Oracle® SQLcl User's Guide





Oracle SQLcl User's Guide, Release 22.4

F74916-01

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Preface

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Audience

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slf4j, v1.7.25,

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tomcat-apr, v5.5.23 (optional)

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HttpComponents Http Client 5.1.3

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jackson-jr-objects 2.13.4

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Launch4j 3.14

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1

Changes in Release 22.4 for *Oracle SQLcl User's Guide*

This section lists the changes for this release.

New Features

New features in this release are:

A new ARGUMENT command to define parameters in SQL scripts.
 See Defining Parameters in SQLcl Scripts Using the ARGUMENT Command



Using Oracle SQLcl

Oracle SQLcl (SQL Developer Command Line) is a Java-based command-line interface for Oracle Database. Using SQLcl, you can execute SQL and PL/SQL statements interactively or as as a batch file. SQLcl provides inline editing, statement completion, command recall, and also supports existing SQL*Plus scripts.

Oracle SQLcl is available for download from Oracle Technology Network.

Note:

- To run SQLcI, you need to install Oracle Java 11 or later versions. If the Java version is less than 11, then the SQLcI installation fails with the following error message: Error: A JNI error has occurred, please check your installation and try again Exception in thread "main" java.lang.UnsupportedClassVersionError:.
- On Windows, Java is searched for in the following directories:
 - For SQLcl (sql.exe):
 ..\..\jdk\jre\bin;%JAVA_HOME%\bin;%PATH%;%ORACLE_HOME%
 \jdk\jre\bin
- If the Java file is not found in those directories, Java is searched for in the registry, the minimum version (version more than or equal to) being 11.0.9.

This chapter contains the following topics:

- Alphabetic List of SQLcl Commands
- List of Unsupported SQL*Plus Commands and Features
- Starting and Leaving SQLcl
- Starting Up and Shutting Down a Database
- Entering and Executing Commands
- Manipulating SQL, SQLcl, and PL/SQL Commands
- Formatting Query Results
- Accessing Databases
- Miscellaneous Commands
- · Loading a File
- Calling Oracle Cloud Infrastructure REST APIs Using the OCI Command



2.1 Alphabetic List of SQLcl Commands

```
@{url | file name[.ext]} [arg ...]
@@ { url | file name[.ext] } [arg ...]
/ (slash)
ACC[EPT] variable [NUM[BER] | CHAR | DATE | BINARY FLOAT | BINARY DOUBLE]
[FOR[MAT] format] [DEF[AULT] default] [PROMPT text | NOPR[OMPT]] [HIDE]
ALIAS [<name>=<SQL statement>; | LOAD [<filename>] | SAVE [<filename>] | LIST
[<NAME>] | DROP <name> | DESC <name> <Description String>]
APEX [export <application id>]
A[PPEND] text
ARCHIVE LOG LIST
ARG[UMENT] OPTIONS See Defining Parameters in SQLcl
Scripts Using the ARGUMENT Command
BRE[AK] [ON report element [action [action]]] ...
BRIDGE
BTI[TLE] [printspec [text | variable] ...] | [ON | OFF]
CD [<directory>]
C[HANGE] sepchar old [sepchar [new [sepchar]]]
CL[EAR] option ...
COL[UMN] [{column | expr} [option ...]]
\texttt{COMP[UTE]} \ [\textit{function} \ [\texttt{LAB[EL]} \ \textit{text}] \ \dots \ \texttt{OF} \ \{\textit{expr} \ | \ \textit{column} \ | \ \textit{alias}\} \ \dots \texttt{ON}
{expr | column | alias | REPORT | ROW} ...]
CONN[ECT] [{<logon>| / |proxy} [AS {SYSOPER | SYSDBA | SYSASM}]
[edition=value]]
CTAS table new table
COPY {FROM database | TO database | FROM database TO database} {APPEND |
CREATE | INSERT | REPLACE | APPEND BYTE | CREATE BYTE | REPLACE BYTE}
destination table[(column, column, column, ...)] USING query
DDL [object name [type] [SAVE filename]]
DEF[INE] [variable] | [variable = text]
DEL [n | n m | n * | n LAST | * | * n | * LAST | LAST]
DESC[RIBE] {[schema.]object[@connect identifier]}
DG
DISC[ONNECT]
ED[IT] [file name[.ext]]
```

```
EXEC[UTE] statement
{EXIT | QUIT} [SUCCESS | FAILURE | WARNING | n | variable | :BindVariable]
[COMMIT | ROLLBACK]
FIND [<filename>]
FORMAT [BUFFER | RULES <filename> | FILE <input file> <output file>]
GET [FILE] file name[.ext] [LIST | NOLIST]
HELP | ? [topic]
HISTORY [index | FULL | USAGE | SCRIPT | TIME | CLEAR (SESSION)?]
HO[ST] [command]
INFO[RMATION] {[schema.]object[@connect identifier]}
I[NPUT] [text]
L[IST] [n | n m | n * | n LAST | * | * n | * LAST | LAST]
LOAD [schema.] table name[@db link] file name
OERR <facility> <error>
PASSW[ORD] [username]
PAU[SE] [text]
PRINT [variable ...]
PRO[MPT] [text]
{QUIT | EXIT} [SUCCESS | FAILURE | WARNING | n | variable | :BindVariable]
[COMMIT | ROLLBACK]
REM[ARK]
REPEAT <iterations> <sleep>
REST [export [<module name> | <module prefix>] | modules | privileges | schemas]
R[UN]
{\tt SAV[E]} \ \textit{[FILE]} \ \textit{file name} [.ext] \ [\underline{\tt CRE[ATE]} \ | \ {\tt REP[LACE]} \ | \ {\tt APP[END]}]
SCRIPT < script file>
SET system variable value
SHO[W] [option]
SHUTDOWN [ABORT | IMMEDIATE | NORMAL | TRANSACTIONAL [LOCAL]]
SODA
SPO[OL] [filename[.ext] [CRE[ATE] | REP[LACE] | APP[END]] | OFF | OUT]
SSHTUNNEL <username>@<hostname> -i <identity file> [-L
localPort:Remotehost:RemotePort]
STA[RT] { url | file name[.ext] } [arg ...]
```

```
STARTUP db_options | cdb_options | upgrade_options

STORE {SET} file_name[.ext] [CRE[ATE] | REP[LACE] | APP[END]]

TNSPING <address>

TTI[TLE] [printspec [text | variable] ...] | [ON | OFF]

UNDEF[INE] variable ...

WHENEVER OSERROR {EXIT [SUCCESS | FAILURE | n | variable | :BindVariable] [COMMIT | ROLLBACK | NONE]}

WHENEVER SQLERROR {EXIT [SUCCESS | FAILURE | WARNING | n | variable | :BindVariable] [COMMIT | ROLLBACK | NONE]}

WHENEVER SQLERROR {EXIT [SUCCESS | FAILURE | WARNING | n | variable | :BindVariable] [COMMIT | ROLLBACK | NONE]}

WHICH <filename>

XQUERY xquery_statement
```



You can use the up and down arrow keys to cycle through the previous 100 statements or scripts.

2.1.1 Defining Parameters in SQLcl Scripts Using the ARGUMENT Command

The ARGUMENT command enables you to define SQL*Plus parameters that are passed to SQLcl scripts. This command adds a DEFINE for the parameter if the parameter does not exist.

Parameters are passed by position to scripts where they are assigned a number starting with one for each position. Therefore, to supply a value for parameter 1, use argument 1 [options]; for parameter 2, use argument 2 [options], and so on. See Passing Parameters through the START Command in the *Oracle SQL*Plus User's Guide* for more information.

Syntax

```
argument|arg OPTIONS
```

Use the SET PARAMETERPOLICY command to control parameter retention. The parameter retention applies to all parameters whether defined using this command or not.

When SET PARAMETERPOLICY is SHARE (default), defined variables retain their values until you:

- Enter a new DEFINE command referencing the variable.
- Enter an UNDEFINE command referencing the variable.
- Enter an ACCEPT command referencing the variable.



- Reference the variable in the NEW_VALUE or OLD_VALUE clause of a COLUMN command and then reference the column in a SELECT command.
- Exit SQLcl.

When SET PARAMETERPOLICY is ISOLATE:

- Parameter settings are saved and undefined at the start of the script.
- On return from the script, the saved parameters are restored.
- Parameter settings in called scripts do not affect the containing script.

The SET PARAMETERPOLICY command must be specified before the script is called. If SET PARAMETERPOLICY is set to ISOLATE within a script, parameters are removed on return. Parameters cannot be reset as the values were not saved at the start of the script.

Options

Option	Description
Required	
arg_num	The position of the parameter relative to 1.
<pre>action {default prompt}</pre>	The argument action to take when a parameter is not already defined.
	prompt: Prompts the user for the parameter value and sets it.default: Sets the default value.
action_value	The value to specify for the parameter or the string for prompting the user for the value. Values containing spaces must be enclosed in double quotes.
Optional	
<pre>comment {comment}</pre>	Associate a comment with the parameter.
	{comment} - Associate the comment value specified with the parameter.
comment_value	The comment to associate with the parameter. Values containing spaces must be enclosed in double quotes.

Examples

Example 1 - The following example uses the ARGUMENT command to define two parameters in a script (script.sql).

```
script.sql:
prompt 'Give value for 1 or prompt for it: &1'
prompt 'Give value for 99 or prompt for it: &99'

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production
Version 19.3.0.0.0
SQL> arg 99 default 99_set
/* 99 shared with script.sql */

SQL> @script.sql
Enter value for 1: x
'Give value for 1 or prompt for it: x'
'Give value for 99 or prompt for it: 99_set'
```



```
SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
```

Example 2 - The following example illustrates how the SET PARAMETERPOLICY ISOLATE is used to redefine parameters every time the script is called.

```
SQL> set parameterpolicy isolate
SQL> arg 99 default 99_set
/* 99 is not passed to the script, so prompted for */

SQL> @script.sql
Enter value for 1: x2
'Give value for 1 or prompt for it: x2'
Enter value for 99: x99
'Give value for 99 or prompt for it: x99'
/* 99 restored - set back to the original value when script.sql finishes */

SQL> define 99
DEFINE 99 = "99 set" (CHAR)
```

2.2 List of Unsupported SQL*Plus Commands and Features

Commands

- REPHEADER
- REPFOOTER
- TIMING

The TIMING command is replaced by the SET TIMING command.

System Variables and Environment Settings through the SET Command

- describe
- flagger
- fullcolname
- logsource
- loboffset
- markup
- recsep
- shiftinout
- sqlterminator
- underline
- xmloptimizationcheck



2.3 Starting and Leaving SQLcl

Logging In and Logging Out

Use the following commands to log in to and out of SQLcl.

```
SQLCL [[option] [logon | / NOLOG] [start]]
```

where option has the following syntax:

```
-H[ELP] | -V[ERSION] | [ [-C[OMPATIBILITY] x.y[.z]]] [-L[OGON]] [-NOLOGINTIME] [-R[ESTRICT] \{1 \mid 2 \mid 3\}] [-S[ILENT]] [-AC]]
```

where logon has the following syntax:

```
{username[/password] [@connect_identifier] | /} [AS {SYSASM | SYSBACKUP | SYSDBA | SYSDG | SYSOPER | SYSRAC | SYSKM}] [edition=value]
```

and where start has the following syntax:

```
@{url | file_name[.ext]} [arg ...]
{EXIT | QUIT} [SUCCESS | FAILURE | WARNING | n | variable | :BindVariable]
[COMMIT | ROLLBACK]
```

Commits or rolls back all pending changes, logs out of Oracle, terminates SQLcl and returns control to the operating system.

```
 \{ \texttt{QUIT} \mid \texttt{EXIT} \} \ [ \underline{\texttt{SUCCESS}} \mid \texttt{FAILURE} \mid \texttt{WARNING} \mid n \mid variable \mid : \texttt{BindVariable} ] \\ [ \underline{\texttt{COMMIT}} \mid \texttt{ROLLBACK} ]
```

Commits or rolls back all pending changes, logs out of Oracle, terminates SQLcl and returns control to the operating system.

Setting JVM Options

To set an Oracle Java Virtual Machine (JVM) option in SQLcl, use the following environment variable:

```
JAVA TOOL OPTIONS
```

The following example shows in Windows, how to change the user interface language in SQLcl to Spanish (es):

```
c:\SQLDev\sqlcl\20.2\sqlcl\bin>SET JAVA_TOOL_OPTIONS=-Duser.language=es c:\SQLDev\sqlcl\20.2\sqlcl\bin>sql hr/oracle
Picked up JAVA_TOOL_OPTIONS: -Duser.language=es
SQLcl: Versi≤n 20.2 Production en mar. ago. 25 15:37:58 2020
Copyright (c) 1982, 2020, Oracle. Todos los derechos reservados.
Last Successful login time: Mar Ago 25 2020 15:38:01 -04:00
Conectado a:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 - 64bit Production
Se ha encontrado login.sql en el CWD. El acceso a la DB estß restringido para login.sql.
```



```
Ajuste SQLPATH para incluir la ruta y activar la funcionalidad completa. 
 SQL>
```

The following example shows how to change the user interface language in SQLcl to French (fr), and also increase the maximum memory available to SQLcl (-Xmx800m):

```
c:\SQLDev\sqlc1\20.2\sqlc1\bin>SET JAVA_TOOL_OPTIONS=-
Duser.language=fr -Xmx800m
c:\SQLDev\sqlc1\20.2\sqlc1\bin>sql hr/oracle
Picked up JAVA_TOOL_OPTIONS: -Duser.language=fr -Xmx800m
SQLc1: version 20.2 Production sur mar. aoVt 25 15:57:21 2020
Copyright (c) 1982, 2020, Oracle. Tous droits r@serv@s....
```

2.4 Starting Up and Shutting Down a Database

Starting up and shutting down a database requires DBA privileges.

```
STARTUP db options | cdb options | upgrade options
where db options has the following syntax:
[FORCE] [RESTRICT] [PFILE=filename] [QUIET] [ MOUNT [dbname] | [ OPEN
[open db options] [dbname] ] | NOMOUNT ]
where open db options has the following syntax:
READ {ONLY | WRITE [RECOVER]} | RECOVER
where cdb options has the following syntax:
root connection options | pdb connection options
where root connection options has the following syntax:
PLUGGABLE DATABASE pdbname [FORCE] | [RESTRICT] [ OPEN {open pdb options}]
where pdb connection options has the following syntax:
[FORCE] | [RESTRICT] [ OPEN {open_pdb_options}]
where open pdb options has the following syntax:
READ WRITE | READ ONLY
and where upgrade options has the following syntax:
[PFILE=filename] {UPGRADE | DOWNGRADE} [QUIET]
```

opening a database.

Starts an Oracle Database instance with several options, including mounting and

```
SHUTDOWN [ABORT | IMMEDIATE | NORMAL | TRANSACTIONAL [LOCAL]]
```

Shuts down a currently running Oracle instance, optionally closing and dismounting a database.



2.5 Entering and Executing Commands

Use the following commands to execute and collect timing statistics on SQL commands and PL/SQL blocks:

```
/ (slash)
```

Executes the most recently executed SQL command or PL/SQL block which is stored in the SQL buffer. Does not list the command. Use slash (/) at the command prompt or line number prompt in SQLcl command line.

```
EXEC[UTE] statement
```

Executes a single PL/SQL statement or runs a stored procedure.

```
R[UN]
```

Lists and executes the most recently executed SQLcl command or PL/SQL block which is stored in the SQL buffer. The buffer has no command history list and does not record SQLcl commands.

```
TIMI[NG]
```

Timing is only available as a switch.

Use the following command to access the help system:

```
HELP | ? [topic]
```

Accesses the command-line help system. Enter HELP INDEX or ? INDEX for a list of topics. You can view the Oracle Database Library at http://www.oracle.com/technology/documentation.

