Constraint)

In configuration parameter for oracle "#Unique or primary key constraint for partitioned table" to comment_unique.

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Oracle Syntax	Syntax After Migration

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);
	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 ;

Partition (I)

Comment ALTER TABLE TRUNCATE PARTITION for non-partitioned tables.

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Oracle Syntax	Syntax After Migration

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;
/
	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;
	/

Partition (II)

Delete data for ALTER TABLE TRUNCATE PARTITION for non-partitioned tables.

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Oracle Syntax	Syntax After Migration

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;
/
	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
	(2011,2012,2013,2014,2015,2016,2017,2018,2019,2
	020);
	 END IF;
	 NULL;

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Oracle Syntax	Syntax After Migration
	END; /

SEGMENT CREATION

DWS does not support **SEGMENT CREATION { IMMEDIATE | DEFERRED }**. This statement is commented out after the migration. You need to set **commentStorageParameter** to **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

DWS does not support storage parameters such as **BUFFER_POOL** and **MAXEXTENTS**. If **comment_storage_parameter** is set to **TRUE**, these parameters that appear in tables or indexes will be commented out during migration.

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
```

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```
  ( 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

DWS does not support the **STORE** keyword of the **LOB** column. This keyword will be commented out after the migration.

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 >  )
```

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```
    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 (
```

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```
   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

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```
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

create table product_part
(
  partid   VARCHAR2(24),
  mbrcoords MDSYS.MBRCOORDLIST
);
	CREATE TABLE product_part
	(
	  partid VARCHAR2(24),
	  mbrcoords CLOB
	);

MDSYS.SDO_GEOMETRY should be replaced with CLOB.

Oracle Syntax	Syntax After Migration

create table product_part
(
  partid   VARCHAR2(24),
  shape MDSYS.SDO_GEOMETRY
);
	CREATE TABLE product_part
	(
	  partid VARCHAR2(24),
	  shape CLOB
	);

GEOMETRY should be replaced with CLOB.

Oracle Syntax	Syntax After Migration

create table product_part
(
  partid   VARCHAR2(24),
  shape GEOMETRY
);
	CREATE TABLE product_part
	(
	  partid VARCHAR2(24),
	  shape CLOB
	);

Columns

xmax, **xmin**, **left**, **right**, and **maxvalue** are keywords of DWS. These keywords must be capitalized and enclosed in double quotation marks ("").

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Oracle Syntax	Syntax After Migration

create table product
(
  xmax VARCHAR2(20),
  xmin VARCHAR2(50),
  left VARCHAR2(50),
  right VARCHAR2(50),
  maxvalue VARCHAR2(50)
);
	CREATE TABLE product1
	(
	  "XMAX" VARCHAR2(20),
	  "XMIN" VARCHAR2(50),
	  "LEFT" VARCHAR2(50),
	  "RIGHT" VARCHAR2(50),
	  "MAXVALUE" VARCHAR2(50)
	);

Interval Partition

Partition should be commented for interval partition.

Oracle Syntax	Syntax After Migration

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')));
	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')))*/;

5.7.1.2 Temporary Tables

DWS does not support **GLOBAL TEMPORARY TABLE**, It migrates **GLOBAL TEMPORARY TABLE** to **LOCAL TEMPORARY TABLE**.

ON COMMIT DELETE ROWS is also not supported and will be migrated to **ON COMMIT PRESERVE ROWS**.

The following is an example of the syntax of a temporary table before and after migration.

Pre-migration

Figure 5-6 GLOBAL TEMPORARY TABLE and ON COMMIT DELETE ROWS

```
CREATE
    GLOBAL TEMPORARY TABLE
        schema1.temp_tbl1 (
            col1 VARCHAR2 (400)
            ,col2 DATE NOT NULL
        )
            ON COMMIT DELETE ROWS
;
```

```
CREATE
    GLOBAL TEMPORARY TABLE
```

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```
            schema1.temp_tbl1
           (
                col1 VARCHAR2 (400),
                col2 DATE NOT NULL
            )
              ON COMMIT DELETE ROWS
;
```

Post-migration

Figure 5-7 LOCAL TEMPORARY TABLE and ON COMMIT PRESERVE ROWS

```
CREATE
    LOCAL TEMPORARY TABLE
        schema1_temp_tbl1 (
            col1 VARCHAR2 (400)
            ,col2 DATE NOT NULL
        )
            ON COMMIT PRESERVE ROWS
;
```

```
CREATE
    LOCAL TEMPORARY TABLE
            schema1_temp_tbl1
           (
                col1 VARCHAR2 (400),
                col2 DATE NOT NULL
            )
              ON COMMIT PRESERVE ROWS
;
```

5.7.1.3 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 ;
```

5.7.1.4 Indexes

When an index is created in 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.

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Figure 5-8 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 5-9 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

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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 )) );
```

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5.7.1.5 Views

A view is a logical table 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.

The following is an example of the syntax before and after view migration.

Table Name (Without Schema Name)

Figure 5-10 Input: tab1 and tab2

```
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'
                )

;
```

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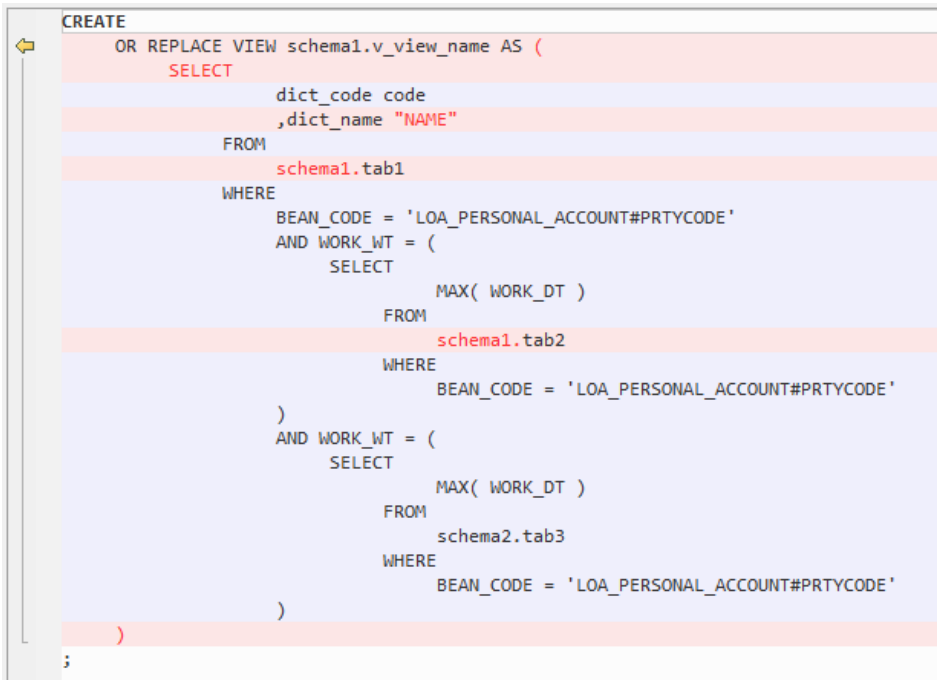
Table Name (With Schema Name)

Figure 5-11 Output: view schema names



```
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'
                )
    )
;
```

5.7.1.6 Sequences

A sequence is an Oracle object used to generate a number sequence. This can be useful when you need to create an autonumber column to act as a primary key.

If **MigSupportSequence** is set to **true** (default), a sequence is created in the **PUBLIC** schema.

NOTE

- **CACHE** and **ORDER** cannot be migrated.
- In Oracle, the maximum value of **MAXVALUE** can be set to **999999999999999999999999999**. In DWS, the maximum value of **MAXVALUE** can be set to **9223372036854775807**.
- Before migrating a sequence, copy the content in the **sequence_scripts.sql** file and paste it to execute the script in all the target databases. For details, see **Executing Custom DB Scripts**.

Sequence

Input - CREATE SEQUENCE

```
CREATE SEQUENCE GROUP_DEF_SEQUENCE
  minvalue 1
  maxvalue 10000000000000000000
  start with 1152
  increment by 1
  cache 50
  order;
```

Output

```
INSERT
    INTO
        PUBLIC.MIG_SEQ_TABLE (
            SCHEMA_NAME
            ,SEQUENCE_NAME
            ,START_WITH
            ,INCREMENT_BY
            ,MIN_VALUE
            ,MAX_VALUE
            ,CYCLE_I
            ,CACHE
            ,ORDER_I
        )
    VALUES (
        UPPER( current_schema ( ) )
        ,UPPER( 'GROUP_DEF_SEQUENCE' )
        ,1152
        ,1
        ,1
        ,9223372036854775807
        ,FALSE
        ,20
        ,FALSE
    )
;
```

SEQUENCE with NOCACHE

Input - CREATE SEQUENCE with NOCACHE

```
CREATE SEQUENCE customers_seq
 START WITH 1000
 INCREMENT BY   1
 NOCACHE
 NOCYCLE;
```

Output

```
INSERT
    INTO
        PUBLIC.MIG_SEQ_TABLE (
            SCHEMA_NAME
            ,SEQUENCE_NAME
            ,START_WITH
            ,INCREMENT_BY
            ,MIN_VALUE
            ,MAX_VALUE
            ,CYCLE_I
            ,CACHE
            ,ORDER_I
        )
    VALUES (
        UPPER( current_schema ( ) )
        ,UPPER( 'customers_seq' )
        ,1000
        ,1
        ,1
        ,9999999999999999999999999999
        ,FALSE
        ,20
        ,FALSE
    )
;
```

Input - CREATE SEQUENCE with a specified schema name

Input - CREATE SEQUENCE with a specified schema name

```
CREATE SEQUENCE scott.seq_customers
 START WITH 1000 INCREMENT BY 1
 MINVALUE 1000 MAXVALUE 999999999999999
 CACHE 20 CYCLE ORDER;
```

Output

```
INSERT
    INTO
        PUBLIC.MIG_SEQ_TABLE (
            SCHEMA_NAME
            ,SEQUENCE_NAME
            ,START_WITH
            ,INCREMENT_BY
            ,MIN_VALUE
            ,MAX_VALUE
            ,CYCLE_I
            ,CACHE
            ,ORDER_I
        )
    VALUES (
        UPPER( 'scott' )
        ,UPPER( 'seq_customers' )
        ,1000
        ,1
        ,1000
        ,999999999999999
        ,TRUE
        ,20
        ,FALSE
    )
;
```

CREATE SEQUENCE with a Default Value

Input - **SEQUENCE** with a default value

```
CREATE SEQUENCE seq_orders;
```

Output

```
INSERT
    INTO
        PUBLIC.MIG_SEQ_TABLE (
            SCHEMA_NAME
            ,SEQUENCE_NAME
            ,START_WITH
            ,INCREMENT_BY
            ,MIN_VALUE
            ,MAX_VALUE
            ,CYCLE_I
            ,CACHE
            ,ORDER_I
        )
    VALUES (
        UPPER( current_schema ( ) )
        ,UPPER( 'seq_orders' )
        ,1
        ,1
        ,1
        ,999999999999999999999999999
        ,FALSE
        ,20
        ,FALSE
    )
;
```

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NEXTVAL

To migrate the NEXTVAL function, a custom function is provided for generating the next value based on **increment_by**, **max_value**, **min_value**, and **cycle**. During the DSC installation, this function should be created in all the databases where the migration is to be performed.

NEXTVAL supports all DWS versions.

NEXTVAL is a system function of Oracle and is not implicitly supported by DWS. To support this function, DSC creates a **NEXTVAL** function in the **PUBLIC** schema. The **PUBLIC.NEXTVAL** function is used in the migrated statements.

NOTE

If **MigSupportSequence** is set to **true**, NEXTVAL is migrated to PUBLIC.NEXTVAL('[schema].sequence').

If **MigSupportSequence** is set to **false**, NEXTVAL is migrated to NEXTVAL('[schema].sequence').

Before migrating the NEXTVAL function, copy the content in the **sequence_scripts.sql** file and paste it to execute the script in all the target databases. For details, see **Executing Custom DB Scripts**.

Input - NEXTVAL

```
[schema.]sequence.NEXTVAL
```

Output

```
PUBLIC.nextval('[schema.]sequence')
```

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 DSC 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 DWS. To support this function, DSC creates a **CURRVAL** function in the **PUBLIC** schema. The **PUBLIC.CURRVAL** function is used in the migrated statements.

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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 **sequence_scripts.sql** file and paste it to execute the script in all the target databases. For details, see **Executing Custom DB Scripts**.

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
;
```

5.7.1.7 PURGE

In Oracle, the **DROP TABLE** statement moves a table to the recycle bin, allowing for potential recovery. In contrast, the **PURGE** statement permanently deletes a table or index from the recycle bin, releasing all associated space. It can also empty the entire recycle bin or permanently remove specific contents from a deleted tablespace.

After migration using **Oracle** syntax, the query does not include **PURGE**.

The following examples illustrate the syntax changes for **PURGE** before and after migration.

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Pre-migration

Figure 5-12 Input: statement containing PURGE

```
Execute immediate 'Drop table
table1 purge' ;

drop table test.emp purge ;
```

Post-migration

Figure 5-13 Output: statement without PURGE

```
Execute immediate 'Drop table table1' ;


drop table test.emp ;
```

5.7.1.8 Database Keywords

DSC supports DWS keywords, such as **NAME**, **LIMIT**, **OWNER**, **KEY**, and **CAST**. These keywords must be enclosed in double quotation marks.

DWS Keywords (NAME, VERSION, LABEL, POSITION)

The keywords **NAME**, **VERSION**, **LABEL**, and **POSITION** are changed to **AS***Keyword*.

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
```

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```
 ,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,
```

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```
  JOINED AS YEAR,
  "LIMIT"
FROM
  EMPLOYEE;

SELECT
  "NAME",
  "TEXT",
  "YEAR",
  VALUE,
  DESCRIPTION,
  "LIMIT"
FROM
  EMPLOYEE_DETAILS;
```

NAME and LIMIT

Input: 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 DWS keyword OWNER

```
SELECT
        owner
    FROM
        Test_Col;
```

Output

```
SELECT
        "OWNER"
    FROM
        Test_Col;
```

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Input: Use DELETE to query the DWS keyword OWNER

```
DELETE FROM emp14
    WHERE
        ename = 'Owner';
```

Input

```
DELETE FROM emp14
    WHERE
        ename = 'Owner'
```

KEY

Blogic Operations

Input: 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 any a DWS keyword is used as an alias for any column in the SELECT list without defining the **AS** keyword, the **AS** keyword is used to define the alias.

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
```

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```
) 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.DESCRIPTION
        ,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.DESCRIPTION
        ,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
```

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```
            ,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 DWS.

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Oracle Syntax	Syntax after Migration

prompt
prompt Creating table product
prompt ==============================
prompt
create table product
(
  product_id   VARCHAR2(20),
  product_name   VARCHAR2(50)
);
	\echo
	\echo Creating table product
	\echo ==============================
	\echo
	CREATE TABLE product
	(
	  product_id VARCHAR2(20),
	  product_name VARCHAR2(50)
	);

5.7.2 COMPRESS Phrase

This function is used to comment out the **COMPRESS** phrase by default during the migration.

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)
) ;
```

5.7.3 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

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```
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) ;
```

5.7.4 Custom Tablespace

This section describes the syntax for migrating a 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
```

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```
            ,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))*/
;
```

5.7.5 Supplemental Log Data

Supplemental columns can be recorded in redo log files. The process of recording these additional columns is called supplemental logging. Oracle supports this function, but DWS 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 */
```

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```
,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*/
  )
```

5.7.6 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)
  );
```

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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)
 );
```

5.7.7 SYS_GUID

SYS_GUID is a built-in function which returns the Global Unique Identifier (GUID) for a row in a table. It accepts no arguments and returns a RAW value of 16 bytes.

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),
organization_id          NUMBER,
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),
sys_id                   VARCHAR2 (32) DEFAULT Sys_guid( )
/*, 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),
organization_id          NUMBER,
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),
sys_id                   VARCHAR2 (32) DEFAULT MIG_ORA_EXT.Sys_guid( )
/*, SUPPLEMENTAL LOG DATA (ALL) COLUMNS*/
 );
```

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5.7.8 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 5-14 Input - Order of Clauses

   ```
   SELECT
           DEPTNO
           ,COUNT( * )
           ,SUM (SAL)
       FROM
           EMP
       WHERE
           JOB = 'CLERK'
       HAVING
           SUM (SAL) >= 500
       GROUP BY
           DEPTNO
   
       ORDER BY
           DEPTNO
   ;
   ```

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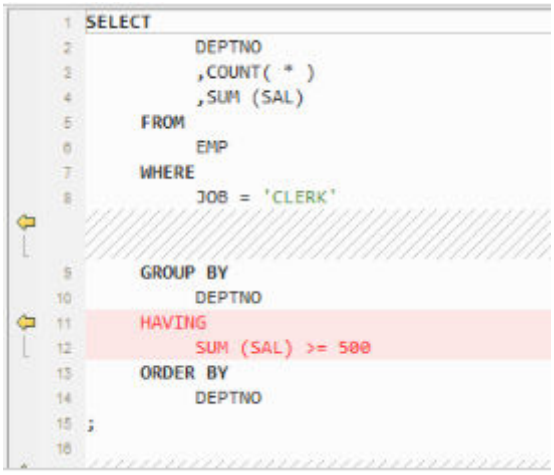
Figure 5-15 Output - Order of Clauses



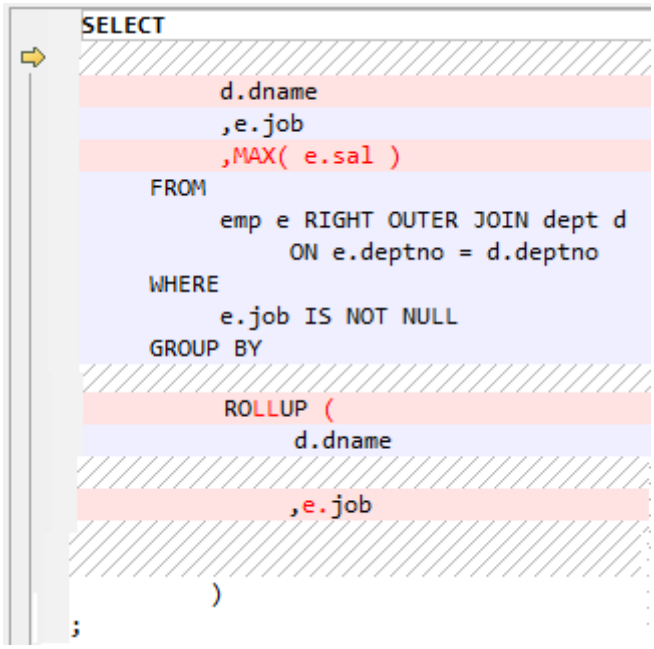
```
SELECT
        DEPTNO
        ,COUNT( * )
        ,SUM (SAL)
    FROM
        EMP
    WHERE
        JOB = 'CLERK'

    GROUP BY
        DEPTNO
    HAVING
        SUM (SAL) >= 500
    ORDER BY
        DEPTNO
;
```

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 DWS but can be enabled using the **UNION ALL** operator.

Figure 5-16 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

        )
;
```

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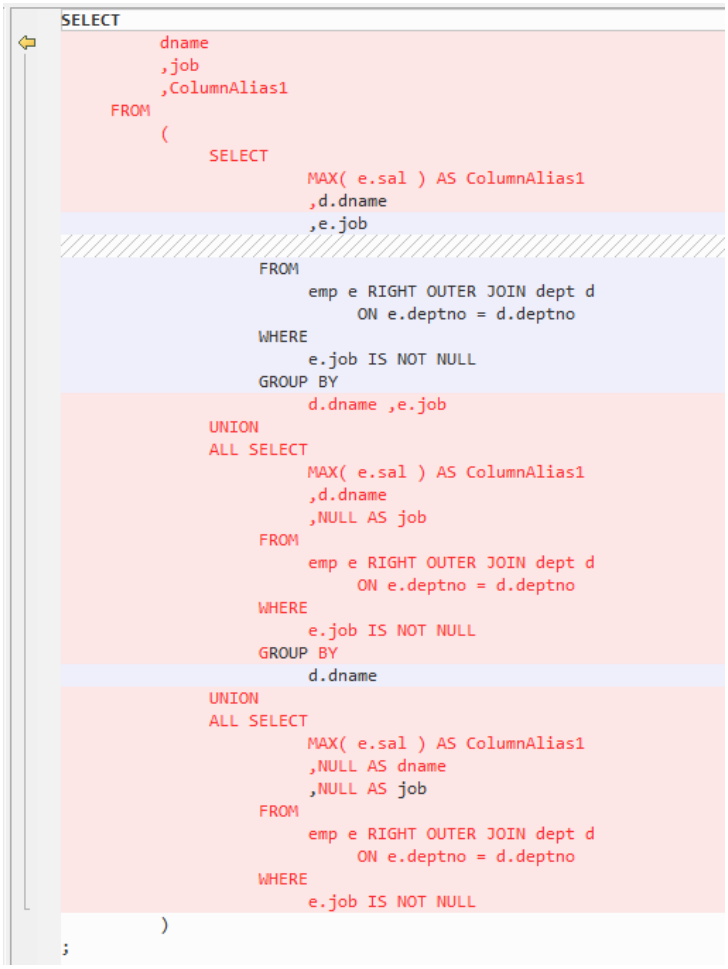
Figure 5-17 Output - Extended group by clause



```
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
        )
;
```

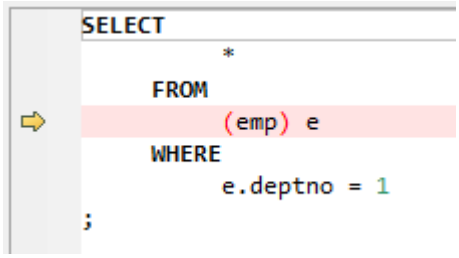
GROUPING_ID and ROLLUP

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 5-18 Input - Table name inside brackets



```
SELECT
        *
    FROM
        (emp) e
    WHERE
        e.deptno = 1
;
```

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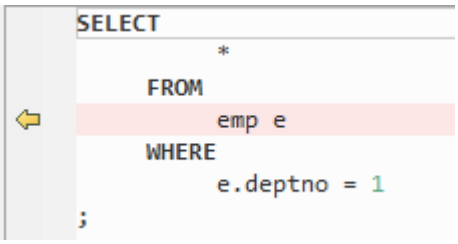
Figure 5-19 Output - Table name inside brackets



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.needing_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
```

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```
                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.needing_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. The **svproduct_is_for_pa** function in **4_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.needing_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
```

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```
    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).

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Figure 5-20 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
```

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Figure 5-21 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.

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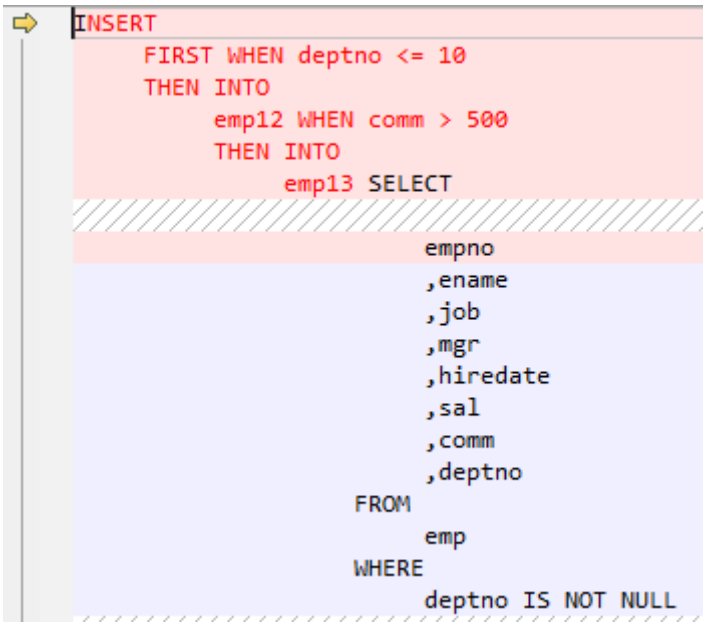
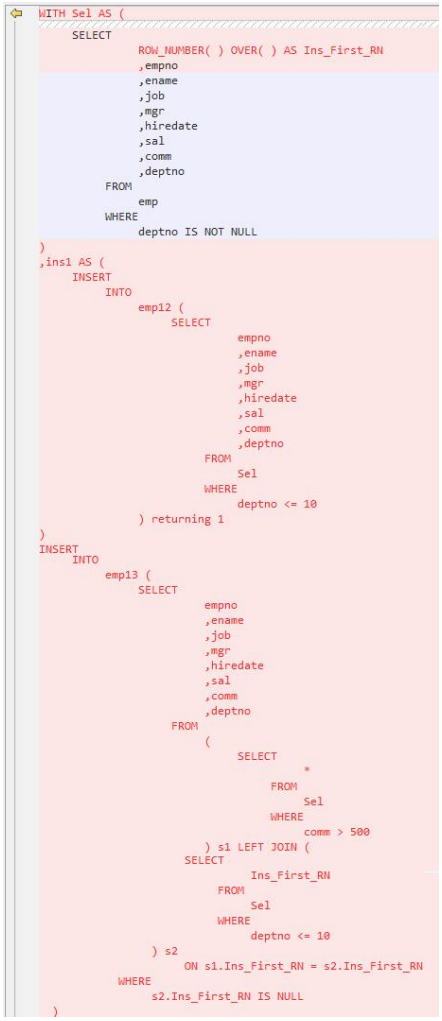
Figure 5-22 Input - Insert first



```
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 5-23 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
)
```

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3. **INSERT with Table Alias**

   The Oracle **table aliases** are 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
```

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```
            ,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
```

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```
            )
;
```

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.