Use the following command to execute operating system commands:

```
HO[ST] [command]
```

Executes an operating system command without leaving SQLcl. Enter HOST without command to display an operating system prompt. You can then enter multiple operating system commands.

With some operating systems, you can use another character instead of HOST such as "!" (UNIX) and "\$" (Windows). See the Oracle installation and user's manuals provided for your operating system for details.

You can use the RC variable to return the exit status of the command executed with HOST.



When connecting to a database using bequeath protocol (where a client connection is passed directly to a dedicated server process without going through the listener), the _RC variable is not automatically updated. Set bequeath_detach=yes in the sqlnet.ora configuration file to update the RC variable.

Use the following command to recall the history of SQLcl commands:

```
HISTORY [index | FULL | USAGE | SCRIPT | TIME | CLEAR (SESSION)?] | FAILS
```



- Use the Up and Down arrow keys to navigate through history items at the prompt.
- Use the HISTORY command to print the history contents.
- History is limited to the last 100 statements.
- SET HISTORY LIMIT *N* allows you to change the default limit, where *N* is the maximum number.
- History is retained between SQLcl sessions.
- By default, the SHOW, HISTORY, CONNECT, and SET commands are not saved in history.
- SET HISTORY FILTER allows you to set the commands that should not be recorded in history.

2.6 Manipulating SQL, SQLcl, and PL/SQL Commands

Use the following commands to edit SQL commands and PL/SQL blocks:

```
A[PPEND] text
```

Adds specified text to the end of the current line in the SQL buffer. To separate text from the preceding characters with a space, enter two spaces. To append text that ends with a semicolon, end the command with two semicolons (a single semicolon is interpreted as a command terminator).

```
C[HANGE] sepchar old [sepchar [new [sepchar]]]
```

Changes first occurrence of old on the current line of the SQL buffer. The buffer has no command history list and does not record SQLcl commands. You can use any non-alphanumeric character such as "/" or "!" as a <code>sepchar</code>. You can omit the space between <code>CHANGE</code> and the first <code>sepchar</code>.

```
DEL [n | n m | n * | n LAST | * | * n | * LAST | LAST]
```

Deletes one or more lines of the SQL buffer ("*" indicates the current line). You can omit the space between DEL and n or *, but not between DEL and LAST. Enter DEL with no clauses to delete the current line of the buffer. The buffer has no command history list and does not record SQLcl commands.

```
I[NPUT] [text]
```

Adds one or more new lines of text after the current line in the SQL buffer. The buffer has no command history list and does not record SQLcl commands.

```
L[IST] [n | n m | n * | n LAST | * | * n | * LAST | LAST]
```

Lists one or more lines of the most recently executed SQL command or PL/SQL block which is stored in the SQL buffer. Asterisk (*) indicates the current line. You can omit the space between LIST and n or *, but not between LIST and LAST. Enter LIST with no clauses to list all lines.

In SQLcl, you can also use ";" to list all the lines in the SQL buffer. The buffer has no command history list and does not record SQLcl commands.

Use the following commands to run scripts:

```
@ { url | file name[.ext] } [arg ...]
```



Runs the SQLcl statements in the specified script. The script can be called from the local file system or a web server. You can pass values to script variables in the usual way.

```
@@ { url | file name[.ext] } [arg ...]
```

Runs the SQLcl statements in the specified script. This command is almost identical to the @ command. It is useful for running nested scripts because it has the additional functionality of looking for the specified script in the same path or url as the calling script.

```
REPEAT <iterations> <sleep>
```

Repeats the current SQL in the buffer at the specified times with sleep intervals. The maximum sleep interval is 120 seconds.

```
SCRIPT <script file>
```

Runs the SQLcl statements in the specified script.

```
STA[RT] { url | file name[.ext] } [arg ...]
```

Runs the SQLcl statements in the specified script. The script can be called from the local file system or a web server. You can pass values to script variables in the usual way.

Use the following commands to create and modify scripts:

```
ED[IT] [file name[.ext]]
```

Invokes an operating system text editor on the contents of the specified file or on the contents of the SQL buffer. To edit the buffer contents, omit the file name.

The DEFINE variable _EDITOR can be used to set the editor to use. In SQLcl, _EDITOR can be set to any editor that you prefer. *Inline* will set the editor to be the SQLcl editor. This supports the following shortcuts:

- ^R Run the current buffer
- ^w Go to top of buffer
- ^S Go to bottom of buffer
- ^A Go to start of line
- ^E Go to end of line

FORMAT

- FORMAT BUFFER formats the script in the SQLcl Buffer
- FORMAT RULES <filename> Loads SQLDeveloper Formatter rules file to formatter
- FORMAT FILE <input file> <output file>

```
GET file name[.ext] [LIST | NOLIST]
```

Loads a SQL statement or PL/SQL block from a file into the SQL buffer. The buffer has no command history list and does not record SQLcl commands.

```
REM[ARK]
```

Begins a comment in a script. The REMARK command must appear at the beginning of a line, and the comment ends at the end of the line (a line cannot contain both a comment and a command). SOLcl does not interpret the comment as a command.

```
SAV[E] [FILE] file name[.ext] [CRE[ATE] | REP[LACE] | APP[END]]
```



Saves the contents of the SQL buffer in a script. The buffer has no command history list and does not record SQLcl commands.

```
STORE {SET} file name[.ext] [CRE[ATE] | REP[LACE] | APP[END]]
```

Saves attributes of the current SQLcl environment in a file.

```
WHENEVER OSERROR {EXIT [SUCCESS | FAILURE | n | variable | :BindVariable] [COMMIT | ROLLBACK] | CONTINUE [COMMIT | ROLLBACK | NONE]}
```

Performs the specified action (exits SQLcl by default) if an operating system error occurs (such as a file writing error).

```
WHENEVER SQLERROR {EXIT [SUCCESS | FAILURE | WARNING | n | variable | :BindVariable] [COMMIT | ROLLBACK | NONE]}
```

Performs the specified action (exits SQLcl by default) if a SQL command or PL/SQL block generates an error.

Use the following commands to write interactive commands:

```
ACC[EPT] variable [NUM[BER] | CHAR | DATE | BINARY_FLOAT | BINARY_DOUBLE] [FOR[MAT] format] [DEF[AULT] default] [PROMPT text | NOPR[OMPT]] [HIDE]
```

Reads a line of input and stores it in a given substitution variable.

```
DEF[INE] [variable] | [variable = text]
```

Specifies a substitution variable and assigns a CHAR value to it, or lists the value and variable type of a single variable or all variables.

```
PAU[SE] [text]
```

Displays the specified text then waits for the user to press RETURN.

```
PRO[MPT] [text]
```

Sends the specified message or a blank line to the user's screen.

```
UNDEF[INE] variable ...
```

Deletes one or more substitution variables that you defined either explicitly (with the DEFINE command) or implicitly (with a START command argument).

Use the following commands to create and display bind variables:

```
PRINT [variable ...]
```

Displays the current values of bind variables, or lists all bind variables.

Use the following symbols to create substitution variables and parameters for use in scripts:

```
& n
```

Specifies a parameter in a script you run using the START command. START substitutes values you list after the script name as follows: the first for &1, the second for &2, and so on.

```
&user variable, &&user variable
```



Indicates a substitution variable in a SQL or SQLcl command. SQLcl substitutes the value of the specified substitution variable for each substitution variable it encounters. If the substitution variable is undefined, SQLcl prompts you for a value *each* time an "&" variable is found, and the *first* time an "&" variable is found.

```
. (period)
```

Terminates a substitution variable followed by a character that would otherwise be part of the variable name.

2.7 Formatting Query Results

Use the following commands to format, store and print your query results.

```
BRE[AK] [ON report_element [action [action]]] ...
```

Specifies where changes occur in a report and the formatting action to perform, such as:

- suppressing the display of duplicate values for a given column
- skipping a line each time a given column value changes
- printing computed figures each time a given column value changes or at the end of the report

Enter BREAK with no clauses to list the current BREAK definition.

Where report element has the following syntax:

```
{column | expression | ROW | REPORT}
```

and where action has the following syntax:

```
[SKI[P] n | [SKI[P]] PAGE] [NODUP[LICATES] | DUP[LICATES]]

BTI[TLE] [printspec [text | variable] ...] | [ON | OFF]
```

Places and formats a title at the bottom of each report page, or lists the current BTITLE definition. Use one of the following clauses in place of *printspec*:

```
BOLD

CE[NTER]

COL n

FORMAT text

LE[FT]

R[IGHT]

S[KIP] [n]

TAB n

CL[EAR] option ...
```

Resets or erases the current value or setting for the specified option.

Where option represents one of the following clauses:

```
BRE [AKS]
BUFF[ER]
COL [UMNS]
COMP[UTES]
```



```
CONTEXT

SCR[EEN]

SQL

TIMI[NG]

COL[UMN] [{column | expr} [option ...]]
```

Specifies display attributes for a given column, such as:

- text for the column heading
- · alignment for the column heading
- format for NUMBER data
- wrapping of column data

Also lists the current display attributes for a single column or for all columns.

Where option represents one of the following clauses:

```
ALI[AS] alias

CLE[AR]

ENTMAP {ON | OFF}

FOR[MAT] format

HEA[DING] text

JUS[TIFY] {L[EFT] | C[ENTER] | R[IGHT]}

LIKE {expr | alias}

NEWL[INE]

NEW_V[ALUE] variable

NOPRI[NT] | PRI[NT]

NUL[L] text

OLD_V[ALUE] variable

ON | OFF

WRA[PPED] | WOR[D WRAPPED] | TRU[NCATED]
```



Currently only NEW V[ALUE] variable syntax is supported.

Enter COLUMN [$\{column \mid expr\}$ FORMAT format] where the format element specifies the display format for the column.

To change the display format of a NUMBER column, use ${\tt FORMAT}$ followed by one of the elements in the following table:

Element	Examples	Description
, (comma)	9,999	Displays a comma in the specified position.
. (period)	99.99	Displays a period (decimal point) to separate the integral and fractional parts of a number.
\$	\$9999	Displays a leading dollar sign.



Element	Examples	Description	
0	0999 9990	Displays leading or trailing zeros (0).	
9	9999	Displays a value with the number of digits specified by the number of 9s. Value has a leading space if positive, a leading minus sign if negative. Blanks are displayed for leading zeros. A zero (0) is displayed for a value of zero.	
В	В9999	Displays blanks for the integer part of a fixed-point number when the integer part is zero, regardless of zeros in the format model.	
С	C999	Displays the ISO currency symbol in the specified position.	
D	99D99	Displays the decimal character to separate the integral and fractional parts of a number.	
EEEE	9.999EEEE	Displays a value in scientific notation (format must contain exactly four "E"s).	
G	9G999	Displays the group separator in the specified positions in the integral part of a number.	
L	L999	Displays the local currency symbol in the specified position.	
MI	9999MI	Displays a trailing minus sign after a negative value. Displays a trailing space after a positive value.	
PR	9999PR	Displays a negative value in <angle brackets="">. Displays a positive value with a leading and trailing space.</angle>	
RN rn	RN rn	Displays uppercase Roman numerals. Displays lowercase Roman numerals. Value can be an integer between 1 and 3999.	
S	S9999 9999S	Displays a leading minus or plus sign. Displays a trailing minus or plus sign.	
TM	TM	Displays the smallest number of decimal characters possible. The default is TM9. Fixed notation is used for output up to 64 characters, scientific notation for more than 64 characters. Cannot precede TM with any other element. TM can only be followed by a single 9 or E.	
Ū	U9999	Displays the dual currency symbol in the specified position.	

 $\begin{tabular}{ll} $\tt COMP[UTE]$ [function [LAB[EL] text] ... OF {\it expr} | column | alias | REPORT | ROW} ...] \\ \end{tabular}$

In combination with the BREAK command, calculates and prints summary lines using various standard computations. It also lists all COMPUTE definitions. The following table lists valid functions. All functions except NUMBER apply to non-null values only. COMPUTE functions are always executed in the following sequence AVG, COUNT, MINIMUM, MAXIMUM, NUMBER, SUM, STD, VARIANCE.



Function	Computes	Applies to Datatypes
AVG	Average of non-null values	NUMBER
COU[NT]	Count of non-null values	All types
MIN[IMUM]	Minimum value	NUMBER, CHAR, NCHAR, VARCHAR2 (VARCHAR), NVARCHAR2 (NCHAR VARYING)
MAX[IMUM]	Maximum value	NUMBER, CHAR, NCHAR, VARCHAR2 (VARCHAR), NVARCHAR2 (NCHAR VARYING)
NUM[BER]	Count of rows	All types
SUM	Sum of non-null values	NUMBER
STD	Standard deviation of non-null values	NUMBER
VAR[IANCE]	Variance of non-null values	NUMBER

```
SET SQLFORMAT {csv | html | xml | json | ansiconsole | insert | loader |
fixed | default}
```

Outputs reports in various formats. The ansiconsole option formats and resizes data according to the column widths, for easier readability. The json option returns a query in JSON format.

SET SQLFORMAT DELIMITED <delimiter> <left enclosure> <right enclosure> allows you to set a custom delimited format.

```
SPO[OL] [filename[.ext] [CRE[ATE] | REP[LACE] | APP[END]] | OFF | OUT]
```

Stores query results in a file, or optionally sends the file to a printer. OFF stops spooling. OUT stops spooling and sends the file to your computer's default printer. Enter SPOOL with no clauses to list the current spooling status. If no file extension is given, the default extension, .1st or .1is, is used.

```
\texttt{TTI[TLE]} \ [printspec \ [text \mid variable] \ \ldots] \ | \ [\texttt{ON} \mid \ \underline{\texttt{OFF}}]
```

Places and formats a specified title at the top of each report page, or lists the current TTITLE definition. The old form of TTITLE is used if only a single word or a string in quotes follows the TTITLE command.

Where printspec represents one or more of the following clauses:

```
BOLD
CE[NTER]
COL n
FORMAT text
LE[FT]
R[IGHT]
S[KIP] [n]
TAB n
```



2.8 Accessing Databases

Use the following commands to access and copy data between tables on different databases:

```
CONN[ECT] [{<logon>| / |proxy} [AS {SYSOPER | SYSDBA | SYSASM}] [edition=value]]
```

where logon has the following syntax:

```
username[/password] [@connect identifier]
```

where proxy has the following syntax:

proxyuser[username] [/password] [@connect identifier]



The brackets around username in proxy are required syntax.

Connects a given username to the Oracle Database. If you omit <code>connect_identifier</code>, SQLcl connects you to the default database. If you omit <code>username</code> and/or <code>password</code>, SQLcl prompts you for them. CONNECT followed by a slash (/) connects you using a default (OPS\$) logon.

When you run a CONNECT command, the site profile, glogin.sql, and the user profile, login.sql, are processed in that order. CONNECT does not reprompt for username or password if the initial connection does not succeed.

```
DISC[ONNECT]
```

Commits pending changes to the database and logs the current user out of Oracle, but does not exit SQLcl. In SQLcl command line, use EXIT or QUIT to log out of Oracle and return control to your computer's operating system.

```
COPY {FROM database | TO database | FROM database TO database} {APPEND | CREATE | INSERT | REPLACE | APPEND_BYTE | CREATE_BYTE | REPLACE_BYTE} destination table[(column, column, column, ...)] USING query
```

where database has the following syntax:

```
username[/password]@connect identifier
```

Copies data from a query to a table in the same or another database. APPEND, CREATE, INSERT or REPLACE specifies how COPY treats the existing copy of the destination table (if it exists). USING *query* identifies the source table and determines which rows and columns COPY copies from it. COPY supports CHAR, DATE, LONG, NUMBER and VARCHAR2 datatypes.

```
PASSW[ORD] [username]
```

Allows you to change a password without displaying it on an input device.

```
XQUERY xquery statement
```

Allows you to run an XQuery from SQLcl.



2.9 Miscellaneous Commands

ALIAS [<name>=<SQL statement>; | LOAD [<filename>] | SAVE [<filename>] | LIST [<NAME>] | DROP <name> | DESC <name> <Description String>]

Alias is a command which allows you to save a SQL, PL/SQL or SQL*Plus script and assign it a shortcut command.

- ALIAS Print a list of aliases
- ALIAS LIST <alias_name> List the contents of the alias

The following example shows how to create a simple alias:

SQL> ALIAS action1=select :one from dual;



Define an alias simply by using the alias keyword followed by a single identifier name followed by an '='. Anything after the '=' will be used as the alias contents. If it is SQL, it will be terminated by ';'. If it is PL/SQL, it will be terminated by '/'.

APEX

Lists Application Express Applications. Use APEX EXPORT <app id> to export the application which could be combined with spool for writing to a file.

```
ARCHIVE LOG LIST
```

Displays information about redo log files.

```
BRIDGE <targetTableName> as "<jdbcURL>"(<sqlQuery>);
```

Used mainly to script data move between two connections/schemas. It also includes functionality to dynamically create Oracle tables which "fit" the data being received through JDBC. The following functionality is available:

- 1. Query tables in other connections
- 2. Query tables in multiple connections in the same statement
- 3. Insert data from one connection into another
- 4. Create a table and insert data into it from another connection

```
CTAS table new table
```

Uses DBMS_METADATA to extract the DDL for the existing table, then modifies that into a create table as select * from.

```
DDL [object name [type] [SAVE filename]]
```

Generates the code to reconstruct the object listed. Use the *type* option for materialized views. Use the SAVE option to save the DDL to a file.

```
DESC[RIBE] {[schema.]object[@connect identifier]}
```



Lists the column definitions for a table, view or synonym, or the specifications for a function or procedure.

```
FIND [<filename>]
```

Searches the SQLPATH and its directories for the specified file name. FIND where <filename> lists all the SQLPATH locations where it finds files matching the specified file name.

```
INFO[RMATION] {[schema.]object[@connect identifier]}
```

Lists more detailed information about the column definitions for a table, view or synonym, or the specifications for a function or procedure.



INFORMATION+ will show column statistics.

```
OERR <facility> <error>
```

Displays information about errors. Facility is identified by the prefix string in the error message. For example, if you get ORA-7300, "ora" is the facility and "7300" is the error. So you should type "oerr ora 7300".

```
SSHTUNNEL <username>@<hostname> -i <identity_file> [-L
localPort:Remotehost:RemotePort]
```

Creates a tunnel using standard ssh options such as port forwarding like option -L of the given port on the local host will be forwarded to the given remote host and port on the remote side. It also supports identity files, using the ssh -i option. If passwords are required, they will be prompted for.

```
TNSPING <address>
```

The TNSPING utility determines whether the listener for a service on an Oracle Net network can be reached successfully.

WHICH

Searches the SQLPATH and its directories for the specified file name and prints the name of the first file matching the specified file name in the SQLPATH.

Other commands are:

- REST
- SODA
- MODELER
- DG (Data Guard)
- AQ (Advanced Queuing)
- SET system_variable value
- SHOW option



2.9.1 REST

REST enables you to export Oracle REST Data Services 3.x services. This is applicable for Oracle REST Data Services release 3.0.5 or later. If you have an earlier version of Oracle REST Data Services, you will need to upgrade. See the Installing Oracle REST Data Services section in Oracle REST Data Services Installation, Configuration, and Development Guide for details.

The options are:

- REST export Export all Oracle REST Data Services 3.x service modules
- REST export <module name> Export a specific module
- REST export <module_uri_uri prefix> Export a specific module related to the given prefix
- REST modules List the available modules
- REST privileges List the existing privileges
- REST schemas List the available schemas

2.9.2 SODA

SODA allows schemaless application development using the JSON data model. The options are:

- SODA create <collection name> Create a new collection
- SODA list List all the collections
- SODA get <collection_name> [-all | -f | -k | -klist] [{<key> | <k1> <k2> ... | <qbe>}] List documents the collection. Optional arguments:
 - all: list the keys of all docs in the collection
 - k: list docs matching the specific <key>
 - klist: list docs matching the list of keys
 - f: list docs matching the <qbe>
- SODA insert <collection_name> <json_str | filename> Insert a new document within a collection
- SODA drop <collection name> Delete existing collection
- SODA count <collection_name> [<qbe>] Count number of documents inside collection. Optional parameter <qbe> returns number of matching documents
- SODA replace <collection_name> <oldkey> <new_{str | doc}> Replace one document with another
- SODA remove <collection_name> [-k | -klist | -f] {<key> | <k1>
 <k2> ... | <qbe>} Remove documents from collection. Optional arguments:
 - k : Remove document in collection matching the specific <key>
 - klist: Remove document in collection matching the list <key1> <key2> ...



f : Remove document in collection matching <qbe>

2.9.3 MODELER

The MODELER command provides a command-line interface for Oracle SQL Developer Data Modeler features.

The options available are:

- modeler help < command> Displays help information about the specified modeler command.
- modeler ddl <parameters> Generates the Data Definition Lanaguage statements from the selected Data Modeler design.
- modeler report <parameters> Generates the report from the selected Data Modeler design.

MODELER DDL

Generates the Data Definition Lanaguage statements from the selected Data Modeler design.

Syntax

MODELER DDL -design <file> -relmodel <name> [-outputfile <name>]

Parameters

Parameter	Description
-design (d) <file></file>	Full path to the design's file name.
-relmodel (rm) < name>	Name of the relational model.
-dbsite (ds) <name></name>	(Optional) Name of the physical model database site. If this is not specified, then the default relational database management system site for the provided relational model is used.
-outputfile (o) <file></file>	Full path to the output file for the generated DDL content.
-systemTypesDir (td) <path></path>	Full path to the system types directory.
-settingsFile (s) <file></file>	Full path to the exported Data Modeler settings file.
-ddlConfigFile (c) <file></file>	Full path to the exported DDL configuration file.

Example

modeler ddl -design "C:/Designs/SH.dmd" -relmodel "SH" -outputfile "C:/
DDL.sql"

MODELER REPORT

Generates the report from the selected Data Modeler design.



Syntax

MODELER REPORT -design <file> -type <type> [-title <name>] -filename <name> -outputpath <path>

Parameters

Parameter	Description
-design (d) <file></file>	Full path to the design's file name.
-type (tp)	Specify the type of report. Available types are: Tables, TableViews, TablesAndViews, Entities, EntityViews, EntitiesAndViews, Domains.
-filename (f) <name></name>	Name of the generated HTML file.
-outputpath (o) <path></path>	Full path to the folder for the generated HTML content. The report file is put in that folder and a "css" sub-directory with the CSS files used is created.
-relmodel (rm) <name></name>	Name of the relational model (for Tables and Table Views only).
-title (tt) <name></name>	(Optional) Title of the report.
-standardTemplate (st) <name></name>	Name of the template for a standard report, defining the set of report sections to include (optional). If this is not specified, all report sections are included.
-customTemplate (ct) <name></name>	(Optional) Name of the template for a custom report.
-reportConfTemplate (c) <name></name>	(Optional) Name of the template that defines the set of objects and subviews to include in the report.
-companyname (cn) < name>	(Optional) Name of the company.
-systemTypesDir (td) <path></path>	Full path to the system types directory.
-settingsFile (s) <file></file>	Full path to the exported Data Modeler settings file.

Example

modeler report -design "C:/Designs/SH.dmd" -type "Tables" -filename
"SHTablesReport" -outputpath "C:/Reports"

2.9.4 DG (Data Guard)

Enables you to manage Oracle Data Guard broker for Oracle Database release 21c only.

See Data Guard Commands in *Oracle Data Guard Broker* for information about Data Guard commands and parameters.

2.9.5 AQ (Advanced Queuing)

The AQ command in SQLcl enables you to access the Oracle Database Advanced Queuing functionality to create queues and queue tables, enqueue and dequeue

messages, add and remove subscribers, and manage transactional event queues (TxEventQ).

Prerequisites

This command requires the ADMIN role.

You must have some working knowledge of Advanced Queuing and Transactional Event Queues and be familiar with the concepts, which are explained in the *Oracle Database Advanced Queuing and Transactional Event Queues User's Guide*.

Supported Commands

You can run Advanced Queuing commands in SQLcl using aq.

To view the help information for Advanced Queuing, enter ag help.

- Create a Queue Table
- Alter a Queue Table
- Drop a Queue Table
- Create a Queue
- Alter a Queue
- Drop a Queue
- · Create a Sharded Queue
- Alter a Sharded Queue
- Drop a Sharded Queue
- Create an Exception Queue
- Create a Transactional Event Queue
- Alter a Transactional Event Queue
- Drop a Transactional Event Queue
- Create an EQ Exception Queue
- Start a Queue
- Stop a Queue
- Add a Subscriber
- Alter a Subscriber
- Remove a Subscriber
- Enqueue
- Dequeue

Example

The following example uses Advanced Queuing commands in SQLcl to create a queue, start the queue, add a subscriber to the queue, enqueue a message and then dequeue it.

--Create a queue named demo2 with multiple consumers and payload type JSON SQL> aq createteq -name demo2 -mul true -pt JSON



```
--Show the queue properties
SQL> select name, qid, queue type, enqueue enabled, dequeue enabled,
sharded, queue category, recipients from user queues;
--Start the queue demo2
SQL> aq startq -name demo2
SQL> select name, qid, queue type, enqueue enabled, dequeue enabled,
sharded, queue category, recipients from user queues;
--Add subscriber named Bob to queue demo2
SQL> aq add subscriber -queue demo2 -name bob;
--Enqueue message "hello" to queue demo2
SQL> aq enq -name demo2 -p {"message":"hello"};
--Commit the message (send)
SQL> commit;
--Dequeue from queue demo2 by subscriber named Bob using NEXT MESSAGE
navigation after waiting for 2 seconds
SQL> aq deq -name demo2 -nav NEXT MESSAGE -consumer name bob -wait 2;
```

2.9.5.1 Create a Queue Table

Syntax

```
AQ CREATE QUEUE TABLE/CREATEQT -n[ame] table_name

[-pay[load_type] {JSON | RAW | [schema.]type_name}]

[-sto[rage_clause] string]

[-sort[_list] string]

[-mul[tiple_consumers] {NO | YES}]

[-com[ment] string]

[-primary[_instance] number]

[-secondary[_instance] number]

[-secure {YES | NO}]

[-repl[ication_mode] {NONE | REPLICATION}]
```

Parameter	Description	Default
-name,-n	<name> Name of a queue table to create.</name>	-
-payload_type,-pt	[OBJECT NAME TYPE NAME JSON] Type of the user data stored.	JSON



	Description	Default
-storage_clause,-sto	<pre><storage_clause>Storage parameter.</storage_clause></pre>	NULL
	The storage parameter is included in the CREATE TABLE statement when the queue table is created. The storage parameter can be made up of any combinations of the following parameters: PCTFREE, PCTUSED, INITRANS, MAXTRANS, TABLESPACE, LOB, and a table storage clause.	
-sort_list,-sort	<sort_list></sort_list>	ENQ_TIME
	The columns to be used as the sort key in ascending order. This parameter has the following format: 'sort_column_1,sort_column_2' The allowed column names are priority, enq_time, and commit_time.	
-multiple_consumers,-	[TRUE FALSE]	False
mul	TRUE: Queues created in the table can only have one consumer for each message.	
	FALSE: Queues created in the table can have multiple consumers for each message.	
-comment,-c	<comment></comment>	NULL
	User-specified description of the queue table.	
-primary_instance,-	<pre><primary_instance></primary_instance></pre>	0
primary	The primary owner of the queue table. Queue monitor scheduling and propagation for the queues in the queue table are done in this instance.	
-secondary_instance,-	<secondary_instance></secondary_instance>	0
secondary	The queue table fails over to the secondary instance if the primary instance is not available.	
-secure,-sec	[TRUE FALSE]	False
	TRUE: Use the queue table for secure queues. Secure queues are queues for which AQ agents must be associated explicitly with one or more database users.	
-replication_mode,-repl	[0:NONE 1:REPLICATION_MODE]	0:NONE

2.9.5.2 Alter a Queue Table

Syntax



```
[-primary[_instance] number]
[-secondary[_instance] number]
[-repl[ication mode] {NONE | REPLICATION}]
```

Parameter	Description	Default
Parameter	Description	Delault
-name,-n	<name> Name of a queue table to alter.</name>	-
-comment,-c	<comment></comment>	NULL
	User-specified description of the queue table.	
-primary_instance,-	<pre><primary_instance></primary_instance></pre>	0
primary	The primary owner of the queue table. Queue monitor scheduling and propagation for the queues in the queue table are done in this instance.	
-secondary_instance,- secondary	<secondary_instance> The queue table fails over to the secondary instance if the primary instance is not available.</secondary_instance>	0
-replication_mode,-repl	[0:NONE 1:REPLICATION_MODE]	0:NONE

2.9.5.3 Drop a Queue Table

Syntax

```
AQ DROP QUEUE TABLE/DROPQT -n[ame] table_name [-for[ce] {NO | YES}]
```

Parameters

Parameter	Description	Default
-name,-n	<name> Name of a queue table to drop.</name>	-
-force,-f	[TRUE FALSE]	False
	TRUE: All queues in the table are stopped and dropped automatically.	
	FALSE: The operation does not succeed if there are any queues in the table.	

2.9.5.4 Create a Queue

```
AQ CREATE QUEUE/CREATEQ -n[ame] queue_name -tab[le_name] [schema.]table_name [-type {NORMAL | EXCEPTION}]
```



```
[-max[_retries] number]
[-retry[_delay] number]
[-retention[_time] number]
[-com[ment] string]
```

Parameter	Description	Default
-name,-n	<name> Name of a queue to create.</name>	-
-table_name,-tab	[schema]. <table_name></table_name>	-
	Name of the queue table that will contain the queue.	
-type,-t	[0:NORMAL QUEUE 1:EXCEPTION QUEUE]	0:NORMAL QUEUE
	Specifies whether the queue being created is an exception queue or a normal queue.	
-max retries,-max	<max_retries number=""></max_retries>	5
_	A message is moved to an exception queue if RETRY_COUNT is greater than MAX_RETRIES.	
	RETRY_COUNT is incremented when the application issues a rollback after executing the dequeue.	
-retry_delay,-retry	<retry_delay number=""></retry_delay>	0
	Delay time, in seconds, before this message is scheduled for processing again after an application rollback.	
-comment,-c	<comment></comment>	NULL
	User-specified description of the queue table.	
-retention_time,-rtime	<retention_time number=""></retention_time>	0
	[-1:INFINITE] means the message is retained forever.	
	Number of seconds that a message is retained in the queue table after being dequeued from the queue.	

2.9.5.5 Alter a Queue

```
AQ ALTER QUEUE/ALTERQ -n[ame] queue_name
  [-max[_retries] number]
  [-retry[_delay] number]
  [-retention[_time] number]
  [-com[ment] string]
```



Parameter	Description	Default
-name,-n	<name> Name of a queue to alter.</name>	-
-max_retries,-max	<max_retries number=""></max_retries>	NULL - current value
	A message is moved to an exception queue if RETRY_COUNT is greater than MAX_RETRIES.	will not be altered.
	RETRY_COUNT is incremented when the application issues a rollback after executing the dequeue.	
-retry_delay,-retry	<retry_delay number=""></retry_delay>	NULL - current value
	Delay time, in seconds, before this message is scheduled for processing again after an application rollback.	will not be altered.
-retention_time,-rtime	<retention_time number=""></retention_time>	0
	[-1:INFINITE] means the message is retained forever.	
	Number of seconds that a message is retained in the queue table after being dequeued from the queue.	
-comment,-c	<comment></comment>	NULL
	User-specified description of the queue table.	