DSC uses multiple methods to migrate **MERGE** to SQL statements compatible with DWS.

Configure parameter **mergeImplementation** as follows:

- Set to **With** by default. In this option, the target query is converted as a CTE.

Figure 5-24 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

;
```

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Figure 5-25 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 5-26 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);
```

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Figure 5-27 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;
```

5.7.9 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 5-28 Input - ROWID

```
SELECT
        empid
        ,ename
        ,ROWID
    FROM
        employees
;
```

Figure 5-29 Output - ROWID

```
SELECT
        empid
        ,ename
        ,CAST( ( xc_node_id || '#' || tableoid || '#' || ctid ) AS TEXT ) AS rowid
    FROM
        employees
;
```

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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 5-30 Input - ROWNUM

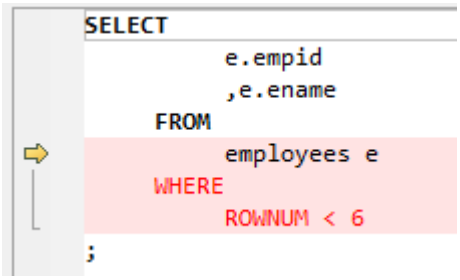
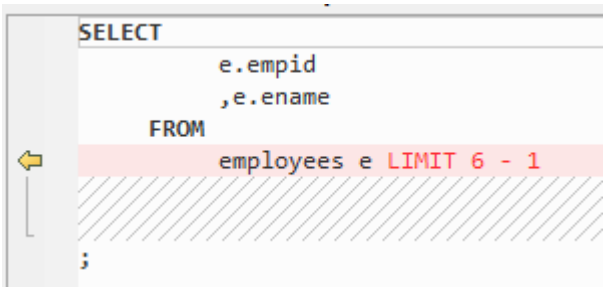


Figure 5-31 Output - ROWNUM



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

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```
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

The UPDATE and DELETE scripts migrated using **ROWNUM** contain **LIMIT**, which is not supported by DWS.

```
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
      );
```

5.7.10 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.

DWS does not support the **+** operator. The function of this operator is enabled using **LEFT OUTER JOIN** and **RIGHT OUTER JOIN** keywords.

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Figure 5-32 Input: OUTER JOIN

```
SELECT
        empno
        ,ename
        ,job
        ,dname
        ,loc
    FROM
        emp
        ,dept
    WHERE
        emp.deptno = dept.deptno (+)
        AND salary > 50000
;
```

Figure 5-33 Output: OUTER JOIN

```
SELECT
        empno
        ,ename
        ,job
        ,dname
        ,loc
    FROM
        emp LEFT OUTER JOIN dept
            ON emp.deptno = dept.deptno
    WHERE
        salary > 50000
```

5.7.11 OUTER QUERY (+)

DWS supports JOIN, so the **supportJoinOperator** parameter 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
;
```

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```
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
;
```

5.7.12 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
```

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```
            ,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'
```

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```
  AND nvl( enabled_flag ,'Y' ) = 'Y'
  AND pr.product_code = rec_product1.service_product_code
ORDER BY LEVEL;
```

5.7.13 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**.

5.7.13.1 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 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
```

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```
    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' */))
 );
```

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;
```

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```
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 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 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.

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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 the target databases to which data is to be migrated. 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 5-34 Input - SYSTIMESTAMP

```
SELECT
        SYSTIMESTAMP
    FROM
        tab1
;
```

Figure 5-35 Output - SYSTIMESTAMP

```
SELECT
        CURRENT_TIMESTAMP
    FROM
        tab1
;
```

5.7.13.2 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

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```
[sys.]dbms_lob.append(o_menuxml, to_clob('DSJKSDAJKSFDA'));
```

Output

```
o_menuxml := CONCAT(o_menuxml, 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 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

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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('abcddedf');
    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('abcddedf' 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('abcddedf');
    DBMS_OUTPUT.PUT_LINE(v_clob);
```

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```
    DBMS_LOB.FREETEMPORARY(v_clob);
end;
/
```

Output

```
DECLARE v_clob clob;
BEGIN
    -- DBMS_LOB.CREATETEMPORARY(v_clob, TRUE, DBMS_LOB.SESSION);
    v_clob := CAST('abcddedf' 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('abcddedf');
    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( 'abcddedf' 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 n^{th} 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
  …
```

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```
    pos := DBMS_LOB.INSTR(str,septr,1, i);
  ...
END;
/
```

Output

```
BEGIN
  …
    pos := INSTR(str,septr,1, i);
  ...
END;
/
```

DBMS_LOB.SUBSTR

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);
```

5.7.13.3 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.

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Figure 5-36 Input - Listagg

```
SELECT
        deptno
        ,ename
        ,LISTAGG (
            ename
            ,': '
        ) OVER( PARTITION BY deptno ,ename ORDER BY ename ) AS rn
    FROM
        emp
    ORDER BY
        deptno
        ,ename
;
```

Figure 5-37 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)
;
```

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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 5-38 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 5-39 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 value 2.

Input - NVL2

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```
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 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

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```
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 5-40 Input - Quote

```
SELECT
          q'[It's a string quote operator.]'
     FROM
          dual
;
```

Figure 5-41 Output - Quote

```
SELECT
          $q$It's a string quote operator.$q$
     FROM
          dual
;
```

5.7.13.4 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
```

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```
        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
```

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```
        ,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
```

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```
                ,Empno
                ,NULL AS Ename
            FROM
                emp1
            GROUP BY
                Empno
        )
    ORDER BY
        Ename
        ,Deptno
        ,Empno
;
```

5.7.13.5 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 REGXP_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

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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
```

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```
            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
```

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```
            ,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.

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```
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 ( 'foobarbequebazilbarfbonk barbeque' ,'(b[^b]+)(b[^b]+)' ) )
    FROM
        DUAL
;
```

Output

```
SELECT
        UPPER( MIG_ORA_EXT.REGEXP_REPLACE ( 'foobarbequebazilbarfbonk 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
```

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```
    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, '.*/', '');
```

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```
THEN  v_auth_type := 102;
        ELSIF v_status IN ('0100', '0200')
                AND REGEXP_INSTR (v_role_str, ',(411|414),') > 0''
```

5.7.14 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

Currently, DWS does not support **set define off/on** and **spool off**. After being converted by the DSC tool, related commands are commented out in the target database.

Oracle Syntax	Syntax After Migration

set define off
spool ORACLE.log
create table product
(
  product_id VARCHAR2(20),
  product_name VARCHAR2(50)
);
spool off
	/*set define off;*/
	/*spool ORACLE.log*/
	CREATE TABLE product
	(
	  product_id VARCHAR2(20),
	  product_name VARCHAR2(50)
	);
	/*spool off*/

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

Procedure Call

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EDITIONABLE

DWS does not support the **EDITIONABLE** keyword. You need to delete it from the destination 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 5-42 Input - PL/SQL

```
BEGIN
 ...
 v_rowcount : = SQL%ROWCOUNT;
 ..
END;
```

Figure 5-43 Output - PL/SQL

```
BEGIN
 ...
 v_rowcount := SQL%ROWCOUNT;
 ..
END;
```

END

END with label is not supported, 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;
```

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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

DWS does not support **EXCEPTION** handling. To migrate scripts, set the **exceptionHandler** parameter to **True**.

For DSC, this parameter must be set to the default value **False**.

Figure 5-44 Input - EXCEPTION Handling

```
CREATE
    OR REPLACE FUNCTION get_salary ( n_emp_id NUMBER ) RETURN NUMBER IS n_salary NUMBER ( 8 ,2 ) ;
    BEGIN
         SELECT
                  salary INTO n_salary
              FROM
                  employees
              WHERE
                  id = n_emp_id ;
                  RETURN n_salary ;
              EXCEPTION WHEN NO_DATA_FOUND
         THEN RETURN NULL ;
         WHEN TOO_MANY_ROWS
    THEN RETURN NULL ;
END get_salary ;
/
```

Figure 5-45 Output - EXCEPTION Handling

```

CREATE
    OR REPLACE FUNCTION get_salary ( n_emp_id NUMBER ) RETURN NUMBER IS n_salary NUMBER ( 8 ,2 ) ;
    BEGIN
         SELECT
                  salary INTO n_salary
              FROM
                  employees
              WHERE
                  id = n_emp_id ;
                  RETURN n_salary ;
              /* EXCEPTION WHEN NO_DATA_FOUND THEN RETURN NULL ; WHEN TOO_MANY_ROWS THEN RETURN NULL ;  */
    end ;


    /
```

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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 5-46 Input - Subtransaction Handling

```
CREATE
    OR REPLACE FUNCTION SUB_TRANSACTION ( x NUMBER ,y VARCHAR2 ) RETURN NUMBER IS id_val NUMBER ( 8 ,2 ) ;
    BEGIN
         INSERT INTO employees ( id ,first_name )
    VALUES ( x ,y ) ;
    UPDATE
         employees
    SET
         id = x
    WHERE
         first_name = y ;

         commit ;
    select
         id into id_val
    from
         employees
    where
         first_name = 'James' ;
         DELETE
         FROM
              employees
         WHERE
              first_name = y ;
              RETURN id_val ;

         Rollback ;
END SUB_TRANSACTION ;
/
```

Figure 5-47 Output - Subtransaction Handling

```
CREATE
    OR REPLACE FUNCTION SUB_TRANSACTION ( x NUMBER ,y VARCHAR2 ) RETURN NUMBER IS id_val NUMBER ( 8 ,2 ) ;
    BEGIN
         INSERT INTO employees ( id ,first_name ) select
                   x ,y ;
                   UPDATE
              employees
         SET
              id = x
         WHERE
              first_name = y ;
              /* commit; */
         null ;
         select
              id into id_val
         from
              employees
         where
              first_name = 'James' ;
              DELETE
              FROM
                   employees
              WHERE
                   first_name = y ;
                   RETURN id_val ;
              /* Rollback; */
         null ;
end ;
/
```

STRING

The Oracle PL/SQL string type is not supported by DWS. This data type is handled by using VARCHAR.

Figure 5-48 Input - STRING

```
--STRING
 CREATE
    OR REPLACE FUNCTION text_length ( a CLOB ) RETURN String DETERMINISTIC IS BEGIN
              RETURN DBMS_LOB.GETLENGTH ( a ) ;
    END text_length ;
    /
```

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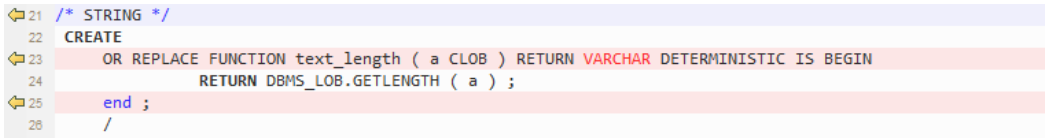
Figure 5-49 Output - STRING



```
/* STRING */
 CREATE
     OR REPLACE FUNCTION text_length ( a CLOB ) RETURN VARCHAR DETERMINISTIC IS BEGIN
                RETURN DBMS_LOB.GETLENGTH ( a ) ;
     end ;
     /
```

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.

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Figure 5-50 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 5-51 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 DWS. DSC removes spaces between the operators.

Figure 5-52 Input - Relational operator

```
--RELATIONAL OPERATOR
CREATE
    OR REPLACE FUNCTION REL_OPTR ( n_emp_id NUMBER ) RETURN NUMBER IS n_salary NUMBER ( 8 ,2 ) ;
    BEGIN
         SELECT
                 salary INTO n_salary
            FROM
                 employees
            WHERE
                 id > = n_emp_id ;
                 RETURN n_salary ;
    END REL_OPTR ;
    /
```

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Figure 5-53 Output - Relational operator

```
/* RELATIONAL OPERATOR */
CREATE
    OR REPLACE FUNCTION REL_OPTR ( n_emp_id NUMBER ) RETURN NUMBER IS n_salary NUMBER ( 8 ,2 ) ;
    BEGIN
         SELECT
                  salary INTO n_salary
             FROM
                  employees
             WHERE
                  id >= n_emp_id ;
                  RETURN n_salary ;
    end ;
    /
```

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: &wdbs 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.