2.9.5.6 Drop a Queue

Syntax

AQ DROP QUEUE/DROPQ -n[ame] queue_name

Parameters

Parameter	Description	Default
-name,-n	<name> Name of a queue to drop.</name>	-

2.9.5.7 Create a Sharded Queue

```
AQ CREATE SHARDED QUEUE/CREATESQ -n[ame] queue_name
[-sto[rage_clause] string]
[-mul[tiple_consumers] {NO | YES}]
[-max[_retries] number]
[-com[ment] string]
[-pay[load_type] {JSON | RAW | [schema.]type_name}]
[-retry[_delay] number]
```



```
[-retention_time number]
[-sort[_list] {PRIORITY,ENQ_TIME | ENQ_TIME}]
[-cache[_hint] {AUTO | UNCACHED | CACHED }]
[-retention_type string]
[-repl[ication_mode] NONE]
```

Parameter	Description	Default
-name,-n	<name> Name of a queue table to create.</name>	-
-storage_clause,-sto	<pre><storage_clause>Storage parameter.</storage_clause></pre>	NULL
	The storage parameter is included in the CREATE TABLE statement when the queue table is created. The storage parameter can be made up of any combinations of the following parameters: PCTFREE, PCTUSED, INITRANS, MAXTRANS, TABLESPACE, LOB, and a table storage clause.	
-multiple_consumers,-mul	[TRUE FALSE]	False
	TRUE: Queues created in the table can only have one consumer for each message.	
	FALSE: Queues created in the table can have multiple consumers for each message.	
-comment,-c	<comment></comment>	NULL
	User-specified description of the queue table.	
-payload_type,-pt	[OBJECT NAME TYPE NAME JSON JMS] Type of the user data stored.	JMS
-retry_delay,-retry	<retry_delay number=""></retry_delay>	0
	Delay time, in seconds, before this message is scheduled for processing again after an application rollback.	
-retention_time,-rtime	<retention_time number=""></retention_time>	0
	[-1:INFINITE] means the message is retained forever.	
	Number of seconds that a message is retained in the queue table after being dequeued from the queue.	
-sort_list,-sort	<sort_list> The columns to be used as the sort key in ascending order. This parameter has the following format: 'sort_column_1,sort_column_2' The allowed column names are priority, enq_time, and commit_time.</sort_list>	PRIORITY,ENQ_TIME



Parameter	Description	Default
-cache_hint,-cache	[1:AUTO 2:CACHED 3:UNCACHED]	1:AUTO
	Specifies a hint to sharded queue whether to cache messages or not. User can specify following:	
	 [1:AUTO]: Message cache does best effort based on available memory. [2:CACHED]: Message cache will cache messages and give preference to those queues with CACHED hint. 	
-retention_type,-rtype	[0: DEQUEUE_TIME]	0:DEQUEUE_TIME
	The retention time starts after a subshard is dequeued by all the subscribers. If a new subscriber seeks back before or to this subshard, then the retention clock is reset.	
-replication_mode,-repl	[0:NONE 1:REPLICATION_MODE]	0:NONE

2.9.5.8 Alter a Sharded Queue

Syntax

```
AQ ALTER SHARDED QUEUE/ALTERSQ -n[ame] queue_name
[-max[_retries] number]
[-com[ment] string]
[-retry[_delay] number]
[-retention_time number]
[-cache[_hint] {AUTO | UNCACHED | CACHED}]
[-retention_type string]
[-repl[ication mode] NONE]
```

Parameter	Description	Default
-name,-n	<name> Name of a queue to alter.</name>	-
-max_retries,-max	<max_retries number=""></max_retries>	NULL - current value
	A message is moved to an exception queue if RETRY_COUNT is greater than MAX_RETRIES.	will not be altered.
	RETRY_COUNT is incremented when the application issues a rollback after executing the dequeue.	
-comment,-c	<comment></comment>	NULL
	User-specified description of the queue table.	
-retry_delay,-retry	<retry_delay number=""></retry_delay>	0
	Delay time, in seconds, before this message is scheduled for processing again after an application rollback.	



Parameter	Description	Default
-retention_time,-rtime	<pre><retention_time number=""> [-1:INFINITE] means the message is retained forever.</retention_time></pre>	0
	Number of seconds that a message is retained in the queue table after being dequeued from the queue.	
-sort_list,-sort	<sort_list></sort_list>	PRIORITY,ENQ_TIM
	The columns to be used as the sort key in ascending order. This parameter has the following format: 'sort_column_1,sort_column_2' The allowed column names are priority, enq_time, and commit_time.	E
-cache_hint,-cache	[1:AUTO 2:CACHED 3:UNCACHED]	1:AUTO
	Specifies a hint to sharded queue whether to cache messages or not. User can specify following:	
	 [1:AUTO]: Message cache does best effort based on available memory. 	
	 [2:CACHED]: Message cache will cache messages and give preference to those queues with CACHED hint. 	
-retention_type,-rtype	[0: DEQUEUE_TIME]	0:DEQUEUE_TIME
	The retention time starts after a subshard is dequeued by all the subscribers. If a new subscriber seeks back before or to this subshard, then the retention clock is reset.	
-replication_mode,-repl	[0:NONE 1:REPLICATION_MODE]	0:NONE

2.9.5.9 Drop a Sharded Queue

Syntax

Parameter	Description	Default
-name,-n	<name> Name of a queue table to drop.</name>	-
-force,-f	[TRUE FALSE]	False
	TRUE: The sharded queue is dropped even if the queue is not stopped.	
	FALSE: The sharded queue is not dropped even if the queue is not stopped.	



2.9.5.10 Create an Exception Queue

Syntax

AQ CREATE EXCEPTION QUEUE/CREATEEQ -n[ame] queue_name -sharded[queue name] [schema.]queue name

Parameters

Parameter	Description	Default
-name,-n	<name></name>	NULL
	Name of a queue to create.	
-sharded_queue_name,-	[schema]. <name></name>	FALSE
sharded	The name of the sharded queue.	

2.9.5.11 Create a Transactional Event Queue



This command is only available for Oracle Database release 21c and later versions.

Syntax

```
AQ CREATE TRANSACTIONAL EVENT QUEUE/CREATETEQ -n[ame] queue_name
[-sto[rage_clause] string]
[-mul[tiple_consumers] {NO | YES}]
[-max[_retries] number]
[-com[ment] string]
[-pay[load_type] {JSON | RAW | JMS | [schema.]type_name}]
[-retry[_delay] number]
[-retention_time number]
[-sort[_list] {PRIORITY, ENQ_TIME | ENQ_TIME}]
[-cache[_hint] {AUTO | UNCACHED | CACHED}]
[-retention_type string]
[-repl[ication mode NONE]
```

Parameter	Description	Default
-name,-n	<name> Name of a queue to create.</name>	-



Parameter	Description	Default
-storage_clause,-sto	<storage_clause>Storage parameter. The storage parameter is included in the CREATE TABLE statement when the queue table is created. The storage parameter can be made up of any combinations of the following parameters: PCTFREE, PCTUSED, INITRANS, MAXTRANS, TABLESPACE, LOB, and a table storage clause.</storage_clause>	NULL
-multiple_consumers,- mul	[TRUE FALSE] TRUE: Queues created in the table can only have one consumer for each message. FALSE: Queues created in the table can have multiple consumers for each message.	False
-max_retries,-max	<pre><max_retries number=""> A message is moved to an exception queue if RETRY_COUNT is greater than MAX_RETRIES. RETRY_COUNT is incremented when the application issues a rollback after executing the dequeue.</max_retries></pre>	5
-comment,-c	<comment> User-specified description of the queue table.</comment>	NULL
-payload_type,-pt	[OBJECT NAME TYPE NAME JSON JMS] Type of the user data stored.	JMS
-retry_delay,-retry	<pre><retry_delay number=""> Delay time, in seconds, before this message is scheduled for processing again after an application rollback.</retry_delay></pre>	0
-retention_time,-rtime	<pre><retention_time number=""> [-1:INFINITE] means the message is retained forever. Number of seconds that a message is retained in the queue table after being dequeued from the queue.</retention_time></pre>	0
-sort_list,-sort	<sort_list> The columns to be used as the sort key in ascending order. This parameter has the following format: 'sort_column_1,sort_column_2' The allowed column names are priority, enq_time, and commit_time.</sort_list>	PRIORITY,ENQ_TIM E



Parameter	Description	Default
-cache_hint,-cache	[1:AUTO 2:CACHED 3:UNCACHED]	1:AUTO
	Specifies a hint to sharded queue whether to cache messages or not. User can specify following:	
	 [1:AUTO]: Message cache does best effort based on available memory. [2:CACHED]: Message cache will cache messages and give 	
	preference to those queues with CACHED hint.	
-retention_type,-rtype	[0: DEQUEUE_TIME]	0:DEQUEUE_TIME
	The retention time starts after a subshard is dequeued by all the subscribers. If a new subscriber seeks back before or to this subshard, then the retention clock is reset.	
-replication_mode,-repl	[0:NONE 1:REPLICATION_MODE]	0:NONE

2.9.5.12 Alter a Transactional Event Queue



This command is only available for Oracle Database release 21c and later versions.

Syntax

```
AQ ALTER TRANSACTIONAL EVENT QUEUE/ALTERTEQ -n[ame] queue_name
[-max[_retries] number]
[-com[ment] string]
[-retry[_delay] number]
[-retention_time number]
[-cache[_hint] {AUTO | UNCACHED | CACHED}]
[-retention_type string]
[-repl[ication_mode NONE]
```

Parameter	Description	Default
-name,-n	<name> Name of a queue to alter.</name>	-



Parameter	Description	Default
-max_retries,-max	<max_retries number=""></max_retries>	NULL - current value
	A message is moved to an exception queue if RETRY_COUNT is greater than MAX_RETRIES.	will not be altered.
	RETRY_COUNT is incremented when the application issues a rollback after executing the dequeue.	
-comment,-c	<comment></comment>	NULL
	User-specified description of the queue table.	
-retry_delay,-retry	<retry_delay number=""></retry_delay>	0
	Delay time, in seconds, before this message is scheduled for processing again after an application rollback.	
-retention_time,-rtime	<retention_time number=""></retention_time>	0
	[-1:INFINITE] means the message is retained forever.	
	Number of seconds that a message is retained in the queue table after being dequeued from the queue.	
-sort_list,-sort	<sort_list></sort_list>	PRIORITY,ENQ_TIM
	The columns to be used as the sort key in ascending order. This parameter has the following format: 'sort_column_1,sort_column_2' The allowed column names are priority, enq_time, and commit_time.	E
-cache_hint,-cache	[1:AUTO 2:CACHED 3:UNCACHED]	1:AUTO
-retention_type,-rtype	Specifies a hint to sharded queue whether to cache messages or not. User can specify following: I:AUTO]: Message cache does best effort based on available memory. [2:CACHED]: Message cache will cache messages and give preference to those queues with CACHED hint.	0:DEQUEUE_TIME
_	The retention time starts after a	
	subshard is dequeued by all the subscribers. If a new subscriber seeks back before or to this subshard, then the retention clock is reset.	
-replication_mode,-repl	[0:NONE 1:REPLICATION_MODE]	0:NONE
_	_	



2.9.5.13 Drop a Transactional Event Queue



This command is only available for Oracle Database release 21c and later versions.

Syntax

AQ DROP TRANSACTIONAL EVENT QUEUE/DROPTEQ -n[ame] queue_name [-for[ce] {NO | YES}]

Parameters

Parameter	Description	Default
-name,-n	<name> Name of a queue to drop.</name>	-
-force,-f	[TRUE FALSE]	FALSE
	TRUE: The sharded queue is dropped even if the queue is not stopped.	
	FALSE: The sharded queue is not dropped even if the queue is not stopped.	

2.9.5.14 Create an EQ Exception Queue

Syntax

AQ CREATE EQ EXCEPTION QUEUE/CREATEEQEQ -n[ame] queue_name -teq[_queue_name] [schema.]queue_name

Parameters

Parameter	Description	Default
-name,-n	<name></name>	NULL
	Name of a queue to create.	
-teq_queue_name,-teq	[schema]. <name></name>	FALSE
	The name of the transactional event queue.	

2.9.5.15 Start a Queue



Syntax

```
AQ START QUEUE/STARTQ -n[ame] queue_name [-enq[ueue] {ENABLE | KEEP}] [-deq[ueue] {ENABLE | KEEP}]
```

Parameters

Parameter	Description	Default
-name,-n	<name></name>	NULL
	Name of a queue to enable.	
-enqueue,-enq	[TRUE FALSE]	TRUE
	TRUE: Enable ENQUEUE.	
	FALSE: Do not alter the current setting.	
-dequeue,-deq	[TRUE FALSE]	TRUE
	TRUE: Enable DEQUEUE.	
	FALSE: Do not alter the current setting.	

2.9.5.16 Stop a Queue

Syntax

```
AQ STOP QUEUE/STOPQ -n[ame] queue_name
  [-enq[ueue] {DISABLE | KEEP}]
  [-deq[ueue] {DISABLE | KEEP}]
  [-wait {YES | NO}]
```

Parameter	Description	Default
-name,-n	<name></name>	NULL
	Name of a queue to disable.	
-enqueue,-enq	[TRUE FALSE]	TRUE
	TRUE: Enable ENQUEUE.	
	FALSE: Do not alter the current setting.	
-dequeue,-deq	[TRUE FALSE]	TRUE
	TRUE: Enable DEQUEUE.	
	FALSE: Do not alter the current setting.	
-wait,-w	[TRUE FALSE	TRUE
	TRUE: Wait if there are any outstanding transactions.	
	FALSE: Return immediately either with a success or an error.	



2.9.5.17 Add a Subscriber

Syntax

```
AQ ADD SUBSCRIBER/ADDSUB -n[ame] subscriber_name
-queue[_name] queue_name
[-subscriber_address string]
[-subscriber_protocol number]
[-rule string]
[-trans[formation] [schema.]name]
[-queue_to_queue {NO | YES}] t
[-mode {PERSISTENT | BUFFERED | PERSISTENT_OR_BUFFERED}]
```

Parameter	Description	Default
-name,-n	Name of a producer or consumer of a message.	-
-queue_name,-queue	<name> Name of a queue.</name>	-
-subscriber_address,-sa	<subscriber_address></subscriber_address>	пп
	Protocol-specific address of the recipient.	
	If the protocol is 0, then the address is of the form [schema.]queue[@dblink].	
	Name of the queue table that will contain the queue.	
-subscriber_protocol,-	<subscriber_protocol></subscriber_protocol>	0
sp	Protocol to interpret the address and propagate the message.	
-rule,-r	<rule></rule>	NULL
	A conditional expression based on the message properties, the message data properties and PL/SQL functions.	
	A rule is specified as a Boolean expression using syntax similar to the WHERE clause of a SQL query.	
	You must prefix each attribute with tab.user_data as a qualifier to indicate the specific column of the queue table that stores the payload.	
-transformation,-trans	<transformation></transformation>	NULL
	Specifies a transformation that will be applied when this subscriber dequeues the message.	
-queue_to_queue,-q2q	[TRUE FALSE]	FALSE
	TRUE: propagation is from queue-to-queue	



Parameter	Description	Default
-mode,-m	[1:PERSISTENT 2:BUFFERED 3:PERSISTENT_OR_BUFFERED]	PERSISTENT
	Delivery mode of the messages the subscriber is interested in.	

2.9.5.18 Alter a Subscriber

Syntax

```
AQ ALTER SUBSCRIBER/ALTERSUB -n[ame] subscriber_name
[-subscriber_address string]
[-subscriber_protocol number]
-queue[_name] [schema.]queue_name
[-rule string]
[-trans[formation] [schema.]name]
```

Parameter	Description	Default
-name,-n	Name of a producer or consumer of a message.	-
-queue_name,-queue	<name> Name of a queue.</name>	-
-subscriber_address,-sa	<subscriber_address></subscriber_address>	***
	Protocol-specific address of the recipient.	
	If the protocol is 0, then the address is of the form [schema.]queue[@dblink].	
	Name of the queue table that will contain the queue.	
-subscriber protocol,-sp	<subscriber_protocol></subscriber_protocol>	0
_	Protocol to interpret the address and propagate the message.	
-rule,-r	<rule></rule>	NULL
	A conditional expression based on the message properties, the message data properties and PL/SQL functions.	
	A rule is specified as a Boolean expression using syntax similar to the WHERE clause of a SQL query.	
	You must prefix each attribute with tab.user_data as a qualifier to indicate the specific column of the queue table that stores the payload.	
-transformation,-trans	<transformation></transformation>	NULL
	Specifies a transformation that will be applied when this subscriber dequeues the message.	



2.9.5.19 Remove a Subscriber

Syntax

```
AQ REMOVE SUBSCRIBER/REMOVESUB -n[ame] subscriber_name [-subscriber_address string] [-subscriber_protocol number] -queue[ name] [schema.]queue name
```

Parameters

Parameter	Description	Default
-name,-n	Name of a producer or consumer of a message.	-
-queue_name,-queue	<name> Name of a queue.</name>	-
-subscriber_address,-sa	<subscriber_address></subscriber_address>	1111
	Protocol-specific address of the recipient.	
	If the protocol is 0, then the address is of the form [schema.]queue[@dblink].	
	Name of the queue table that will contain the queue.	
-subscriber_protocol,-	<subscriber_protocol></subscriber_protocol>	0
sp	Protocol to interpret the address and propagate the message.	

2.9.5.20 Enqueue

```
AQ ENQ[UEUE] -n[ame] queue_name
{
    -pay[load] payload
    |
    -file[name] name
}
[-type {JSON | HEX | BINARY}]

[-vis[ibility] {ON_COMMIT | IMMEDIATE}]
[-trans[formation] [schema.]name]
[-mode {PERSISTENT | BUFFERED}]
[-pri[ority] priority]
[-del[ay] delay]
[-exp[iration] expiration]
[-corr[elation] string]
[-rec[ipient_list] agents]
[-exc[eption queue] name]
```



[-sender[_agent] name]
[-out_msgid string]

Parameter	Description	Default
-name,-n	<name> Name of the queue to which this message should be enqueued.</name>	-
-payload,-p	Message payload.	-
-filename,-file	File to read the message payload.	-
-payload_type,-pt	Payload format type.	JSON
-visibility,-vis	 Specifies the transactional behavior of the enqueue request. Possible settings are: [2:ON_COMMIT]: The enqueue is part of the current transaction. The operation is complete when the transaction commits. This setting is the default. [1: IMMEDIATE]: The enqueue operation is not part of the current transaction, but an autonomous transaction which commits at the end of the operation. This is the only value allowed when enqueuing to a non-persistent queue. 	2:ON_COMMIT
-mode,-m	[1:PERSISTENT 2:BUFFERED 3:PERSISTENT_OR_BUFFERED] Delivery mode of the messages the subscriber is interested in.	PERSISTENT
-priority,-pri	Specifies the priority of the message. A smaller number indicates higher priority. The priority can be any number, including negative numbers.	1
-comment,-c	<comment></comment>	NULL
	User-specified description of the queue table.	
-delay,-del	The delay represents the number of seconds after which a message is available for dequeuing.	0
-expiration,-exp	It determines, in seconds, the duration the message is available for dequeuing.	-1 - NEVER
-correlation,-corr	Specifies the name of the queue into which the message is moved if it cannot be processed successfully.	-
-sender_id,-sid	The application-sender identification specified at enqueue time by the message producer. Sender name is required for secure queues at enqueue time.	-



Parameter	Description	Default
-out_message_id,- out_msgid	System generated identification of the message. This is a globally unique identifier that can be used to identify the message at dequeue time.	-
	A bind variable can also be used as an input to store the message id. (Example: - out_msgid :xyz)	

2.9.5.21 Dequeue

Syntax

```
AQ DEQ[UEUE] -n[ame] queue name
  [-cons[umer] name]
    -pay[load] payload
    -file[name] name
  [-type {JSON | HEX | BINARY}]
  [-deq[ueue]_mode {REMOVE | BROWSE | LOCKED | REMOVE_NODATA}]
  [-nav[igation {NEXT MESSAGE | NEXT TRANSACTION | FIRST MESSAGE}]
  [-vis[ibility] {ON COMMIT | IMMEDIATE}]
  [-wait number]
  [-msgid string]
  [-corr[elation] string]
  [-cond[ition] string]
  [-trans[formation] [schema.]name]
  [-mode {PERSISTENT | BUFFERED | PERSISTENT OR BUFFERED}]
  [-for[mat enqueue time] string]
  [-out msgid string]
  [-out_pri[ority] number]
  [-out del[ay] number]
  [-out exp[iration] number]
  [-out corr[elation] string]
  [-out attempts number]
  [-out_exc[eption_queue] name]
  [-out_enqueue_time string]
  [-out state string]
  [-out sender agent name]
  [-out_original_msgid string]
  [-out mode string]
```

Parameters

Parameter	Description	Default
-name,-n	<name> Name of the queue to which</name>	-
	this message should be dequeued.	



Parameter	Description	Default
-payload,-p	Message payload to be written on the console.	-
-filename,-file	File to write the message payload.	-
-payload_type,-pt	Payload format type.	JSON
-consumer_name,-cons	Only those messages matching the consumer name are accessed. If a queue is not set up for multiple consumers, then this field should be set to NULL.	-
-dequeue_mode,-dm	Specifies the locking behavior associated with the dequeue. Possible settings are:	-
	 [1: BROWSE]: Read the message without acquiring any lock on the message. This specification is equivalent to a select statement. [2: LOCKED]: Read and obtain a write lock on the message. The lock lasts for the duration of the transaction. This setting is equivalent to a select for update statement. [3: REMOVE - DEFAULT]: Read the message and delete it. [4: REMOVE_NODATA]: Mark the message as updated or deleted. The message can be retained in the queue table based on the retention properties. 	
-navigation,-nav	Specifies the position of the message that will be retrieved. Possible settings are: • [1: FIRST_MESSAGE:]: Retrieves the first message which is available and matches the search criteria. • [2: NEXT_TRANSACTION]: Skip the remainder of the current transaction group (if any) and retrieve the first message of the next transaction group. • [3: NEXT_MESSAGE - DEFAULT]: Retrieve the next message that is available and matches the search criteria.	



Parameter	Description	Default
-visibility,-vis	Specifies the transactional behavior of the enqueue request. Possible settings are: • [2:ON_COMMIT]: The enqueue is part of the current transaction. The operation is complete when the transaction commits. This setting is the default. • [1: IMMEDIATE]: The enqueue operation is not part of the current transaction, but an autonomous transaction which commits at the end of the operation. This is the only value allowed when enqueuing to a non-persistent queue.	2:ON_COMMIT
-deq_wait,-deq_w	Specifies the wait time if there is currently no message available which matches the search criteria. Possible settings are: • [-1: FOREVER]: Wait forever. This setting is the default. • [0: NO_WAIT]: Do not wait. • [x]: Wait time in seconds. (x seconds)	
-correlation,-corr	Specifies the name of the queue into which the message is moved if it cannot be processed successfully.	-
-condition,-con	A conditional expression based on the message properties, the message data properties, and PL/SQL functions.	-
-message_id, msg_id	Specifies the message identifier of the message to be dequeued. A bind variable can also be used as an input (Example: -msgid:xyz).	-
-transformation,-trans	<transformation> Specifies a transformation that will be applied after dequeuing the message.</transformation>	NULL
-mode,-m	[1:PERSISTENT 2:BUFFERED 3:PERSISTENT_OR_BUFFERED]	PERSISTENT
	Delivery mode of the messages the subscriber is interested in.	
<pre>-out_message_id,- out_msgid</pre>	System generated identification of the message. This is a globally unique identifier that can be used to identify the message at dequeue time. A bind variable can also be used as an input to store the message id.	-
-out priority,-out pri	(Example: -out_msgid :xyz) Priority of the message. A smaller	-
ous_prioricy, ous_pri	number indicates higher priority. A bind variable can also be used as an	
	input to store the priority. (Example: - out_priority :xyz)	



Parameter	Description	Default
-out_delay,-out_del	The delay represents the number of seconds after which a message is available for dequeuing.	-
	A bind variable can also be used as an input to store the delay. (Example: - out_delay :xyz)	
-out_expiration,- out_exp	The duration the message is available for dequeuing.	-
	A bind variable can also be used as an input to store the expiration. (Example: -out_expiration :xyz)	
-out_correlation,- out_corr	Correlation identifier of the message to be dequeued.	-
_	A bind variable can also be used as an input to store the correlation. (Example: -out_correlation :xyz)	
-out_attempts,-out_att	Number of attempts made to dequeue the message.	-
	A bind variable can also be used as an input to store the attempts. (Example: -out_attempts :xyz)	
-out_exception_queue,- out_exc	Name of the queue into which the message is moved if it cannot be processed successfully.	-
	A bind variable can also be used as an input to store the exception queue (Example: -out_exception_queue :xyz)	
-out_enqueue_time,-	The time the message was enqueued.	-
out_eqt	A bind variable can also be used as an input to store the enqueue time. (Example: -out_enqueue_time :xyz)	
-out_state,-out_st	State of the message at the time of the dequeue.	-
	A bind variable can also be used as an input to store the state (Example: - out_state :xyz)	
-out_sender_id,-out_sid	The application-sender identification specified at enqueue time by the message producer.	-
	A bind variable can also be used as an input to store the sender id (Example: -out_sender_id :xyz)	
-out_mode,-out_m	The delivery mode of the messages.	-
	A bind variable can also be used as an input to store the mode (Example: - out_mode :xyz)	



2.9.6 SET system_variable value

Sets a system variable to alter the SQLcl environment settings for your current session.

For example, to:

- · Set the display width for data
- Customize HTML formatting
- Enable or disable printing of column headings
- Set the number of lines per page

Enter a system variable followed by a value as shown below:

```
SET APPI[NFO] {ON | OFF | text}
SET ARRAY[SIZE] \{15 \mid n\}
SET AUTO[COMMIT] {ON | OFF | IMM[EDIATE] | n}
SET AUTOP[RINT] {ON | OFF}
SET AUTORECOVERY {ON | OFF]
SET AUTOT[RACE] {ON | OFF | TRACE[ONLY]}
SET BLO[CKTERMINATOR] {. | c | ON | OFF}
SET CLASSIC [ ON | OFF ]
SET CLEAR [ TOP | BOTTOM | SAME ]
SET CLOUDCONFIG [ -proxy=cproxyhost>:<port> ] <wallet.zip location>
SET CMDS[EP] \{; | c | ON | OFF\}
SET CODESCAN [ON | SQLINJECTION | SQLPERFORMANCE | OFF] (For more details,
see the description at the bottom.)
SET CON[CAT] {. | c | ON | OFF}
SET COPYC[OMMIT] {0 | n}
SET COPYTYPECHECK {ON | OFF}
SET DDL [ PRETTY | SQLTERMINATOR | CONSTRAINTS | REF CONSTRAINTS |
CONSTRAINTS AS ALTER OID | SIZE BYTE KEYWORD | PARTITIONING |
SEGMENT ATTRIBUTES | STORAGE | TABLESPACE | SPECIFICATION | BODY |
FORCE | INSERT | | INHERIT | RESET] {on|off} ] | OFF ]
SET DEF[INE] \{\underline{\&} \mid c \mid \underline{ON} \mid \mathsf{OFF}\}
SET ECHO {ON | OFF}
SET EDITF[ILE] file name[.ext]
SET EMB[EDDED] {ON | OFF}
SET ENCODING
SET ERRORL[OGGING] {ON | OFF} [TABLE [schema.]tablename] [TRUNCATE]
[IDENTIFIER identifier]
SET ESC[APE] \{ \setminus | c | \text{ON} | \underline{\text{OFF}} \}
SET ESCCHAR {@ | ? | % | $ | OFF}
SET EXITC[OMMIT] {ON | OFF}
SET FEED[BACK] \{\underline{6} \mid n \mid \underline{ON} \mid \text{OFF}\} [SQL ID]
SET FLU[SH] {ON | OFF}
SET HEA[DING] {ON | OFF}
SET HEADS[EP] \{ \underline{\ } \mid c \mid \underline{\text{ON}} \mid \text{OFF} \}
```



```
SET HISTORY [FAILS [LIMIT [ n | DEFAULT ] ] | NOFAILS | FILTER [DEFAULT
  <command list>?!<command list>?] |LIMIT [n|DEFAULT]]
  SET LDAPCON
  SET LIN[ESIZE] \{80 \mid n\}
  SET LOAD default [options...]
  SET LOADFORMAT [ DEFAULT | CSV | DELIMITED | HTML | INSERT | JSON | JSON-
  FORMATTED | LOADER | T2 | XML ] [options...]
  SET LONG {80 | n}
  SET LONGC[HUNKSIZE] \{80 \mid n\}
  SET MAXROWS { n>1 | DEFAULT }
  SET MAXSPOOLROWSTRUNCATE [ON | OFF | DEFAULT]
  SET NET {ON | OFF | READONLY}
  SET NEWP[AGE] \{\underline{1} \mid n \mid NONE\}
  SET NOVERWRITE {ON | OFF | WARN}
  SET NULL text
  SET NUMF[ORMAT] format
  SET NUM[WIDTH] \{\underline{10} \mid n\}
  SET PAGES[IZE] \{14 \mid n\}
  SET PARAMETERPOLICY {default | isolate}
  SET PAU[SE] {ON | OFF | text}
  SET RECSEPCHAR { | c}
  SET SERVEROUT[PUT] {ON | OFF} [SIZE \{n \mid \underline{UNL[IMITED]}\}] [FOR[MAT] {WRA[PPED] |
  WOR[D WRAPPED] | TRU[NCATED]}]
  SET SHOW[MODE] {ON | OFF}
  SET SQLBL[ANKLINES] {ON | OFF}
  SET SQLC[ASE] {MIX[ED] | LO[WER] | UP[PER]}
  SET SQLCO[NTINUE] \{ \geq \mid text \}
  SET SQLFORMAT {csv | html | xml | json | ansiconsole | insert | loader |
  fixed | default}
  SET SQLPLUSCOMPAT[IBILITY] {x.y[.z]}
  SET SQLPRE[FIX] \{\# \mid c\}
  SET SQLP[ROMPT] \{SQL > | text\}
  SET SUF[FIX] \{SQL \mid text\}
  SET T2 METRICDATA NAMESPACE { text}
  SET T2 METRICDATA COMPARTMENTID { text}
  SET T2 METRICDATA NAME { text}
  SET T2 DIMENSIONS RESOURCEID { text}
  SET T2 DIMENSIONS REGION { text}
  SET T2 METADATA UNIT { text}
  SET TAB {ON | OFF}
  SET TERM[OUT] {ON | OFF}
  SET TI[ME] {ON | OFF}
  SET TIMI[NG] {ON | OFF}
  SET TRIM[OUT] {ON | OFF}
  SET TRIMS[POOL] {ON | OFF}
  SET VER[IFY] {ON | OFF}
  SET WRA[P] {ON | OFF}
SET DDL [[ PRETTY | SQLTERMINATOR | CONSTRAINTS | REF CONSTRAINTS |
CONSTRAINTS AS ALTER OID | SIZE BYTE KEYWORD | PARTITIONING | SEGMENT ATTRIBUTES
```

```
| STORAGE | TABLESPACE | SPECIFICATION | BODY | FORCE | INSERT | |INHERIT | RESET] {on|off} ] | OFF ]
```

Allows you to set the DDL transform option on DBMS_METADATA.

```
SET ENCODING <encoding>
```

Allows you to set the encoding for the current session. Use ${\tt SHOW}$ ENCODING to view the encoding set for the current session. Use SHOW ENCODINGS to list the encodings available on your platform.

```
SET CODESCAN [ON | SQLINJECTION | SQLPERFORMANCE | OFF]
```

Controls warning messages issued for code quality issues. ON turns on warnings for possible SQL injection vulnerabilities and SQL performance issues. See SQL Performance Troubleshooting

2.9.7 SHOW option

Shows the value of a SQLcl system variable, or the current SQLcl environment. Enter any system variable set by the SET command in place of <code>system_variable</code>. SHOW SGA can only be used by a DBA user. Use one of the following terms or clauses in place of <code>option</code>:

```
system_variable
ALL
BTI[TLE]
CON ID
CON NAME
CONNECTION
DDL
EDITION
ENCODING
ENCODINGS
ERR[ORS] [ {FUNCTION | PROCEDURE | PACKAGE | PACKAGE BODY | TRIGGER |
VIEW | TYPE | TYPE BODY | DIMENSION | JAVA CLASS | [schema.] name]
INSTANCE
JAVA
JDBC
LNO
NLS
PARAMETER[S] [parameter name]
PDBS
RECYC[LEBIN] [original name]
REL[EASE]
REPF[OOTER]
REPH[EADER]
SGA
SP00[L]
SPPARAMETER[S] [parameter name]
SQLCODE
```



```
SQLPATH
TNS
TTI[TLE]
USER
VERSION
SHOW ENCODING
```

Shows the encoding which is set for the client.

```
SHOW ENCODINGS
```

Shows the available encodings for the client.