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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' ) ;
```

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```
END sp_dd_table ;
/
```

Output

```
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 ;
/
```

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;
```

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```
/
```

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;
```

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```
  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. For example, in **SAD.SAD_CALC_ITEM_PKG_TEST_OB#error_msg ( )**, **error_msg** is defined without parameter, as shown below:

```
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,
```

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```
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 ;
```

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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 ) ;
```

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```
    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 ;
/
```

5.7.15 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 determines how data behaves and is structured in applications, using both built-in and user-defined data types. 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
```

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```
        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 ;
```

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```
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';
…
```

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EXTEND

DWS supports keyword **EXTEND**.

Input - Extend

```
FUNCTION FUNC_EXTEND ( in_str  IN   VARCHAR2)
    RETURN ARRYTYPE
  AS
    v_count2    INTEGER;
    v_strlist   arrytype;
    v_node      VARCHAR2 (2000);
  BEGIN
    v_count2 := 0;
    v_strlist := arrytype ();
   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 ARRYTYPE AS v_count2 INTEGER ;
v_strlist arrytype ;
v_node VARCHAR2 ( 2000 ) ;
BEGIN
        v_count2 := 0 ;
        v_strlist := arrytype ( ) ;
    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 ;
    /
```

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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 VARRY.

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_remitparammgmt_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;
/
```

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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

PL/SQL's **SUBTYPE** statement enables the creation of aliases for user-defined subtypes or predefined data types, also known as abstract data types.

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
```

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```
    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

Since DWS does not support **SUBTYPE**, you will have to substitute it with the actual type that was used when creating the **SUBTYPE** variable.

5.7.16 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**.

5.7.16.1 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.

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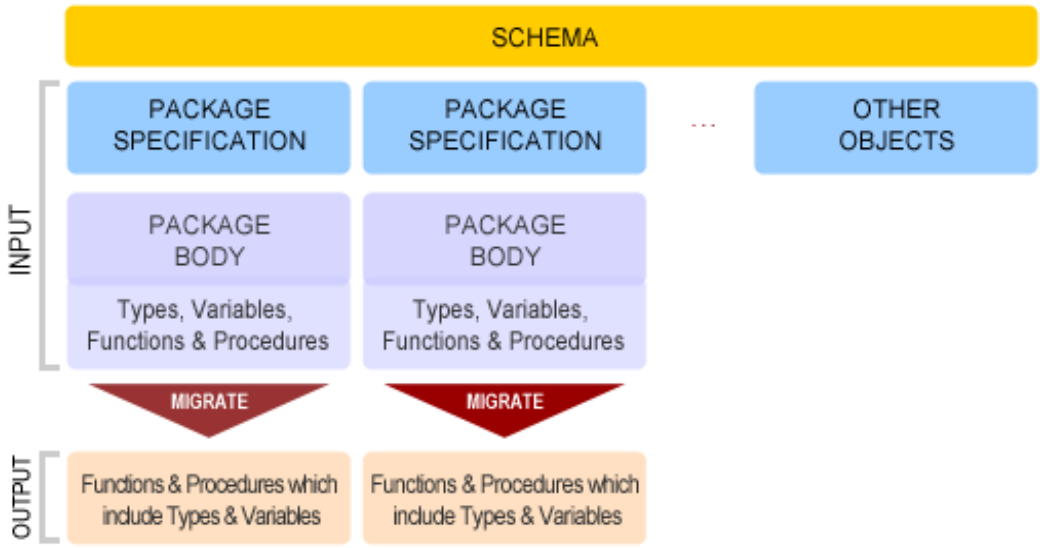
Figure 5-54 Migration of PL/SQL packages



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 ;
```

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```
        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 ;
```

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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
```

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```
    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;
```

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```
   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;
```

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```
---
END;
```

NOTE

Remove the SYS schema while calling the package.

Input - Procedure/Function variable

The variable declaration of DWS does not support the NULL constraint. Therefore, you need to comment out 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_statusvarchar2 ( 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' ;
--------------
```

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```
--------------
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 belong 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.

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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;
```

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```
    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;
```

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```
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 ;
```

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```
  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 ;
/
```

5.7.16.2 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 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 ) ;
```

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```
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 ,$q$sysdate$q$ ,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 ,$q$CURRENT_TIMESTAMP$q$ ,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 ) ;
```

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```
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
```

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```
  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.

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```
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';
```

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```
 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 ) ;
```

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```
   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 ) ;
```

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```
    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
```

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```
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) ;
```

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```
    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 declare as **EXCEPTION**. DWS does not support this function.

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'
```

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```
    ,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
    ,$q$pkg_etl.proc_set_chain ('DAILY ARPU')$q$
    ,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 ) ;
```

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```
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, varaible1 PLS_INTEGER ==> varaible1 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
```

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```
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 varaible1 PLS_INTEGER ==> varaible1 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
```

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```
        ,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 ;
```

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```
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
```

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```
   , 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_SPLI
T_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';
```

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```
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
```

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```
    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.

5.7.16.3 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;
/
```

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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;
/
```

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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
```

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```
PACKAGE
IS
  l_func_name VARCHAR2(100) ;
BEGIN
   l_func_name := 'bas_dml_lookup_pkg' || '.' || 'func_name' ;
   RETURN l_func_name ;

END ;
/
```

5.7.16.4 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_emptyp** (local REF CURSOR) and ref_strong_emptyp (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_emptyp IS REF CURSOR RETURN emp_o%ROWTYPE;
    PROCEDURE p_get_employees ( v_id in INTEGER ,po_results OUT ref_strong_emptyp );

END pkg_refcur ;
/

# Package body
CREATE OR REPLACE PACKAGE BODY pkg_refcur
IS
    TYPE lref_strong_emptyp IS REF CURSOR RETURN emp_o%ROWTYPE ;
    var_num NUMBER ;

    PROCEDURE p_get_employees ( v_id IN INTEGER, po_results OUT ref_strong_emptyp )
    is
        vemp_rc lref_strong_emptyp ;
    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
```

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```
            emp_o e
        WHERE
            e.id = v_id ;
            EXCEPTION WHEN OTHERS
        THEN RAISE ;
 END ;
 /
```

5.7.16.5 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 getNovaInfo (
     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
;
```

5.7.17 VARRAY

REF CURSOR is defined as a return parameter.

It can be migrated after **plsqlCollection** 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

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```
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;
```

5.7.18 Granting Execution Permissions

This feature is used to give privileges to users for specific 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 ;
```

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```
    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 ;
/
```

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```
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;
```

5.7.19 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.
```

5.7.20 Data Type

Subtype

Customized types 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;
```

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```
END bas_dml_lookup_pkg;
/
```

%ROWTYPE

The procedures/functions in the package contain the **%ROWTYPE** attribute of the **IN**/**OUT** parameter. This is not supported

Scripts: BAS_DML_SERVICE_PKG.SQL and BAS_LOOKUP_MISC_PKG.SQL

INPUT

```
CREATE OR REPLACE PACKAGE BODY "SAD"."BAS_DML_SERVICE_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_SERVICE_PKG;
```

OUTPUT

```
CREATE
OR REPLACE PROCEDURE SAD.BAS_DML_SERVICE_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_SERVICE_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_SERVICE_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_SERVICE_PKG#save_split_ou
 ( pi_split_ou IN mig_typ_split_ou
    ,po_error_msg OUT VARCHAR2 )
PACKAGE
IS
BEGIN
```