2.10 Loading a File

Use the LOAD command in SQLcl to load a comma-separated value file from a local directory or cloud storage location into a table.

2.10.1 LOAD Command

Loads a comma-separated value (csv) file from a local directory or cloud storage location into a table.

Syntax

```
LOAD [TABLE] [schema.]table_name { <file-specification> | <cloud-storage-
specification> }
[NEW | SHOW | SHOW_DDL | CREATE | CREATE_DDL]
```

where

[schema.]table_name identifies the table to load. If the schema is omitted, the table for the connected user schema is loaded.

file-specification has the following syntax:

```
{ <fully-qualified-file-name> | <file-name> }
```

- fully-qualified-file-name: Identifies the full path to the file to load.
- file-name: Identifies the file to load. The file must be located in the default path.

cloud-storage-specification has the following syntax:

```
{ CLOUDSTORAGE | CS | CLOUD_STORAGE } [ <url> | <qualified-name> ]
```

- url: Complete URL for the cloud storage file if a default cloud storage URL is not set using the Cloud Storage command.
- qualified-name: Name of the object, optionally qualified by the namespace and bucket.
 The qualified name combined with the URL specified by the Cloud Storage command
 must fully identify the object URL. If url and qualified-name are omitted, the default Cloud
 Storage URL must be set to the object.



NEW creates a table and loads data.

[SHOW | SHOW DDL] executes the DDL generation phase and shows the DDL.

[CREATE | CREATE_DDL] executes the DDL generation phase and creates the table.

Use SET LOAD and SET LOADFORMAT to specify properties for DDL analysis and generation.

Create table DDL generation pre-scans the data file to determine column properties. Use SET LOAD SCAN < n > to specify the number of rows to scan for DDL. 100 is the default. To turn off scanning, set to 0.

Use SET LOAD COL_SIZE to change column sizes that are generated. Use SET LOAD MAP_NAMES to map file column names to table column names.

For more information about the Cloud Storage command, see Using Cloud Storage.

The defaults for the file format are:

- The columns are delimited by a comma and may optionally be enclosed in double quotes.
- Lines are terminated with standard line terminators for Windows, UNIX or Mac.
- File is encoded UTF8.

The default load:

- Processes with 50 rows per batch.
- If AUTOCOMMIT is set in SQLcL, a commit is done every 10 batches.
- The load is terminated if more than 50 errors are found.

Use SET LOADFORMAT options for reading the file (delimiter, enclosures).

Use SET LOAD options for loading the data (rows per batch, date formats).

Example

The following example shows how to load a file from local storage into a table.

```
--Create Table "countries"

create table countries(countries_id NUMBER(5), countries_name

VARCHAR2(40));

Table COUNTRIES created

--Load file COUNTRIES_DATA_TABLE.csv in local storage to "countries"

table

load countries C:\Users\JDOE\SQLcl\COUNTRIES_DATA_TABLE.csv

format csv

column_names on

delimiter ,

enclosure_left "

enclosure_right "

encoding UTF8

row limit off
```



The following example shows how to load data into a new table EMP.

```
load emp empfile.csv new
--Create new table and load data into table HR.EMP
CSV
column_names on
delimiter ,
enclosures ""
encoding UTF8
row limit off
row terminator default
skip rows 0
skip_after_names
#INFO DATE format detected: RRRR-MM-DD
CREATE TABLE HR.EMP
 EMPLOYEE ID NUMBER (5),
  FIRST NAME VARCHAR2 (26),
  LAST NAME VARCHAR2 (26),
  EMAIL VARCHAR2 (26),
  PHONE NUMBER VARCHAR2 (26),
  HIRE DATE DATE,
  JOB ID VARCHAR2 (26),
  SALARY NUMBER (9, 2),
  COMMISSION_PCT VARCHAR2(26),
  MANAGER ID NUMBER (5),
  DEPARTMENT_ID NUMBER(5)
 )
;
#INFO Table created
#INFO Number of rows processed: 21
#INFO Number of rows in error: 0
```



```
#INFO Last row processed in final committed batch: 21 SUCCESS: Processed without errors
```

The following example shows how to create a new table from a local file.

```
load emp1 empfile.csv create ddl
--Create new table HR.EMP1
column names on
delimiter ,
enclosures ""
encoding UTF8
row limit off
row terminator default
skip rows 0
skip_after_names
batch_rows 50
batches_per_commit 10
clean names transform
column size rounded
commit on
date format
errors 50
map column names off
method insert
timestamp format
timestamptz format
locale English United States
scan rows 100
truncate off
unknown columns fail on
--Pre-scans the date format
#INFO DATE format detected: RRRR-MM-DD
CREATE TABLE SYSTEM.EMP1
 EMPLOYEE ID NUMBER (5),
  FIRST NAME VARCHAR2 (26),
  LAST NAME VARCHAR2 (26),
  EMAIL VARCHAR2 (26),
  PHONE NUMBER VARCHAR2 (26),
  HIRE DATE DATE,
  JOB ID VARCHAR2 (26),
  SALARY NUMBER (9, 2),
  COMMISSION_PCT VARCHAR2(26),
  MANAGER ID NUMBER (5),
  DEPARTMENT ID NUMBER (5)
```



#INFO Table created SUCCESS: Processed without errors

2.10.1.1 SET LOAD Command

SET LOAD enables you to set options for loading data.

Syntax

```
SET LOAD default | [options...]
```

where

default means load method properties return to default values.

options represents the following:

• BATCH ROWS|BATCHROWS < number of rows>

Data loading is done in batches. Specifies the number of rows to include in each batch.

BATCHES PER COMMIT|BATCHESPERCOMMIT <batches per commit>

Commit after processing $number_of_batches$. If the number is equal to 0, commit happens at the end of the load. If the number is greater than or equal to 0, COMMIT ON is set.

• CLEAN NAMES [TRANSFORM | TRANSFORM128 | QUOTE | QUOTE128 | UNIQUE]

Identifies the rule for making table and column names compliant with database identifiers. Names are cleaned before they are mapped to provide consistency with previous releases. If both <code>CLEAN_NAMES</code> and <code>MAP_COLUMN_NAMES</code> are used, then clean names should be specified.

The standard identifiers are:

- No longer than 30 or 128 characters.
- Not a reserved word.
- Starts with a letter and contains only letters, digits, or one of _\$#.
- Uppercase
- Names that do not comply must be quoted. Length rules always apply.



Data that is enclosed in quotes will have quotes in the header row removed before names are cleaned.

TRANSFORM (default)



Indicates that names are transformed as follows:

- Names are in uppercase.
- If the name starts and ends with the quote character, the quotes are removed.
- Names that are reserved words are appended with a dollar sign (\$).
- Names that start with a number or special character is prefixed with an X.
- Spaces and hyphens are replaced with underscores (_). \$ and # characters are retained.
- Special characters other than \$ and # is replaced with the number sign (#).
- Names are truncated to 30 or 128 characters depending on database MAX_STRING_SIZE.
- After names are cleaned, non-unique names within the column set are appended with a unique sequence number. If truncation is required, the sequence number is maintained.

```
TRANSFORM (default)
```

Applies all transform rules. Names may be 128 characters.

OUOTE

Quote non-compliant names and shorten to 30 or 128 characters depending on database MAX_STRING_SIZE.

OUOTE128

Quote non-compliant names. Names may be 128 characters.

UNIQUE

Compatibility option with previous releases of load service. Names that are not unique within the column set are appended with a unique sequential number. Truncation is not provided.

COLUMN SIZE | COLUMNSIZE | COLSIZE { ACTUAL | ROUND | ROUNDED | MAX | MAXIMUM }

Create table column size strategy.

ACTUAL uses the largest size found during the scan.

 ${\tt ROUND \mid ROUNDED} \ uses \ a \ size \ a \ little \ larger \ than \ the \ largest \ size \ found \ during \ the scan.$

 ${\tt MAX\,|\,MAX\,IMUM}$ uses the database maximum size for the data type that was detected.

COMMIT {ON|OFF}

Enable or disable data commits.

DATE | DATE FORMAT | DATEFORMAT format mask

The format of all DATE data type columns loaded. Specify no format_mask or DEFAULT to use database default.



For DATE columns, if format is not set and SCAN_ROWS = 0, the data is not scanned for a valid mask.

ERRORS { number of rows | UNLIMITED} | -1: Indicates the number of error rows allowed.

If this number is exceeded, the load will be terminated.

-1 and UNLIMITED indicate no error limit.

All rows in a batch may be in error if any row fails.

LOCALE { <language country> | DEFAULT | "" }

Specify locale language and optionally country.

DEFAULT | "" : Set to default locale.

MAP_COLUMN_NAMES|MAPCOLUMNNAMES|MAPNAMES { OFF| (<file-col-name>=<table-col-name>,...) }

Provide a mapping from the column names specified in the file to column names in the table.

METHOD INSERT

Method to use for data loads.

• SCAN ROWS|SCANROWS|SCAN <1-5000>

Identify the number of rows to scan for create table generation. Default is 100 rows.

TIMESTAMP|TIMESTAMP FORMAT|TIMESTAMPFORMAT

The format of all TIMESTAMP data type columns being loaded. Specify no format_mask or DEFAULT to use database default. For TIMESTAMP columns, if format is not set and SCAN_ROWS not equal to 0, the data is scanned for a valid mask.

TIMESTAMPTZ|TIMESTAMPTZ FORMAT|TIMESTAMPTZFORMAT

The format of all TIMESTAMPTZ data type columns being loaded. Specify no format_mask or DEFAULT to use database default. For TIMESTAMPTZ columns, if format is not set and SCAN_ROWS not equal to 0, the data is scanned for a valid mask.

• TRUNCATE {OFF|ON}

Truncate ON truncates the table before loading

UNKNOWN COLUMNS FAIL | UNKNOWNCOLUMNSFAIL | UNKNOWNFAIL {ON | OFF}

 ${\tt ON:}$ Terminates the load if any columns in the file do not map to a column in the table.

OFF: Allows the load to proceed when columns in the file do not map to a column in the table.



2.11 Calling Oracle Cloud Infrastructure REST APIs Using the OCI Command

Starting from SQLcl release 20.2, you can call Oracle Cloud Infrastructure (OCI) REST APIs using the oci command.



Oracle Cloud Infrastructure API Documentation

Prerequisites

To use the OCI command, you need to first set the OCI profile for authentication and access.

For more information about how to set up the required SSH keys and configure your Oracle Cloud Infrastructure Software Development Kits, see Setup and Prerequisites in the Oracle Cloud Infrastructure Documentation.

To list profiles contained in the OCI configuration file at ~/.oci/config, enter:

oci profile

To set the profile name as "demo", enter:

oci profile demo

Two Syntax Formats

There are two syntax formats available for using the OCI command.

Specify Target

In the first syntax format, the target is specified completely in the OCI command:

oci <host> <method> [file-to-send-as-body] <request-target>

where

method is GET, PUT or DELETE.

request-target is the path to the namespace, bucket or object on host.

Examples

To delete the emp.csv file from testing-bucket:

oci objectstorage.us-ashburn-1.oraclecloud.com delete /n/abc123/b/testing-bucket/o/emp.csv $\,$



To list the contents of testing-bucket:

oci objectstorage.us-ashburn-1.oraclecloud.com get /n/abc123/b/testing-bucket/o/

To put the emp.csv file into testing-bucket:

oci objectstorage.us-ashburn-1.oraclecloud.com put ./emp.csv /n/abc123/b/testing-bucket/o/emp.csv

To get the emp.csv file from testing-bucket:

oci objectstorage.us-ashburn-1.oraclecloud.com get /n/abc123/b/testing-bucket/o/emp.csv

Specify Target using Cloud Storage Command

In the second syntax format, the target is a complete or partial URL to the location, which is set using the Cloud Storage command (cs):

```
oci <method> [file-to-send-as-body] <qualifier>
```

where

method is GET, PUT or DELETE.

qualifier is the cloud storage namespace or bucket. *qualifier* is appended to the location specified on the set Cloud Storage command and must form the complete URL to the namespace, bucket, or object used by the *method*.

For more information about the Cloud Storage command, see Using Cloud Storage.

Examples

To delete emp.csv from testing-bucket:

```
cs objectstorage.us-ashburn-1.oraclecloud.com
oci delete /n/abc123/b/testing-bucket/o/emp.csv
```

To list contents of testing-bucket:

```
--Using the OCI Command (oci get)

cs objectstorage.us-ashburn-1.oraclecloud.com/n/abc123/b/testing-bucket/o/oci get

--Using the Cloud Storage Command (cs listo)

cs objectstorage.us-ashburn-1.oraclecloud.com/n/abc123/b/testing-bucket/o/cs listo
```



To put emp.csv into testing-bucket:

cs objectstorage.us-ashburn-1.oraclecloud.com/n/abc123/b/testing-bucket
oci put ./emp.csv /o/emp.csv

To get emp.csv from testing-bucket:

cs objectstorage.us-ashburn-1.oraclecloud.com/n/abc123/b/testing-bucket oci get /o/emp.csv



3

Using Liquibase

This chapter covers the Liquibase feature in SQLcl. It has the following topics:

- About Liquibase in SQLcl
- Requirements for Using Liquibase
- Supported Types
- Supported Liquibase Commands in SQLcl
- Using SQLcl Liquibase Functionality with Open-Source Liquibase
- Dynamic Object Transformation with SQLcl Liquibase and DBMS_METADATA Oracle
 Database Package
- Liquibase Open-Source Changesets with SQLcl Liquibase
- DATABASECHANGELOG_DETAILS VIEW
- ChangeSets in Liquibase
- Examples Using Liquibase

3.1 About Liquibase in SQLcl

Liquibase is an open-source database-independent library for tracking, managing and applying database schema changes.

For an understanding of the major concepts in Liquibase, see Major Concepts.



Liquibase is not available in SQLcl that is part of the SQL Developer installation. To use this feature, you need to download the standalone SQLcl offering.

The Liquibase feature in SQLcl enables you to execute commands to generate a changelog for a single object or for a full schema (changeset and changelogs). You can process these objects manually using SQLcl or through any of the traditional Liquibase interfaces.

With the Liquibase feature in SQLcl, you can:

- Generate and execute single object changelogs
- Generate and execute schema changesets with object dependencies
- Automatically sort a changeset during creation based on object dependencies
- Record all SQL statements for changeset or changelog execution, as it is generated
- Provide full rollback support for changesets and changelogs automatically



3.2 Requirements for Using Liquibase

The two important aspects for using the Liquibase functionality are capturing and deploying objects in an Oracle database.

Capture Objects

To capture an object or a schema, you must have SQLcl with the Liquibase plug-in available.

In this release, you can only capture objects from the schema you are connected to in SQLcl. You also need write permission on the directory in which you save the files.

If you are capturing an entire schema, the user you are connected to must have the privilege to create a table. The DATABASECHANGELOG_EXPORT table is created internally to gather object details and sort them correctly. The created object is automatically excluded from the capture process and destroyed upon capture completion.

Deploy Objects

Liquibase uses the DATABASECHANGELOG table to track the changesets that have been run. The DATABASECHANGELOGLOCK table ensures that only one instance of Liquibase is running at a time. The DATABASECHANGELOG_ACTIONS table tracks the object state and the SQL statements executed during deployment.

SQLcl

Deploying changes to any database through SQLcl requires the privilege to create a table. You must have necessary permissions to create any object type through the change that you are deploying.

Liquibase

If you use Liquibase directly to deploy changesets, you need:

- the extension installed in your Liquibase environment. Add the following jar files from sqlcl/lib and sqlcl/lib/ext folders to the liquibase/lib folder:
 - * dbtools-liquibase.jar
 - * dbtools-apex.jar
 - * guava-with-lf.jar
 - * xmlparserv2 sans jaxp_services.jar
 - * dbtools-common.jar
- the privileges to create a table and a package.
- to update your properties file by adding the following line:

```
change-exec-listener-class:
liquibase.changelog.visitor.OracleActionChangeListener
```



3.3 Supported Types

DDL types use create or replace syntax. A snapshot of the object is taken before applying the change so automatic rollback to the last known state is supported.

SXML types support automatic alter generation with automatic rollback support.

DDL types have their own change type.

- CONSTRAINT
- DIMENSION
- DIRECTORY
- FUNCTION
- JOB
- OBJECT GRANT
- PACKAGE_BODY
- PACKAGE_SPEC
- PROCEDURE
- PUBLIC_SYNONYM
- REF_CONSTRAINT
- SYNONYM
- TRIGGER
- TYPE BODY
- TYPE SPEC

SXML types share the SXML change type.

- AQ_QUEUE
- AQ_QUEUE_TABLE
- AQ_TRANSFORM
- ASSOCIATION
- AUDIT
- AUDIT_OBJ
- CLUSTER
- CONTEXT
- DB_LINK
- DEFAULT_ROLE
- FGA_POLICY
- JOB
- LIBRARY
- MATERIALIZED_VIEW



- MATERIALIZED_VIEW_LOG
- OPERATOR
- PROFILE
- PROXY
- REFRESH_GROUP
- RESOURCE_COST
- RLS_CONTEXT
- RLS_GROUP
- RMGR_CONSUMER_GROUP
- RMGR_INTITIAL_CONSUMER_GROUP
- RMGR_PLAN
- RMGR_PLAN_DIRECTIVE
- ROLE
- ROLLBACK_SEGMENT
- SEQUENCE
- TABLE
- TABLESPACE
- TRIGGER XS_ACL
- TRUSTED_DB_LINK
- USER
- VIEW
- XMLSCHEMA
- XS_ACL_PARAM INDEX
- XS_DATA_SECURITY
- XS_ROLE
- XS_ROLESET
- XS_ROLE_GRANT
- XS_SECURITY_CLASS
- XS_USER

3.4 Supported Liquibase Commands in SQLcl

You can invoke the Liquibase commands in SQLcl with liquibase or lb.

The SQLcl Liquibase commands that were initially launched in SQLcl release 19.2 has deprecated. In this release, the SQLcl plug-in has been updated to synchronize with the new command format introduced by Liquibase.



Syntax

```
Liquibase|lb COMMAND {OPTIONS}
Liquibase|lb help|he [-example|-ex]
Liquibase|lb help|he COMMAND [-syntax|-sy] [-example|-ex]
```

To see the help for Liquibase in SQLcl, type one of the following:

```
help Liquibase or lb
```

Liquibase or 1b help

To quickly view the syntax and exclude other details, type:

```
lb help -syntax
```

To only view the examples in help, type:

```
lb help -example
```

<OPTIONS>: The list of options for each Liquibase command is provided in the following sections.

Database Diff Commands

New Command	Description	Deprecated SQLcI Command
diff	Writes description of differences between two databases to standard out.	diff
diff-changeLog	Adds any differences between the databases specified to a changelog. Can append in any of the supported changelog formats.	-

Database Rollback Commands

New Command	Description	Deprecated SQcl Command
rollback	Rolls back the database to the state it was in when the tag was applied.	rollback { -tag }
rollback-sql	A helper command that produces the raw SQL Liquibase would run when using the rollbackByTag command.	rollbacksql { -tag }
rollback-to-date	Rolls back the database to the state it was in at the given date/time.	rolback { -date }
rollback-to-date-sql	A helper command that allows you to inspect the SQL Liquibase will run while using the rollback-to-date command.	rollbacksql { -date }
rollback-count	Rolls back the last <value> changesets.</value>	rollback { -count }



New Command	Description	Deprecated SQcI Command
rollback-count-sql	Writes SQL to roll back the last <value> changesets to STDOUT.</value>	rollbacksql { -count }
future-rollback-sql	Writes SQL to roll back the database to the current state after the changes in the changelog have been applied.	-
future-rollback-count-sql	Generates the SQL that Liquibase would use to sequentially revert the number of changes associated with undeployed changesets, which are added to a changelog file.	-
future-rollback-from-tag-sql	Produces the raw SQL Liquibase would need to roll back all undeployed changes made up to the specified tag.	-

Database Snapshot Commands

New Command	Description	Deprecated SQLcl Command
data	Generate changelogs for the data.	-
generate-apex-object	Generate apex objects from a database	genobject { -apex }
generate-control-file	Generate an empty control file that you can use to start a new changelog.	-
generate-object	Generate database objects from a database	genobject
generate-ords-module, generate-ords-schema	Generate ords objects from a database	genobject { -ords }
generate-schema	Generate all supported objects in a schema and controller file.	genschema
generate-changelog	Generate a changelog from a database when adding Liquibase to a new project. This is synonymous with snapshot with the exception of saving the output as XML in the changelog.	-
snapshot	Gathers the current database schema and displays that information to STDOUT. With options, can save the schema in JSON format, and that JSON snapshot can serve as a comparison database.	-
update-to-tag-sql	A helper command that inspects the SQL code Liquibase will run when using the update-to-tag <tag> command.</tag>	-
snapshot-reference	Captures the current state of the referenceURL database, which is the source database.	-



Database Update Commands

New Command	Description	Deprecated SQLcl Command
update	Updates the database to the current version.	update
update-sql	A helper command that enables you to inspect the SQL code that Liquibase will run when using the update command.	updateSql
update-count	Applies the next <value> changesets.</value>	-
update-count-sql	Writes SQL to apply the next <value> changesets to STDOUT.</value>	-
update-testing-rollback	Updates the database, then rolls back changes before updating again.	-
update-to-tag	Applies sequential changes to your database from the newest changeset to the changeset with the tag you specified and applied earlier.	-
update-to-tag-sql	A helper command that inspects the SQL code Liquibase will run when using the update-to-tag <tag> command.</tag>	-

Documentation Commands

New Command	Description	Deprecated SQLcl Command
db-doc	Generates Javadoc-like documentation based on current database and changelog.	dbdoc

Maintenance Commands

New Command	Description	Deprecated SQLcl Command
calculate-checksum	Calculates and prints a checksum for the changeset with the specified id in the following format: filepath::id::author.	-
changelog-sync	Marks all changes as executed in the database.	-
changelog-sync-sql	Writes SQL to mark all changes as executed in the database to STDOUT.	changelogsync
changelog-sync-to-tag	Marks all undeployed changesets from your changelog up to and including the specified tag as executed in your database.	-
changelog-sync-to-tag-sql	Produces the raw SQL that Liquibase would run when using the changelog-sync-to-tag command to mark all undeployed changesets associated with the specified tag as executed in your database.	-



New Command	Description	Deprecated SQLcl Command
clear-checksums	Removes current checksums from database. On next update changesets that have already been deployed will have their checksums recomputed, and changesets that have not been deployed will be deployed.	clearchecksums
drop-all	Drops all database objects owned by the user.	-
list-locks	Lists who currently has locks on the database changelog.	listlocks
mark-next-changeset-ran	Mark the next changeset as executed in the database.	-
mark-next-changeset-ran- sql	Inspects the SQL Liquibase will run while using the mark-next-changeset-ran command.	-
release-locks	Releases all locks on the database changelog.	releaselocks
tag	"Tags" the current database state for future rollback.	tag
tag-exists	Checks whether the given tag already exists.	tagexists
unexpected-changesets	Produces a list of changesets that were run in the database but do not exist in the current changelog.	
validate	Checks the changelog for errors.	validate

Status Commands

New Command	Description	Deprecated SQLcI Command
history	Lists all deployed changesets and their deploymentIds.	-
status	Outputs the count (or list, ifverbose) of changesets that have not been deployed.	-

3.4.1 calculate-checksum

Calculates and prints a checksum for the changeset with the given ID in the format filepath::id::author.

Syntax

Liquibase|| b calculate-checksum|| cac OPTIONS

The calculate-checksum command is typically used to compute an MD5 checksum, which serves as a unique identifier for the changeset. As a result, you can see whether the changeset has been changed and whether it has to be deployed differently. The MD5SUM column in the DATABASECHANGELOG table contains a checksum of the changeset and any change made in the changeset will result in a different checksum.



Options

Option	Description	Default	Deprecated
Required			
-changelog-file - chf	The root changelog file.	-	changelogFile
-changeset- identifier -chi	Changeset ID identifier of form filepath::id::author.	-	changesetIdentifier
Optional			
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me
log -lo	Enable logging.	False	-
	Standard logging is INFO level (no debug flag).		
	Debug logging is FINEST level (both log and debug flag).		
-search-path -sep	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		
-secure-parsing - scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

Example

Calculate a checksum for changeset:

SQL> lb calculate-checksum --changelog-file countries_table.xml --changesetidentifier
countries_table.xml::382e51cedfbfc7ba59568dd09dcd4e110b9fbeca::(USER)Generated
SQL> liquibase calculate-checksum changelog.oracle.sql::myID_123::Steve



3.4.2 changelog-sync

Marks all changes as executed in the database.

Syntax

Liquibase|lb changelog-sync|chs OPTIONS

Uses include:

- Creating a new baseline database.
- Excluding objects from a database.
- Marking a change as executed. The change was created manually.

Options

Option	Description	Default	Deprecated
Required			
-changelog-file	The root changelog	-	changelogFile
-chf	file.		
Optional			
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database-	Name of table to use	-	
changelog-table- name -dactn	for tracking change history.		databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema-	The default schema	-	defaultSchemaName
name -desn	name to use for the database connection.		
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase-	Tablespace to use for		
tablespace-name -lbtn	Liquibase objects.		liquibaseTablespaceN ame
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-



Option	Description	Default	Deprecated
-search-path - sep	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

Example

Mark changes as executed in the database:

```
-- Set default output path

SQL> cd <output-files-path>
-- Connect to target and execute command

SQL> connect <db-connect-string>

SQL> lb changelog-sync -changelog-file countries_table.xml
```

3.4.3 changelog-sync-sql

Output the raw SQL used by Liquibase when running changelogsync.

Syntax

Liquibase||b changelog-sync-sql||chss

Options

Option	Description	Default	Deprecated
Required			
<pre>-changelog-file - chf</pre>	The root changelog file.	-	changelogFile
Optional			
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database-	Name of table to use for	-	
changelog-table- name -dactn	tracking change history.		databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-



Option	Description	Default	Deprecated
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.		 liquibaseTablespaceNa me
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-output-default- schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False	outputDefaultSchema
-search-path -sep	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

Example

Generate SQL to mark changes as executed in the database:

```
-- Set default output path

SQL> cd <output-files-path>
-- Connect to target and execute command

SQL> connect <db-connect-string>

SQL> lb changelog-sync-sql -changelog-file countries_table.xml -
outputfile countries_synch.sql
```



3.4.4 changelog-sync-to-tag

Marks all undeployed changesets as executed starting from the top of the changelog file and moving down up to and including the tag.

Syntax

Liquibase||b changelog-sync-to-tag||chstt

Options

Option	Description	Default	Deprecated
Required			
-changelog-file -chf	The root changelog file.	-	changelogFile
Optional			
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.		 liquibaseTablespaceNa me
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-search-path -sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating	-	searchPath
	them with commas.		



Option	Description	Default	Deprecated
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

Example

Mark changes as executed in database up to and including tag.

```
cd <1b-changes-directory>
-- Edit changelog file and add tagDatabase entries for versions.
-- Execute command using a tag specified in tagDatabase in the changelog file.
SQL> 1b changelog-sync-to-tag -tag version1 -changelog-file controller.xml
```

3.4.5 changelog-sync-to-tag-sql

Output the raw SQL used by Liquibase when running changelogSyncToTag.

Syntax

Liquibase||b changelog-sync-to-tag-sql|chstts OPTIONS

Options

Option	Description	Default	Deprecated
Required			
-changelog-file -chf	The root changelog file.	-	changelogFile
-tag -ta	Generic 'tag to apply action to'	-	-
Optional			
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName



Option	Description	Default	Deprecated
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.		 liquibaseTablespaceN ame
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-output-default- schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False	 outputDefaultSchema
-search-path -sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with	-	searchPath
-secure-parsing -scp	commas. If true, remove functionality from file parsers, which can be	-	secureParsing
	used insecurely. An example is disabling remote XML entity support.		

Example

Mark changes as executed in database up to and including tag.

```
cd <1b-changes-directory>
```

- -- Edit changelog file and add tagDatabase entries for versions.
- -- Execute command using a tag specified in tagDatabase in the changelog file.

SQL> lb changelog-sync-to-tag-sql -tag version1 -changelog-file controller.xml -outputfile synch.sql



3.4.6 clear-checksums

Clears all checksums and nullifies the MD5SUM column of the DATABASECHANGELOG table so that they will be recomputed on the next database update.

Syntax

Liquibase|lb clear-checksums|clc OPTIONS

Options

Option	Description	Default	Deprecated
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.		 liquibaseTablespaceN ame
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

Example

Clear checksums:

-- Connect to target and execute command. SQL> connect <db-connect-string> SQL> clear-checksums

3.4.7 data

Generate changelogs for the data. Creates a changelog for data from all objects or as filters are specified.

Syntax

Liquibase|| data|| da OPTIONS

Options

Option	Description	Default	Deprecated
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-exclude-objects -exo	Objects to exclude from diff.	-	excludeObjects
-include-objects -ino	Objects to include in diff.	-	includeObjects
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.		 liquibaseTablespaceNa me
-log -lo	Enable logging.	False	-
	Standard logging is INFO level (no debug flag).		
	Debug logging is FINEST level (both log and debug flag).		
-schemas -sc	Schemas to include in diff.	-	-
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

3.4.8 db-doc

Generates JavaDoc documentation for the existing database and changelogs.

Syntax

Liquibase|lb db-doc|dbd OPTIONS



Options

Option	Description	Default	Deprecated
Required			
-changelog-file -chf	The root changelog file.	-	changelogFile
-output-directory -oud	The directory where the documentation is generated.	-	outputDirectory
Optional			
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.		 liquibaseTablespaceN ame
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-search-path -sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-	searchPath
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML	-	secureParsing

Example

Generate db documentation:

-- Set default output path SQL> cd <output-files-path>



-- Generate doc SQL> lb db-doc -output-directory ./dbdoc -changelog-file controller.xml

3.4.9 diff

Compare two databases.