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```
        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 ;
/
```

5.8 Netezza Syntax Migration

5.8.1 Tables

Distribution Key

DISTRIBUTE ON (column) should be migrated to DISTRIBUTE BY HASH (column).

Netezza Syntax	Syntax After Migration
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) ;	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) */ ;

ORGANIZE ON

ORGANIZE ON will be commented out.

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Netezza Syntax	Syntax After Migration
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) ;	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)*/ ;

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
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) ;	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) */ ;

5.8.2 PROCEDURE with RETURNS

PROCEDURE with RETURNS will be modified to FUNCTION with RETURN.

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Netezza Syntax	Syntax After Migration

CREATE OR REPLACE PROCEDURE "DWDB"."EDW"."SP_O_HXYW_LNSACCTINFO_H"(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_START,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;
	CREATE OR REPLACE FUNCTION "EDW"."SP_O_HXYW_LNSACCTINFO_H"(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_START,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;
	/

Qualifying Language

Migrate the nzplSQL language to the plpgSQL language or delete the language.

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Netezza Syntax	Syntax After Migration

CREATE OR REPLACE PROCEDURE "DWDB"."EDW"."SP_O_HXYW_LNSACCTINFO_H"(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_START,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;
	CREATE OR REPLACE FUNCTION "EDW"."SP_O_HXYW_LNSACCTINFO_H"(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_START,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;
	/

Process Compilation Specification

The process which is started with **Begin_PROC** and ended with **END_PROC** should be removed.

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Netezza Syntax	Syntax After Migration

CREATE OR REPLACE PROCEDURE "DWDB"."EDW"."SP_O_HXYW_LNSACCTINFO_H"(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_START,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;
	CREATE OR REPLACE FUNCTION "EDW"."SP_O_HXYW_LNSACCTINFO_H"(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_START,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;
	/

DECLARE Keyword to Declare the Local Variables

DECLARE should be modified to AS.

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Netezza Syntax	Syntax After Migration

CREATE OR REPLACE PROCEDURE "DWDB"."EDW"."SP_O_HXYW_LNSACCTINFO_H"(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_START,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;
	CREATE OR REPLACE FUNCTION "EDW"."SP_O_HXYW_LNSACCTINFO_H"(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_START,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;
	/

5.8.3 Procedure

Variable Data Type

NVARCHAR changed to NCHAR VARING.

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Netezza Syntax	Syntax After Migration

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;
	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;
	/

row counts

The **row_count** function is supported for affected row counting.

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Netezza Syntax	Syntax After Migration
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;	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; /

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
BEGIN SELECT COUNT(*) INTO V_CNT FROM _V_SYS_COLUMNS WHERE table_schema = 'SCOTT' AND TABLE_NAME='TMPO_HXYW_LNSACCTINFO_H1'; if V_CNT>0 then EXECUTE IMMEDIATE 'DROP TABLE TMPO_HXYW_LNSACCTINFO_H1'; end if; END;	BEGIN SELECT COUNT(*) INTO V_CNT FROM information_schema.columns WHERE table_schema = 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;

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NOTE

Column mapping:

- table_schema => 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
SELECT CAST(T1.Buyback_Mature_Dt - CAST('${gsTXDate}' AS DATE) AS CHAR(5)) FROM tab1 T1 WHERE T1.col1 > 10; ----- SELECT CURRENT_DATE - DATE '2019-03-30';	SELECT CAST(EXTRACT('DAY' FROM (T1.Buyback_Mature_Dt - CAST('${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)));

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
TRANSLATE(param1) TRANSLATE(1st param, 2nd param, 3rd param) TRANSLATE(1st param, 2nd param, 3rd param, 4th param)	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))

NOTE

If it contains a single parameter, just execute 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)

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Netezza Syntax	Syntax After Migration

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;
	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;
	/

CHARACTER VARYING (ANY)

Netezza Syntax	Syntax After Migration

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;
	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;
	/

Numeric (ANY)

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Netezza Syntax	Syntax After Migration

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_enddate);
if ERROR_INFO != V_VC_SUCCESS then
V_VC_YCBZ := 'C';
end if;
 	
RETURN V_VC_SUCCESS;
 	
END;
END_PROC;
	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_enddate);
	if ERROR_INFO != V_VC_SUCCESS then
	V_VC_YCBZ := 'C';
	end if;
	
	RETURN V_VC_SUCCESS;
	
	END;
	/

Exception

TRANSACTION_ABORTED

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Netezza Syntax	Syntax After Migration

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_enddate);
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;
	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_enddate);
	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;
	/

END statement is specified without semicolon (;)

END statement specified without semicolon (;) is migrated as follows:

END /

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Netezza Syntax	Syntax After Migration

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) := 'ABCDEFGHIJKLMNOPQR-
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;
	CREATE OR REPLACE FUNCTION
	sp_ntz_end_wo_semicolon
	(NATIONAL CHARACTER VARYING(10))
	RETURN CHARACTER VARYING
	AS
	v_B64 Varchar(64) := 'ABCDEFGHIJKLMNOPQR-
	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;
	/

LOOP

Netezza Syntax	Syntax After Migration

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;
	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;
	/

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DWS Keywords

CURSOR

Netezza Syntax	Syntax After Migration

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;
	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;
	/

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DECLARE

Netezza Syntax	Syntax After Migration

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;
	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;
	/

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EXECUTE AS CALLER

Netezza Syntax	Syntax After Migration

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;
	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;
	/

Expression

SELECT result assign into variable.

Netezza Syntax	Syntax After Migration

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;
	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;
	/

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5.8.4 System Functions

ISNULL()

Netezza Syntax	Syntax After Migration
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;	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;

NVL

Second parameter is missing.

Netezza Syntax	Syntax After Migration
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;	SELECT 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;

DATE

Casting the data type.

Netezza Syntax	Syntax After Migration
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; 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;	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;

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analytic_function

Netezza Syntax	Syntax After Migration
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;	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;

Stored Procedure

Netezza Syntax	Syntax After Migration

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_START,0,0);
 	
RETURN O_RETURN;
 	
END;
END_PROC;
	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_START,0,0);
	
	RETURN O_RETURN;
	
	END;
	/

5.8.5 Operator

**

Netezza Syntax	Syntax After Migration
V_Out := V_Out + v_J * (v_N ** v_K) ;	V_Out := V_Out + v_J * (v_N ^ v_K) ;

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NOTNULL and ISNULL

Netezza Syntax	Syntax After Migration
CASE WHEN ((A1.EXCEPT_OFF_SEQU_NO NOTNULL) AND (A2.LOG_SEQU_NO ISNULL)) THEN 0 ELSE 1 END AS FLG	CASE WHEN ((A1.EXCEPT_OFF_SEQU_NO NOTNULL) AND (A2.LOG_SEQU_NO ISNULL)) THEN 0 ELSE 1 END AS FLG

5.8.6 DML

DWS Keyword: SOURCE Specified As the Column Alias Without the AS Keyword

Netezza Syntax	Syntax After Migration
SELECT SUBSTR(OP_SOURCE ,1 ,4) SOURCE , ONLINE_FLAG, 'TRD' AS SRC_SYS , CURRENT_TIMESTAMP AS ETL_LOAD_TIME FROM tb_keyword_source;	SELECT SUBSTR(OP_SOURCE ,1 ,4) AS SOURCE , ONLINE_FLAG, 'TRD' AS SRC_SYS , CURRENT_TIMESTAMP AS ETL_LOAD_TIME FROM tb_keyword_source;

FREEZE

Netezza Syntax	Syntax After Migration
INSERT INTO tmp_tb_keyword_freeze (BRANCH_CODE, FREEZE, UNFREEZE, BRAN_JYSDM) SELECT BRANCH_CODE, FREEZE, UNFREEZE, BRAN_JYSDM FROM tb_keyword_freeze;	INSERT INTO tmp_tb_keyword_freeze (BRANCH_CODE, "FREEZE", UNFREEZE, BRAN_JYSDM) SELECT BRANCH_CODE, "FREEZE", UNFREEZE, BRAN_JYSDM FROM tb_keyword_freeze;

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
SELECT username owner FROM tb_ntz_keyword_owner;	SELECT username AS owner FROM tb_ntz_keyword_owner;

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ATTRIBUTE (AS should be specified)

Netezza Syntax	Syntax After Migration
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;	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;

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5.8.7 Unique Index

Unique Index

Netezza Syntax	Syntax After Migration
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);	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

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Netezza Syntax	Syntax After Migration
	ADD constraint uq_prod UNIQUE (prod_no); */

NOTE

This feature is applicable only for COLUMN store. For ROW store, Unique Index should not be commented.

5.9 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.

Question 2: How do I configure DSC to enable Teradata to support version GaussDB 200 V100R002C60?

Answer: Perform the following steps to set table variables to support the GaussDB 200 V100R002C60 version:

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*.

5.10 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.

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Table 5-38 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.
Disk is almost full. Please clear the space and re-run the tool.	**Cause**: Insufficient space on the disk. **Solution**: Free space from the disk and retry the operation.
Please enter valid input parameters, Kindly refer the user manual to execute.	**Cause**: The possible cause could be: 1. No valid parameters are specified. 2. The short keys are in lower case. **Solutions**: 1. Provide all mandatory parameters when performing migration. 2. Ensure all short keys are in upper case.
No SQL files found in input folder. Hence stopping migration.	**Cause**: No valid SQL files are present in the input folder during the migration process. **Solution**: Ensure SQL files to be migrated are present in the input folder. For details, see **Migration Process**.
Migration Application failed to start : Currently we are not supporting this Database : *<database-name>*	**Cause**: Incorrect database name mentioned in the source database parameter. **Solution**: Use only Teradata or Oracle as values to the source database parameter.
Output folder is not set. Please enter an output folder and refer the user manual for syntax.	**Cause**: The output folder path is not specified. **Solution**: Specify a valid path for the output folder parameter.

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Symptom/Issue	Cause and Solution
java.lang.OutOfMemoryError: GC overhead limit exceeded.	**Cause**: During migration, if the memory usage exceeds the preset value, DSC displays the error message and exits. **Solution**: Change the values of **initialJVMMemory** and **maxJVMMemory** in the **application.properties** configuration file to allocate more memory.
ascii "****" does not map to charset	**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. **Solution**: Set **encodingFormat** to the actual encoding format and try again. Example: 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 Extracting SQL contents from perl files started ascii "\xFF" does not map to Unicode at core/teradatacore.pm line 1270. ascii "\xFE" does not map to Unicode at core/teradatacore.pm line 1270. ascii "\xFE" does not map to Unicode at core/teradatacore.pm line 1270. ascii "\xFF" does not map to Unicode at core/teradatacore.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 **********

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Error codes

Table 5-39 Error codes

Error Code	Error Information
Teradata	
DSC_ERR_003_001	Query/statement is not supported since the Teradata view "dbc.indices" is supported only for the indextype P and Q.
DSC_ERR_003_002	Error in Bteq processing. Something went wrong while processing the BTEQ commands.
DSC_ERR_003_003	Query/statement is not supported in ddl DSC. Please check the same and refer user manual for the supported feature list.
DSC_ERR_003_004	Unsupported format decimal format like ZZZ99Z, ZZZ.ZZ9.
DSC_ERR_003_005	The tool does not support the "IN/NOT IN to EXISTS/NOT EXISTS conversion" for the query in which its outer query refers multiple tables and the column(s) specified with IN / NOT IN operator do not have table reference.
DSC_ERR_003_006	The tool does not support the query in which its outer query refers multiple tables and the column(s) specified with IN / NOT IN operator do not have table reference.
DSC_ERR_003_007	Primary Index without column is not supported.
DSC_ERR_003_008	TeradataQuerySplitter config file contains list is not supported.
DSC_ERR_003_009	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.

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Error Code	Error Information
DSC_ERR_003_010	Gauss does not have an equivalent syntax for CHARACTER SET & CASE SPECIFIC option in column-level. Please enable the config_param tdMigrateCharsetCase to comment the CHARACTER SET & CASE SPECIFIC option syntax in the statement.
DSC_ERR_003_011	Gauss does not have equivalent syntax for LOCK option in CREATE VIEW and INSERT statement. You can rewrite this statement or set the configuration parameter tdMigrateLOCKOption to TRUE to comment the LOCK syntax in this statement.
DSC_ERR_003_012	Invalid width (Number of rows) parameter in MDIFF function.
DSC_ERR_003_013	First 2 parameters should be present in MDIFF function.
DSC_ERR_003_014	Query/statement is not supported as ORDER BY clause is not present in TOP WITH TIES. Please check the same and refer user manual.
DSC_ERR_003_015	Column mismatch for the TITLE conversion.
DSC_ERR_003_016	Query/statement is not supported as same Table alias is addressed in both inner and outer query. Please check the same and refer user manual for the supported feature list.
DSC_ERR_003_017	Sub query list does not have columns.
DSC_ERR_003_018	Number of expressions specified in the outer query does not match with inner query.
DSC_ERR_003_019	Error while loading the .RUN FILE from given location.
DSC_ERR_003_020	Unable to delete the file, file not found.
DSC_ERR_003_021	Unable to delete the file, failed with IOEXception.
DSC_ERR_003_022	Please specify the value for environment_file_path parameter in features-teradata.properties.

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Error Code	Error Information
Application	
DSC_ERR_004_001	Application has timed out, exceeded the hours specified in the config file. Please configure the Timeout parameter in the application.properties to higher value.
DSC_ERR_004_002	Error while loading the property files from config directory.
DSC_ERR_004_003	Error while loading the property files from config directory, directory is not readable.
DSC_ERR_004_004	Error while loading the property file.
DSC_ERR_004_005	Unable to load the JSON file.
DSC_ERR_004_006	DSC tool does not support this Conversion type provided.
DSC_ERR_004_007	Error occurred while framing output replacement query.
DSC_ERR_004_008	Invalid index value while parsing the script.
DSC_ERR_004_009	Error in conversion process, unable to convert the script.
DSC_ERR_004_010	No SQL files found in the input directory with the extension specified in the fileExtension property in application.properties.
DSC_ERR_004_011	The query length parameter (MaxSqlLen) value is not valid.
DSC_ERR_004_012	Since the input folder has write privileges to Group and/or Others, process is stopped due to security reason.
DSC_ERR_004_013	Since the output directory has write privileges to Group and/or Others, process is stopped due to security reason.
DSC_ERR_004_014	Disk is almost full. Please clear the space and re-run the tool.
DSC_ERR_004_015	DSC has been cancelled as configured by the user.

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Error Code	Error Information
DSC_ERR_004_016	Error occurred while formatting the sql scripts.
DSC_ERR_004_017	Invalid index specified for fetching the element from list while formatting the scripts
DSC_ERR_004_018	Error occurred while converting from string to integer.
DSC_ERR_004_019	Input File is modified while DSC is in progress.
DSC_ERR_004_020	Process is null, unable to read encoding format.
DSC_ERR_004_021	Target File does not have write permissions.
DSC_ERR_004_022	The target directory does not have write privileges to Group and/or Others, process is stopped due to security reason.
DSC_ERR_004_023	PL/SQL object contains incorrect DDL/ Query. Please check the script for the query position specified in the log.
DSC_ERR_004_024	PreQueryValidation failed due to bracket mismatch or invalid terminator.
DSC_ERR_004_025	Conversion task name is not valid.
DSC_ERR_004_026	Database entered by the user is not supported by the DSC tool.
DSC_ERR_004_027	Gauss db password should not be empty.
DSC_ERR_004_028	Gauss db password should not be empty.
DSC_ERR_004_029	Target db entered in the Gaussdb.properties is not valid.
DSC_ERR_004_030	User name entered in the Gaussdb.properties is empty.
DSC_ERR_004_031	Port entered in the Gaussdb.properties is not valid.
DSC_ERR_004_032	IP entered in the Gaussdb.properties is not valid.

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Error Code	Error Information
DSC_ERR_004_033	Database name entered in the Gaussdb.properties is empty.
DSC_ERR_004_034	DSC Application failed to start.
DSC_ERR_004_035	Since the environment variable path has write privileges to Group and/or Others, process is stopped due to security reason.
DSC_ERR_004_036	Error while loading environment parameter File.
DSC_ERR_004_037	Invalid input (empty/space/string value) for the parameter NoOfThreads in application.properties. Hence taking the default processes.
DSC_ERR_004_038	Input for the parameter NoOfThreads in application.properties is less than 1. Hence taking the default processes.
DSC_ERR_004_039	Error in processing the DDL query.
DSC_ERR_004_040	Error in processing the PL/SQL query.
DSC_ERR_004_041	Error in post processing the query.
DSC_ERR_004_042	Invalid application timeout value, default to 4 hours.
DSC_ERR_004_043	Error in writing the output file.
DSC_ERR_004_044	Error in reading the input file.
DSC_ERR_004_045	No valid files found in the input directory for migration.
DSC_ERR_004_046	Query is not converted as it contains unsupported keyword.
DSC_ERR_004_047	Error while reading the property.
DSC_ERR_004_048	PreQueryValidation failed due to query exceeds maximum length (MaxSqlLen config parameter).
DSC_ERR_004_049	Thread count entered in the Gaussdb.properties is not valid.
Wrapper	
DSC_ERR_005_003	Reading file Failed with error: File not found Exception.

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Error Code	Error Information
DSC_ERR_005_004	Reading file Failed with error: IOException.
DSC_ERR_005_005	Root privileged users are not allowed to execute the DSC tool.
DSC_ERR_005_006	Error while getting the id of os user used to execute the DSC tool.
DSC_ERR_005_007	Arguments specified is not valid, please check the user manual for the command line arguments.
DSC_ERR_005_008	File name is not specified for reading the encoding type.
DSC_ERR_005_009	Invalid argument specified for the encoding parameter.
DSC_ERR_005_010	Source database is not set. Please enter a valid source db and refer the user manual for syntax.
DSC_ERR_005_011	Commandline database specified for source to target is not supported by the DSC tool.
DSC_ERR_005_012	Error in loading config file with IOException.
DSC_ERR_005_013	Initial JVM memory is greater than maximum JVM memory.
DSC_ERR_005_014	Invalid value specified for configValue.
DSC_ERR_005_015	Invalid source database specified for source-db option.
DSC_ERR_005_016	Invalid target database specified for target-db option.
DSC_ERR_005_017	Invalid conversion type specified for dsc-type option.
DSC_ERR_005_018	Invalid application language specified for application-lang option.
DSC_ERR_005_019	Conversion-type should be DDL for application-lang type as perl.
DSC_ERR_005_020	Source-db should be teradata for application-lang type as perl.

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Error Code	Error Information
DSC_ERR_005_021	Please use "-VN [V1R7 | V1R8_330]" or "--version-number [V1R7 | V1R8_330]" to specify the kernel version which can be either V1R7 or V1R8_330.
DSC_ERR_005_022	Input directory does not exist.
DSC_ERR_005_023	Getting path for input directory failed with IOException.
DSC_ERR_005_024	Getting path for output directory failed with IOException.
DSC_ERR_005_025	Setting file permission for output directory failed with IOException.
DSC_ERR_005_026	Creating output directory failed.
DSC_ERR_005_027	Setting file permissions for log directory/file failed with FileException.
DSC_ERR_005_028	Error while connecting to GaussDB, Failed with error.
DSC_ERR_005_029	Error occurred due to file permission while creating or executing the file.
DSC_ERR_005_030	No arguments specified in the commandline.
DSC_ERR_005_031	Error occurred in creating output directory.

5.11 Glossary

The following table lists the acronyms, abbreviations, terms, and their descriptions.

Term	Description
C	
Common Table Expression (CTE)	A common table expression is a temporary named result set defined in a query and can be referenced later in the main query.
D	

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Term	Description
Databases (DB)	A database is a collection of related information, usually organized to make general retrieval simple and efficient. Database attributes: • Database name • Endian format (BIG_ENDIAN big-endian or LITTLE_ENDIAN little-endian) • Relationship • All databases have relationships with others.
Database administrator (DBA)	A database administrator is a person responsible for installing, configuring, upgrading, managing, monitoring, and maintaining a database in an organization. This role includes developing and designing database policies, monitoring and optimizing database performance and capacity, and planning future expansion. Database administrators can also plan, coordinate, and implement security measures to ensure the security of the database.
E	
Encoding	In information processing, encoding is a rule system that converts information such as letters, words, sounds, images, or gestures into a format. Sometimes, it shortens them or encrypts them for communication or storage.
I	
Indexes	An index is an ordered data structure in a database management system that facilitates the query and update of data in a table.
M	

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Term	Description
Migration	Migration is the process to migrate scripts, queries, schemas, and data from a source database (such as Teradata) to a target database (such as DWS.
Metadata	Metadata is the information about data. Metadata defines data attributes and is used to specify the data storage location, historical data, indexing resources, and record information.
O	
Operating System (OS)	An operating system is a program loaded into the computer in prior to other programs through a boot program to manage all other programs.
Q	
Queries	A query is an information request sent to a database. A query executes the SQL statement and returns the result set defined by the statement.
S	
Structured Query Language (SQL)	It is a programming language widely used to access, update, manage, and query data in relational databases.
Schema	A schema is a structure described in a formal language supported by a database management system. A schema is an organization form of data. It describes how a database is built. (In a relational database, it describes how a database is divided into tables.)
T	
Teradata	Teradata is a relational database management system. It can be used to run multiple complex queries at the same time. It supports ad hoc queries using SQL statements and is widely used to manage large warehouse operations.

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Term	Description
Tables	A table is a collection of closely related columns. A table consists of rows that contain different column values.
V	
Views	A view allows access to specific rows or columns of a table. A view can be created from one or more tables and is determined by the queries used to create the view.

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6 DataCheck

6.1 Introduction to DataCheck

6.1.1 Overview

To ensure a complete and accurate database migration when switching to DWS database, you need to migrate your data and SQL scripts, and check the data after migration.

DataCheck is a command-line tool that works on Linux and Windows OSs. It offers fast, reliable, and user-friendly data check services. By connecting to both the source and destination databases, DataCheck checks table data in both locations to ensure consistency before and after migration.

DataCheck requires a connection to the database and can perform data check in offline mode. The verification results are sequentially recorded in an Excel file, and any errors encountered during the operation are logged for efficient fault diagnosis.

Supported Source Databases

- MySQL (including AnalyticDB for MySQL)
- PostgreSQL
- DWS

Data Check Process

The DataCheck process is as follows:

1. Download the DataCheck tool package to a Linux or Windows server and decompress it.
2. Run the encryption command to encrypt the login passwords of the source and destination databases.
3. Configure the **dbinfo.properties** file, including connection details for the source and destination databases, as well as function switch information.

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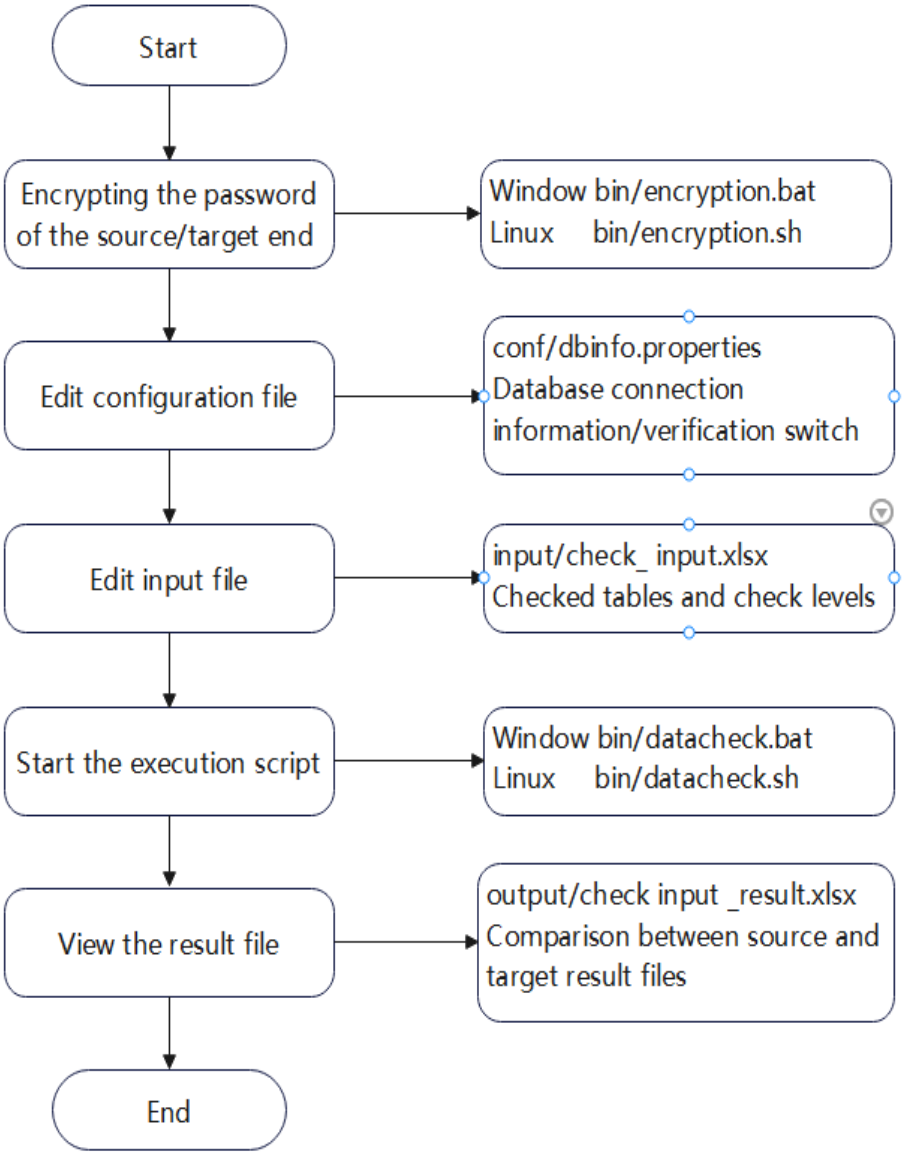
4. Input the schema, source database table name, DWS table name, and check level in the **check_input.xlsx** file.
5. Run the DataCheck startup command to verify data. The verification result is saved in **check_input_result.xlsx**.

Figure 6-1 DataCheck process



6.1.2 Operating Environment

Supported Databases

The following table lists the source databases supported by DataCheck.

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Table 6-1 Supported source databases

Database	Version
MySQL	8.0
PostgreSQL	42.6.0
DWS	8.1.0 or later

The following table lists the destination databases supported by DataCheck.

Table 6-2 Supported destination databases

Database	Version
DWS	8.1.0 or later

Hardware requirements

Table 6-3 lists the hardware requirements of DataCheck.

Table 6-3 DataCheck hardware requirements

Hardware	Configuration
CPU	AMD or Intel Pentium (minimum frequency: 500 MHz)
Min memory	1 GB
Disk space	1 GB

Software requirements

OS requirements

Table 6-4 lists the OSs that are compatible with DataCheck.

Table 6-4 Compatible OSs

Server	OS	Version
General-purpose x86 server	SUSE Linux Enterprise Server 11 and later	SUSE Linux Enterprise Server 11 SP1 or later
	RHEL	Red Hat 6.4 or later
	CentOS	CentOS 6.4 or later
	Windows	7.0, 10, 11

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Requirements of DataCheck on other software versions

Table 6-5 lists other software versions required by DataCheck.

Table 6-5 Requirements of DataCheck on other software versions

Software	Purpose
JDK 1.8 or JRE 1.8	Run the DataCheck tool.

6.2 Basic Functions of DataCheck

Statistical Value Check

- Support data check when source database is DWS, MySQL, PostgreSQL, or BigQuery and destination database is DWS.
- Check common fields, such as numeric, time, and character types.
- Support three check levels, including high, middle, and low.
- Check schemas, table names, and column names.
- Specify the check scope of records. By default, all records are checked.
- Support various check methods, including **COUNT(*)**, **MAX**, **MIN**, **SUM**, and sampling details check.
- Output the check result and related check details.

Table 6-6 Data check levels

Check Level	Description	Syntax
Low	Quantity check	Number of records: **COUNT(*)**
Middle	• Quantity check • Numeric type check	• Number of records: **COUNT(*)** • Value check: **MAX**, **MIN**, and **SUM**
High	• Quantity check • Numeric type check • Date type check • Character type check	• Number of records: **COUNT(*)** • Value check: **MAX**, **MIN**, and **SUM** • Date check: **MAX**, **MIN** • Character check: **order by limit 1000**, which reads the data and checks whether the content is the same.

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Metadata Check

- Table definition verification is supported when the source database is a DWS, MySQL, PostgreSQL, or BigQuery database and the destination database is DWS.
- Four verification types are supported: character, integer, decimal, and time (including date).
- If the column names and types match, the check is passed.

Precise Data Comparison

- Precise data comparison is supported when the source database is a DWS, MySQL, PostgreSQL, or BigQuery database and the destination database is DWS.
- This function is used to compare data by column in the tables at the source and destination databases based on the primary key or the unique record of the specified column ID, and outputs the comparison results, including the extra records and different column values at the source database or destination DWS database.

CAUTION

- You are advised to perform precise data comparison during off-peak hours, as the operation consumes executor resources and occupies the load of databases at both ends.
- For exact comparison, you need to specify the number of data records to be queried in batches (1000 by default) and the number of different results (100 by default. If the number of different results reaches the threshold, the precise comparison stops).

6.3 Downloading and Installing DataCheck

Prerequisites

- The server is compatible with 64-bit operating systems and can run on either Linux or Windows.
- Either JDK 1.8 or JRE 1.8 has been installed on the system.
- The DataCheck tool's server is on the same network as the database to be interconnected with.

Downloading DataCheck

Contact technical support team to download the DataCheck software.

Installing DataCheck

DataCheck is a command line tool that works on both Linux and Windows OSs. It does not require installation and can be used right after downloading the software package. You can decompress it to start using it.

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Windows:

Step 1 Decompress the **DataCheck-*.zip** package.

The **DataCheck-*** folder is generated.

NOTE

You can decompress **DataCheck-*** to any folder you need.

Step 2 Go to the **DataCheck-*** directory.

Step 3 Find and check the files in the DataCheck directory.

Table 6-7 describes the obtained folders and files.

----End

Linux

Step 1 Extract files from the **DataCheck-*.zip** package.

```
unzip DataCheck-*.zip
```

Step 2 Go to the DataCheck directory.

```
cd DataCheck-*
```

Step 3 Check the files in the DataCheck directory.

```
ls
conf   lib   bin   check_input.xlsx
```

----End

Table 6-7 DataCheck directory description

File or Folder		Description
DataCheck	bin	Stores the script for starting the tool. Windows version: datacheck.bat Linux version: datacheck.sh
	conf	Configuration file, which is used to configure the connection between the source database and the destination database and set log printing.
	lib	Stores JAR packages required for running the check tool.
	check_input.xlsx	1. Information about the table to be checked, including the schema name, table name, and column name. 2. Check level information and check rules of users. Three verification levels are supported: **high**, **middle**, and **low**. The default value is **low**.

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File or Folder		Description
	logs	The compressed package does not contain this file. After the check tool is executed, this file is automatically generated to record the tool running process.
	check_input_result.xlsx	The compressed package does not include this file. Once the check tool is run, a check result file will be created in the same location as **check_input.xlsx**.

6.4 Configuring DataCheck

6.4.1 Configuration of dbinfo.properties

The **dbinfo.properties** file contains a series of application configuration parameters, which are used to connect the source database and the destination DWS database. The parameters in this file are general parameters.

Perform the following steps to configure the parameters:

Step 1 Open the **dbinfo.properties** file in the **conf** folder.

Step 2 Change the values of the parameters in the **dbinfo.properties** file according to the actual situation.

For the description of the parameters in the **dbinfo.properties** file, see **Table 6-8**.

NOTE

- Parameter values are case-insensitive.
- Do not modify any other parameter except the listed ones.

Step 3 Save the configuration and exit.

----End

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Table 6-8 Parameters in the dbinfo.properties file

Parameter	Description	Value Range	Default Value	Example
src.dbtype	Source database type	• mysql • pg • oracle • dws • hive • mrs_hive • hologres • greenplum • redshift • bigquery • elasticsearch • synapse	MySQL	src.dbtype=mysql
src.dbname	Source database name	N/A	sys	src.dbname=sys
src.ip	IP address of the source database	N/A	N/A	src.ip=100.xx.xx.47
src.port	Source database port	N/A	3306	src.port=3306
src.username	Source database username	N/A	root	src.username=root
src.passwd	Source database password	N/A	N/A	src.passwd=123456
dws.dbtype	Database type of the destination database DWS	dws	dws	dws.dbtype=dws
dws.dbname	Name of the destination database DWS	N/A	gaussdb	dws.dbname=gaussdb
dws.ip	IP address of the destination database DWS	N/A	N/A	dws.ip=100.xx.xx.186
dws.port	Port of the destination database DWS	N/A	8000	dws.port=8000

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Parameter	Description	Value Range	Default Value	Example
dws.username	Username of the destination database DWS	N/A	dbadmin	dws.username=dbadmin
dws.passwd	Password of the destination database DWS	N/A	N/A	dws.passwd=123456
config.sum.switch	Value check sum function switch	• on • off	on	config.sum.switch=on
config.data.min.switch	Minimum value function switch for value check	• on • off	on	config.data.min.switch=on
config.data.max.switch	Maximum value function switch for value check	• on • off	on	config.data.max.switch=on
config.date.min.switch	Minimum value function switch for date check	• on • off	on	config.date.min.switch=on
config.date.max.switch	Maximum value function switch for date check	• on • off	on	config.date.max.switch=on
config.collate.switch	Indicates whether to enable a collate rule. **on**: enable; **off**: disable.	• on • off	on	config.collate.switch=on
config.collate.value	Collate rule value: **C**, **zh_CN**, or **en_US**.	• C • zh_CN • en_US	C	config.dws.collate=C
src.projectid	Project ID of the source database (mandatory for BigQuery)	N/A	N/A	src.projectid=xxxxxx
src.oauthtype	OAuth type of the source database (mandatory for BigQuery)	• 0	0	src.oauthtype

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Parameter	Description	Value Range	Default Value	Example
src.oauthserviceacctemail	OAuth email address of the source database (mandatory for BigQuery)	N/A	N/A	src.oauthserviceacctemail=xxx@sina.com
src.oauthpvtkeypath	Path of the OAuth authentication information file on the source database (mandatory for BigQuery)	N/A	N/A	src.oauthpvtkeypath =/opt/temp/analytics-di-dev-a8dfdf.json
config.batch.size	Number of data records queried in each batch during precise comparison.	N/A	1000	config.batch.size = 1000
precise.result.max	Maximum differences in the precise comparison result. When the differences reach the threshold, the precise comparison stops.	N/A	100	precise.result.max = 100
difference	Allowed error value during floating point number comparison	N/A	0.0001	difference = 0.0001
output.file.suffix	File name extension of the output result file. The value can be CSV or XLSX.	• xlsx • csv	xlsx	output.file.suffix = csv

6.4.2 Configuration of check_input.xlsx

The **check_input.xlsx** file includes user input details such as schema, original table name, destination table name, specified column name (all columns are checked by

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default), check scope, check level (**low** by default), and excluded columns. You can customize this information as needed.

Perform the following steps to configure the parameters:

Step 1 Open the **check_input.xlsx** file in the folder.

Step 2 Change the values of parameters in the **check_input.xlsx** file based on the site requirements.

For the description of the parameters in the **check_input.xlsx** file, see **Table 6-9**.

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 6-9 Parameters in the check_input.xlsx file

Parameter	Description	Value Range	Default Value	Example
Source Database Name	Name of the database to which the source table to be verified belongs. This parameter is optional. If this parameter is not specified, **src.dbname** in **dbinfo.properties** is used.	N/A	N/A	mydb
Source Schema Name	Name of the schema to which the source table to be verified belongs. If this parameter is not involved, leave it blank.	N/A	N/A	myschema

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Parameter	Description	Value Range	Default Value	Example
Source Table Name	Name of the table to be verified in the source database. This parameter is mandatory.	N/A	N/A	order_info
Target Database Name	Name of the database to which the destination DWS table belongs. This parameter is optional. If this parameter is not specified, **dws.dbname** in **dbinfo.properties** is used.	N/A	N/A	dws_db
Target Schema Name	Name of the schema to which the destination DWS table belongs. This parameter is mandatory.	N/A	N/A	dws_sch
Target Table Name	Name of the table to be verified in the destination DWS database. This parameter is mandatory.	N/A	N/A	dws_info
Check Mode	Check mode. The options are as follows: Statistical value check, precise check, and metadata check.	• Statistics • Precisene ss • Metadata	• Statistic s	Statistics

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Parameter	Description	Value Range	Default Value	Example
Src Row Range(Where sql)	Check scope of table records in the source database. By default, all records are checked.	N/A	ALL	where begin_time > '2020-1-1' and begin_time < '2021-1-1'
DWS Row Range(Where sql)	Check scope of table records in the destination database DWS. By default, all records are checked.	N/A	ALL	where begin_time > '2020-1-1' and begin_time < '2021-1-1'
Column Range	Column check. By default, all supported fields are checked, including numeric, time, and character types. This parameter is optional.	N/A	N/A	col1,col10,col19
Check Strategy	Data check level	• low • middle • high	low	low
Sort Column	Optional. During precise verification, data is sorted based on **Sort Column**. If **Sort Column** is empty, data is sorted based on the primary key and then compared row by row.	N/A	N/A	col1,col10,col19
Column Exclude	Optional. It is used to exclude specified columns from a check.	N/A	N/A	col1,col10,col19

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Parameter	Description	Value Range	Default Value	Example
Columns Wthout Sum	Optional. It is used to exclude specified columns from the SUM check.	N/A	N/A	col1,col10,col19

6.5 Using DataCheck

Notes

- Before starting DataCheck, configure the **dbinfo.properties** and **check_input.xlsx** files in the **config** folder. Incorrect parameter settings will cause DataCheck execution errors.
- If you are running DataCheck tasks concurrently on the same server (by the same or different tasks), it is important to use separate **check_input.xlsx** files for each task.
- After running DataCheck, a **logs** folder is created. You can open this folder to review the logs generated during the execution of DataCheck, which can assist you in identifying any problems.

Using DataCheck on Linux

Step 1 Upload the tool package to the Linux server and decompress it.

```
[root@dws-testng-nodelete DataCheck]# ll
total 32
drwx------ 2 root root  4096 Nov 12 20:47 bin
drwxr-xr-x 2 root root  4096 Nov 12 20:34 conf
drwxr-xr-x 2 root root  4096 Nov 12 20:34 input
drwxr-xr-x 2 root root 20480 Nov 12 20:34 lib
```

Step 2 Generate the ciphertext of the database login password.

Go to the **bin** directory.

```
[root@dws-testng-nodelete DataCheck]# cd bin
[root@dws-testng-nodelete bin]#
[root@dws-testng-nodelete bin]#
[root@dws-testng-nodelete bin]# ll
total 16
-rwxr-xr-x 1 root root 1254 Oct 19 14:58 datacheck.bat
-rwxr-xr-x 1 root root  410 Oct 19 14:58 datacheck.sh
-rwxr-xr-x 1 root root 1322 Oct 19 14:58 encryption.bat
-rwxr-xr-x 1 root root  385 Oct 19 14:58 encryption.sh
```

Run the script for generating the ciphertext. Run this script to generate ciphertext for the login passwords of the source and destination databases.

sh encryption.sh [password]

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```
[root@dws-testng-nodelete bin]# sh encryption.sh  123
B06456948116E8E77222B6C4EE5F7CF7A122E357C
[root@dws-testng-nodelete bin]#
```

Step 3 Configure the **conf/dbinfo.properties** file.

Go to the Datacheck directory and run the **vi conf/dbinfo.properties** command.

```
[root@dws-testng-nodelete DataCheck]# cd /opt/temp/DataCheck
[root@dws-testng-nodelete DataCheck]# vi conf/dbinfo.properties
[root@dws-testng-nodelete DataCheck]#
```

Configure the database connection information of the source and destination ends. Use the ciphertext generated in the previous step for the password in the configuration file.

```
[Source Database Info]
## src.dbtype support: mysql/pg/oracle/dws_src/
src.dbtype = mysql
src.dbname = db_test
src.ip = localhost
src.port = 3306
src.username = admin
src.passwd = 745675379

src.projectid =
src.oauthtype = 0
src.oauthserviceacctemail =
src.oauthpvtkeypath =

src.jar.path =
input.file.path =

[DWS Database Info]
dws.dbtype = dws
dws.dbname = db_dws
dws.ip = 100
dws.port = 8000
dws.username = dbadmin
dws.passwd = 424312BAB
```

Step 4 Edit the **input/check_input.xlsx** file.

Copy the **check_input.xlsx** file to the Windows server, use Excel to edit the file, enter the table information to be verified, save the file, and upload the file to the Linux server to overwrite the original file.

Source Database Name	Source Schema Name	Source Table Name	Target Database Name	Target Schema Name	Target Table Name	* Check Mode	Check Strategy
		t_data_20		sch_test	t_data_21	Statistics	high

Step 5 Run the data check tool.

Go to the bin directory and run the **sh datacheck.sh** script.

```
[root@dws-testng-nodelete DataCheck]# cd /opt/temp/DataCheck/bin/
[root@dws-testng-nodelete bin]# sh datacheck.sh
```

Step 6 View the result **output/check_input_result.xlsx**.

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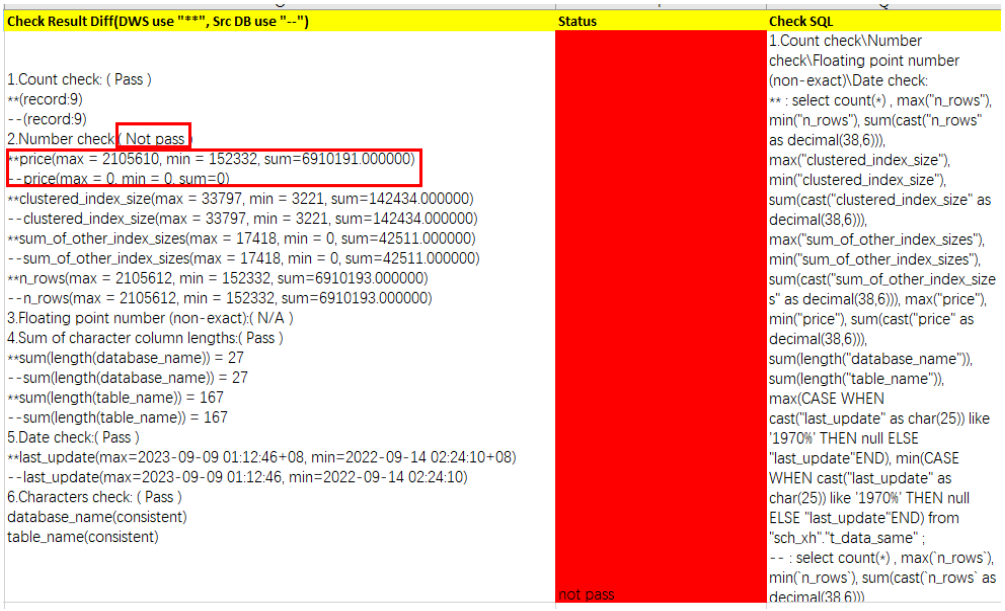

Check Result Diff(DWS use "**", Src DB use "--")	Status	Check SQL
1.Count check: (Pass) **(record:9) --(record:9) 2.Number check: (Not pass) **price(max = 2105610, min = 152332, sum=6910191.000000) --price(max = 0, min = 0, sum=0) **clustered_index_size(max = 33797, min = 3221, sum=142434.000000) --clustered_index_size(max = 33797, min = 3221, sum=142434.000000) **sum_of_other_index_sizes(max = 17418, min = 0, sum=42511.000000) --sum_of_other_index_sizes(max = 17418, min = 0, sum=42511.000000) **n_rows(max = 2105612, min = 152332, sum=6910193.000000) --n_rows(max = 2105612, min = 152332, sum=6910193.000000) 3.Floating point number (non-exact):(N/A) 4.Sum of character column lengths:(Pass) **sum(length(database_name)) = 27 --sum(length(database_name)) = 27 **sum(length(table_name)) = 167 --sum(length(table_name)) = 167 5.Date check:(Pass) **last_update(max=2023-09-09 01:12:46+08, min=2022-09-14 02:24:10+08) --last_update(max=2023-09-09 01:12:46, min=2022-09-14 02:24:10) 6.Characters check: (Pass) database_name(consistent) table_name(consistent)	not pass	1.Count check\Number check\Floating point number (non-exact)\Date check: ** : select count(*) , max("n_rows"), min("n_rows"), sum(cast("n_rows" as decimal(38,6))), max("clustered_index_size"), min("clustered_index_size"), sum(cast("clustered_index_size" as decimal(38,6))), max("sum_of_other_index_sizes"), min("sum_of_other_index_sizes"), sum(cast("sum_of_other_index_sizes" as decimal(38,6))), max("price"), min("price"), sum(cast("price" as decimal(38,6))), sum(length("database_name")), sum(length("table_name")), max(CASE WHEN cast("last_update" as char(25)) like '1970%' THEN null ELSE "last_update"END), min(CASE WHEN cast("last_update" as char(25)) like '1970%' THEN null ELSE "last_update"END) from "sch_xh"."t_data_same" ; -- : select count(*) , max(`n_rows`), min(`n_rows`), sum(cast(`n_rows` as decimal(38,6)))

Step 7 Check result analysis:

1. If **Status** is **No Pass**, the check fails.
2. The **Check Result Diff** column displays the items that fail to pass the check. You can view the column that fails to pass the check.
3. The **Check SQL** area displays the query SQL statements that are executed in the database.

----End

Using DataCheck on Windows

Step 1 Upload the tool package to the Windows server and decompress it.

bin	2024/11/13 10:31
conf	2024/11/13 9:42
input	2024/11/13 9:42
lib	2024/11/13 9:42

Step 2 Generate the ciphertext of the database login password.

Go to the **bin** directory and start the CMD tool.

datacheck.bat	2024/10/19 14:58
datacheck.sh	2024/10/19 14:58
encryption.bat	2024/10/19 14:58
encryption.sh	2024/10/19 14:58

Run the script for generating the ciphertext. Run this script to generate ciphertext for the login passwords of the source and destination databases.

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encryption.bat [password]

```
D:\temp\DataCheck\bin>encryption.bat 1[redacted]
7EE79288E4BAFA94808D5540794CB1004491[redacted]

D:\temp\DataCheck\bin>encryption.bat a[redacted]
416A0EB307C290131A1C3D2AC77D36AC6D[redacted]
```

Step 3 Configure the **conf/dbinfo.properties** file.

Edit the **dbinfo.properties** file in the **conf** directory, configure the database connection information of the source and destination ends, and use the ciphertext generated in the previous step as the password in the configuration file.

```
[Source Database Info]
## src.dbtype support: mysql/pg/oracle/dws_src
src.dbtype = mysql
src.dbname = mysql
src.ip = localhost
src.port = 3306
src.username = ***
src.passwd = *****

src.jar.path =
input.file.path =

[DWS Database Info]
## dws.dbtype support: dws
dws.dbtype = dws
dws.dbname = dbname
dws.ip = localhost
dws.port = 8000
dws.username = ***
dws.passwd = *****
```

Step 4 Edit the **input/check_input.xlsx** file and save it.

Open the **input/check_input.xlsx** file using Excel, input the table information that needs to be verified, and save the file.

Source Database Name	Source Schema Name	Source Table Name	Target Database Name	Target Schema Name	Target Table Name	* Check Mode	Check Strategy
		t_data_20		sch_test	t_data_21	Statistics	high

Step 5 Run the data check tool **datacheck.bat**.

```
D:\temp\DataCheck\bin>datacheck.bat
```

Step 6 View the result **output/check_input_result.xlsx**. (The result analysis is the same as that in the Linux scenario.)

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Check Result Diff(DWS use "**", Src DB use "--")	Status	Check SQL
1.Count check: (Pass) **(record:9) --(record:9) 2.Number check: (Not pass) **price(max = 2105610, min = 152332, sum=6910191.000000) --price(max = 0, min = 0, sum=0) **clustered_index_size(max = 33797, min = 3221, sum=142434.000000) --clustered_index_size(max = 33797, min = 3221, sum=142434.000000) **sum_of_other_index_sizes(max = 17418, min = 0, sum=42511.000000) --sum_of_other_index_sizes(max = 17418, min = 0, sum=42511.000000) **n_rows(max = 2105612, min = 152332, sum=6910193.000000) --n_rows(max = 2105612, min = 152332, sum=6910193.000000) 3.Floating point number (non-exact):(N/A) 4.Sum of character column lengths:(Pass) **sum(length(database_name)) = 27 --sum(length(database_name)) = 27 **sum(length(table_name)) = 167 --sum(length(table_name)) = 167 5.Date check:(Pass) **last_update(max=2023-09-09 01:12:46+08, min=2022-09-14 02:24:10+08) --last_update(max=2023-09-09 01:12:46, min=2022-09-14 02:24:10) 6.Characters check: (Pass) database_name(consistent) table_name(consistent)	not pass	1.Count check\Number check\Floating point number (non-exact)\Date check: ** : select count(*) , max("n_rows"), min("n_rows"), sum(cast("n_rows" as decimal(38,6))), max("clustered_index_size"), min("clustered_index_size"), sum(cast("clustered_index_size" as decimal(38,6))), max("sum_of_other_index_sizes"), min("sum_of_other_index_sizes"), sum(cast("sum_of_other_index_sizes" as decimal(38,6))), max("price"), min("price"), sum(cast("price" as decimal(38,6))), sum(length("database_name")), sum(length("table_name")), max(CASE WHEN cast("last_update" as char(25)) like '1970%' THEN null ELSE "last_update"END), min(CASE WHEN cast("last_update" as char(25)) like '1970%' THEN null ELSE "last_update"END) from "sch_xh"."t_data_same" ; -- : select count(*) , max(`n_rows`), min(`n_rows`), sum(cast(`n_rows` as decimal(38,6)))

Check Result Diff(DWS use "**", Src DB use "--")	Status	Check SQL
1.Count check: (Pass) **(record:9) --(record:9) 2.Number check: (Not pass) **price(max = 2105610, min = 152332, sum=6910191.000000) --price(max = 0, min = 0, sum=0) **clustered_index_size(max = 33797, min = 3221, sum=142434.000000) --clustered_index_size(max = 33797, min = 3221, sum=142434.000000) **sum_of_other_index_sizes(max = 17418, min = 0, sum=42511.000000) --sum_of_other_index_sizes(max = 17418, min = 0, sum=42511.000000) **n_rows(max = 2105612, min = 152332, sum=6910193.000000) --n_rows(max = 2105612, min = 152332, sum=6910193.000000) 3.Floating point number (non-exact):(N/A) 4.Sum of character column lengths:(Pass) **sum(length(database_name)) = 27 --sum(length(database_name)) = 27 **sum(length(table_name)) = 167 --sum(length(table_name)) = 167 5.Date check:(Pass) **last_update(max=2023-09-09 01:12:46+08, min=2022-09-14 02:24:10+08) --last_update(max=2023-09-09 01:12:46, min=2022-09-14 02:24:10) 6.Characters check: (Pass) database_name(consistent) table_name(consistent)	not pass	1.Count check\Number check\Floating point number (non-exact)\Date check: ** : select count(*) , max("n_rows"), min("n_rows"), sum(cast("n_rows" as decimal(38,6))), max("clustered_index_size"), min("clustered_index_size"), sum(cast("clustered_index_size" as decimal(38,6))), max("sum_of_other_index_sizes"), min("sum_of_other_index_sizes"), sum(cast("sum_of_other_index_sizes" as decimal(38,6))), max("price"), min("price"), sum(cast("price" as decimal(38,6))), sum(length("database_name")), sum(length("table_name")), max(CASE WHEN cast("last_update" as char(25)) like '1970%' THEN null ELSE "last_update"END), min(CASE WHEN cast("last_update" as char(25)) like '1970%' THEN null ELSE "last_update"END) from "sch_xh"."t_data_same" ; -- : select count(*) , max(`n_rows`), min(`n_rows`), sum(cast(`n_rows` as decimal(38,6)))

Step 7 Check result analysis:

1. If **Status** is **No Pass**, the check fails.
2. The **Check Result Diff** column displays the items that fail to pass the check. You can view the column that fails to pass the check.
3. The **Check SQL** area displays the query SQL statements that are executed in the database.

----End

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7 Server Tools

7.1 gs_dump

Context

gs_dump is tool provided by 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, the exported table is locked, blocking read and write operations.

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**.

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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,

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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.

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- -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.)

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- -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 **gsql**. 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**.

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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.

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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

  This parameter is no longer used in 8.2.0.100 and is only kept for compatibility with earlier versions.

  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**.

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- --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.

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- --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.

- --cstore-fine-disaster (Discarded)

  If this parameter is selected and a table whose **fine_disaster_table_role** is **primary** is dumped, a table definition whose **fine_disaster_table_role** is **standby** is generated.

  This parameter is discarded in 8.2.1.

- --only-publications

  If this parameter is specified, only the definitions of all publications (publication) in the current database are dumped. This parameter is supported by version 8.2.1 or later clusters.

- --no-comment

  The dump does not contain object comments. This is supported only by clusters of version 9.1.0.100 or later.

- --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

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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 data 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

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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 bfnextval
```

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 **2^63-2**.

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 **2^63-2** 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
```

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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
```

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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 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, the exported table is locked, blocking read and write operations.

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.

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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.

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- -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

  This parameter is no longer used in 8.2.0.100 and is only kept for compatibility with earlier versions.

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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.

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- --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.

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- -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, you are advised to run **ANALYZE** on each database. The optimizer provides useful statistics.

gs_dumpall requires all needed tablespace directories to exit 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 **gsql** 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**

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7.3 gs_restore

Context

gs_restore is a tool provided by 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:

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  - **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

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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 **-l** 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
  ```

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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.

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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

  This parameter is no longer used in 8.2.0.100 and is only kept for compatibility with earlier versions.

  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.

  It outputs the **SET SESSION AUTHORIZATION** statement instead of **ALTER OWNER** to determine the 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.

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NOTE

- **-d/--dbname** and **-f/--file** cannot be used at the same time.
- **-s/--schema-only** and **-a/--data-only** cannot be used at the same time.
- **-c/--clean** and **-a/--data-only** cannot be used at the same time.
- When **--single-transaction** is used, **-j/--jobs** must be a single task.
- **--role** and **--rolepassword** must be used together.

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:

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```
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
```

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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
```

NOTE

When a cluster is created, the scheduler is started and some resources of the scheduler are created, including the schema scheduler where the tables of the scheduler are located, and the tables created when the scheduler is running, such as **bandwidth_history_table**, **cpu_template_storage**, **io_template_storage**, **mem_template_storage**, **scheduler_config**, **scheduler_storage**, **task_history_storage**, **task_storage**, **vacuum_full_rslt**, **function scheduler_workload_query_func**, and **pg_task**. When **gs_restore** is executed, the tables, schemas, and indexes of the scheduler are also restored. The scheduler is a resident process, and the new cluster automatically creates these objects. Therefore, an error message is displayed when gs_restore is executed, indicating that the objects of the scheduler exist. This error has no impact on normal cluster operations and can be ignored.

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 running the script. For details, see "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.

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- 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%
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.

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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
```

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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 running the script. For details, see "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**.
- 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 be executed to 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...]]
```

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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-9.1.0-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 row contains an IP address, 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

  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 row contains an IP address, 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 **/opt/gdspackages/install_dir** as the installation directory. The GDS user is **gds_test:wheel**.

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```
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-9.1.0-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 running the script. For details, see "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.

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- -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

- Start 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.

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  - 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
- -p

  Listening port.

  Value range: 1024 to 65535 (integer)

  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.

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Value range: 0 < size < 1 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 MB < size < 100 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 1,024 KB.

- -R size

  Sets the maximum size of a single GDS log file specified by **-l**.

  Value range: 1 MB < size < 1 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 1,024 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

  Recursively traverses files in a directory (subdirectories in the foreign table directory) and recursively reads all files with the same name in the directory specified by location. Only the Linux system is supported.

- --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

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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: The value should be greater than 1s and must be a positive integer plus the unit. The unit can be s, m, or h. For example, 1 hour can be set to **3600s**, **60m**, or **1h**.

  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
```

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