Syntax

Liquibase|lb diff|di OPTIONS

Options

Ontion	Description	Default	Deprecated
Option	Description	Delauit	Deprecaled
<pre>Required -reference-password -rep</pre>	The reference database password.	-	referencePassword
-reference-url - reur	The JDBC reference database connection URL.	-	referenceUrl
-reference-username -reu	The reference database username.	-	referenceUsername
Optional			
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-diff-types -dit	Types of objects to compare	catalogs, tables, views, columns, indexes, foreignkeys, primarykeys, uniqueconstraints, data, storedprocedures, sequences{catalogs tables views columns indexes foreignkeys primarykeys uniqueconstraints data storedprocedures sequences}	diffTypes
-exclude-objects -exo	Objects to exclude from diff	-	excludeObjects
-include-objects -ino	Objects to include in diff	-	includeObjects
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.		 liquibaseTablespaceNa me



Option	Description	Default	Deprecated
-log -lo	Enable logging.	False	-
	Standard logging is INFO level (no debug flag).		
	Debug logging is FINEST level (both log and debug flag).		

Compare two databases and spool output.

```
-- Set default output path

SQL> cd <output-files-path>

SQL> spool diff.sql
-- Connect to target database

SQL> connect <db-connect-string>
-- Compare to a reference database

SQL> lb diff -reference-url <reference-db-url> -reference-username

<reference-db-user> -reference-password <reference-db-password>

SQL> spool off
```

Compare tables, indexes and views between two databases.

```
-- Set default output path

SQL> cd <output-files-path>

SQL> spool diff.sql
-- Connect to comparison database

SQL> connect <db-connect-string>
-- Compare to a reference database

SQL> lb diff -diff-types tables,indexes,views -reference-url <db-url>
-reference-username <db-user> -reference-password <db-password>
```

3.4.10 diff-changeLog

Compare two databases to produce changesets and write them to a changelog file.

Syntax

Liquibase|lb diff-changelog|dic OPTIONS

Option	Description	Default	Deprecated
Required			
<pre>-changelog-file -chf</pre>	The root changelog file.	-	changelogFile



Option	Description	Default	Deprecated
-reference- password -rep	The reference database password.	-	referencePassword
-reference-url -reur	The JDBC reference database connection URL.	-	referenceUrl
-reference- username -reu	The reference database username.	-	referenceUsername
Optional			
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-diff-types - dit	Types of objects to compare	catalogs, tables, views, columns, indexes, foreignkeys, primarykeys, uniqueconstraints, data, storedprocedures, sequences{catalogs tables views columns indexes foreignkeys primarykeys uniqueconstraints data storedprocedures sequences}	diffTypes
-exclude-objects -exo	Objects to exclude from diff	-	excludeObjects
<pre>-include-objects -ino</pre>	Objects to include in diff	-	includeObjects
-include-schema -ins	If true, the schema is included in generated changeSets.	False	includeSchema
-include- tablespace -int	Include the tablespace attribute in the changelog	False	includeTableSpace
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.		 liquibaseTablespaceN ame



Option	Description	Default	Deprecated
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-reference- default-schema- name -redsn	The reference default schema name to use for the database connection.	-	referenceDefaultSche maName
-schemas -sc	Schemas to include in diff	-	-
-search-path -	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

Create changelog to synchronize two databases.

```
-- Set default output path
SQL> cd <output-files-path>
-- Connect to target database
SQL> connect <db-connect-string>
-- Compare to a reference database and create a changelog to synchronize them
SQL> lb diff-changelog -changelog-file diff.xml -reference-url <db-url> -reference-username <db-user> -reference-password <db-password>
```

Create changelog to synchronize table excluding employees between two databases.

```
-- Set default output path

SQL> cd <output-files-path>
-- Connect to comparison database

SQL> connect <db-connect-string>
-- Compare tables to a reference database

SQL> lb diff-changelog -changelog-file diff.xml -diffTypes=tables -
```



exclude-objects employees -reference-url <db-url>
-reference-username <db-user> -reference-password <db-password>

3.4.11 drop-all

Drops all database objects owned by the user.

Syntax

Liquibase|lb drop-all|dra

dropAll will not drop functions, procedures, or packages for the community version of Liquibase.

Functions, procedures, packages, and synonyms can only be dropped for Liquibase Pro supported objects.

dropAll is typically used when there is a need to prepare an environment schema to be identical to another environment schema. dropAll is useful in the developer and test environments to remove unwanted objects to reset the database to empty.

The command makes it easier to standardize another schema, compared to manually deleting the objects, or dropping and recreating the desired schema. dropAll should not be used in a production environment to prevent removal of required objects.

3.4.12 future-rollback-count-sql

Generates SQL that is used to sequentially revert the specified number of undeployed changes.

Syntax

Liquibase|| future-rollback-count-sql||furcs|| OPTIONS

Option	Description	Default	Deprecated
Required			
-changelog-file -chf	The root changelog file.	-	changelogFile
-count -cu	The number of changes to roll back.	-	-
Optional			
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName



Option	Description	Default	Deprecated
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-output-default- schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true, they are qualified. If false, only objects outside the default schema are fully qualified.	False	outputDefaultSchema
-search-path -sep	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		
-secure-parsing - scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

Generate SQL to roll back the specified number of undeployed changes.

```
-- Set default output path
SQL> cd <output-files-path>
-- Connect to target
SQL> connect <db-connect-string>
-- Generate SQL to roll back 1 undeployed change
SQL> lb future-rollback-count-sql -count 1 -changelog-file controller.xml
```

3.4.13 future-rollback-from-tag-sql

Generates SQL to revert future undeployed changes up to the specified tag.

Syntax

Liquibase|lb future-rollback-from-tag-sql|furfts OPTIONS



Option	Description	Default	Deprecated
Required			
-changelog-file -chf	The root changelog file.	-	changelogFile
-tag -ta	Generic 'tag to apply action to'.	-	-
Optional			
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me
-log -lo	Enable logging.	False	-
	Standard logging is INFO level (no debug flag).		
	Debug logging is FINEST level (both log and debug flag).		
-output-default- schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true, they are qualified. If false, only objects outside the default schema are fully qualified.	False	outputDefaultSchema
-search-path -sep	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		
-secure-parsing - scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		



Generate SQL to roll back undeployed changes to tag.

```
-- Set default output path

SQL> cd <output-files-path>
-- Connect to target

SQL> connect <db-connect-string>
-- Generate SQL to roll back 1 undeployed change

SQL> lb future-rollback-count-sql -count 1 -changelog-file

controller.xml
-- Edit changelog file and add tagDatabase entries for versions
-- Generate SQL to roll undeployed changes back to version1

SQL> lb future-rollback-from-tag-sql -tag version1 -changelog-file

controller.xml
```

3.4.14 future-rollback-sql

Generate the raw SQL needed to roll back future undeployed changes.

Syntax

Liquibase|lb future-rollback-sql|furs OPTIONS

Option	Description	Default	Deprecated
Required			
-changelog-file	The root changelog file.	-	changelogFile
-chf			
Optional			
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceN ame



Option	Description	Default	Deprecated
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST	False	-
	level (both log and debug flag).		
-output-default- schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true, they are qualified. If false, only objects outside the default schema are fully qualified.	False	 outputDefaultSchema
-search-path - sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-	searchPath
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	-	secureParsing

Generate SQL to roll back undeployed changes.

```
-- Set default output path

SQL> cd <output-files-path>
-- Connect to target

SQL> connect <db-connect-string>
-- Generate SQL to roll back 1 undeployed change

SQL> lb future-rollback-count-sql -count 1 -changelog-file controller.xml
-- Generate SQL to rollback all undeployed changes

SQL> lb future-rollback-sql -changelog-file controller.xml
```

3.4.15 generate-apex-object

Generates the changeset for an APEX object.

Syntax

Liquibase|lb generate-apex-object|geao OPTIONS

This command uses custom extension functionality.

XML files are generated defining the DDL for the APEX object.



Options

Option	Description	Default	Deprecated
-debug -de	Enable debug output.	False	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-

Example

Generate APEX object:

```
-- Set default output path
SQL> cd <output-files-path>
-- Generate XML files
SQL> lb generate-apex-object
```

3.4.16 generate-changelog

Writes changelog XML to copy the current state of the database to standard output or a file (uses core Liquibase functionality).

Syntax

Liquibase|lb generate-changelog|gec OPTIONS

Option	Description	Default	Deprecated
Required			
-changelog-file -chf	The root changelog file.	-	changelogFile
Optional			
-data-output- directory -daod	Directory to write data to.	-	dataOutputDirectory
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName



Option	Description	Default	Deprecated
-diff-types - dit	Types of objects to compare	catalogs, tables, views, columns, indexes, foreignkeys, primarykeys, uniqueconstraints, data, storedprocedures, sequences{catalogs tables views columns indexes foreignkeys primarykeys uniqueconstraints data storedprocedures sequences}	diffTypes
-exclude-objects -exo	Objects to exclude from diff	-	excludeObjects
-include-objects -ino	Objects to include in diff	-	includeObjects
-include-schema -ins	If true, the schema is included in generated changeSets.	False	includeSchema
-include- tablespace -int	Include the tablespace attribute in the changelog	False	includeTableSpace
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.		 liquibaseTablespaceN ame
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-output-default- schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False	 outputDefaultSchema
-overwrite- output-file - ovof	Flag to enable overwriting of output changelog file.	False	overwriteOutputFie
-schemas -sc	Schemas to include in diff	-	-



Option	Description	Default	Deprecated
-search-path - sep	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

Generate XML files for a database.

```
-- Set default output path SQL> cd <output-files-path>
-- Generate xml files
SQL> lb generate-changelog
```

Generate XML files for specific schemas in a database.

SQL> 1b generate-changelog -schemas hr, sales

3.4.17 generate-control-file

Generates an empty control file that you can use to start a new changelog.

Syntax

Liquibase|lb generate-control-file OPTIONS

Option	Description	Default	Deprecated
Required			
<pre>-changelog-file -chf</pre>	The root changelog file.	-	changelogFile
Optional			
-debug -de	Enable debug output.	False	-



Option	Description	Default	Deprecated
-log -lo	Enable logging.	False	-
	Standard logging is INFO level (no debug flag).		
	Debug logging is FINEST level (both log and debug flag).		

Generate control file:

```
--Set default output path
SQL> cd <output-files-path>
SQL> lb generate-control-file
```

3.4.18 generate-object

Writes change \log XML to copy the current state of the database object to a file. **Syntax**

lb generate-object OPTIONS

This command uses custom extension functionality. An XML file is generated defining the DDL for the object specified. The file is used to deploy using \mathtt{UPDATE} commands.

Option	Description	Default	Deprecated
-debug -de	Enable debug output	False	-
-fail-on-error - foe	Set failonError attribute to true in changelog.	False	-
-log -lo	Enable logging	False	-
-object-name -obn	Name of the object.	-	-
-object-type -obt	Type of object.	-	-
-output-default- schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true, they are qualified. If false, only objects outside the default schema are fully qualified.	False	outputDefaultSchema
-replace -re	Set replacelfExists attribute to true in changelog.	False	-
-runalways -ra	Set runAlways attribute to true in changelog	False	-



Option	Description	Default	Deprecated
-runonchange -rc	Set runOnChange attribute to true in changelog.	False	-

Generate the XML file for a specific object.

```
-- Set default output path
SQL> cd <output-files-path>
-- Generate xml files
SQL> lb generate-object -object-type table -object-name employees
```

3.4.19 generate-ords-module

Generates the code necessary to reproduce a module and all children using the ORDS APIs.

Syntax

Liquibase||b generate-ords-module||geom OPTIONS

This command uses custom extension functionality. The generated script includes roles and privileges associated with the selected module.

Options

Option	Description	Default	Deprecated
Required			
-module-name - mon	The module name for which to generate code.	-	-
Optional			
-debug -de	Enable debug output.	False	-
-include-enable- schema -ines	Dictates whether the enable_schema call will be included in the export.	True	-
-include-privs -inp	Dictates whether privileges will be included in the export.	True	-

Example

Generate ORDS module object:

```
-- Set default output path
SQL> cd <output-files-path>
```



-- Generate XML files SQL> lb generate-ords-module

3.4.20 generate-ords-schema

Generates the code necessary to reproduce all modules and children using the ORDS APIs.

Syntax

Liquibase|| b generate-ords-schema||geos OPTIONS

The generated script includes all roles and privileges associated with the exported modules.

Options

Option	Description	Default	Deprecated
-debug -de	Enable debug output.	False	-
-include-enable- schema -ines	Dictates whether the enable_schema call is included in the export.	True	-
-include-privs - inp	Dictates whether privileges will be included in the export.	True	-

3.4.21 generate-schema

Writes changelog XML to copy the current state of the database to files.

Syntax

Liquibase||b generate-schema||ges OPTIONS

This command uses custom extension functionality. XML files are generated defining the DDL for each object in the database. A controller XML file is created or updated identifying the individual XML files generated. The files are used to deploy using UPDATE commands.

Option	Description	Default	Deprecated
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history	DATABASECHANGELO G	 databaseChangelogTabl eName
-debug -de	{true false} Enable debug output.	False	-



Option	Description	Default	Deprecated
-fail-on-error - foe	{true false} Set failonError attribute to true in changelog.	False	-
-filter -fi	The filter value is the right-hand side of a SQL comparison, that is, a SQL comparison operator (=,!=, and so on) and the value compared against. The value must contain parentheses and quotation marks where appropriate. For example: "IN ('DEPT','EMP')" The filter value is combined with the object attribute corresponding to the object name to produce a WHERE condition in the query that fetches the objects. In the preceding example, objects named DEPT and EMP are retrieved. By default, all named objects of object_type are selected.		
-grants -gr	{true false} Export Object, System and Role grants.	False	-
-labels -la	Label expression to use for filtering which changes to operate on.	-	-
-log -lo	{true false} Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	
-replace -re	{true false} Set replacelfExists attribute to true in changelog.	False	-
-runalways -ra	{true false} Set runAlways attribute to true in changelog.	False	-



Option	Description	Default	Deprecated
-runonchange -rc	{true false} Set runOnChange attribute to true in changelog.	False	
-split -sp	{true false} This makes the export split the files into directories based on the object types.	False	-
-sql -sq	{true false} Generate a SQL file along with the changelog showing the DDL for the object. This SQL is not intended for anything other than review.	False	-
-synonyms -sy	{true false} Export public synonymns.	False	-

Generate XML files into separate directories.

```
-- Set default output path
SQL> cd <output-files-path>
-- Generate xml files
SQL> lb generate-schema -split
```

Generate XML files using a filter to include specific object types.

```
SQL> 1b generate-schema -filter "IN ('DEPARTMENTS', 'EMPLOYEES')"
```

3.4.22 history

List all deployed changesets and their deployment ID.

Syntax

Liquibase||b history||hi OPTIONS

Option	Description	Default	Deprecated
Required			
-changelog-file -chf	The root changelog file.	-	changelogFile



Option	Description	Default	Deprecated
Optional			
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me
log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-search-path -sep	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		
-secure-parsing - scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.	,	

Show the deployment history.

```
-- Connect to target
SQL> connect <db-connect-string>
SQL> lb history
```

3.4.23 list-locks

List the hostname, IP address, and timestamp of the Liquibase lock record.

Syntax

Liquibase|| list-locks|| lil OPTIONS

The ${\tt DATABASECHANGELOGLOCK}$ table is read to show lock details based on the connection.



Options

Option	Description	Default	Deprecated
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-secure-parsing - scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

3.4.24 mark-next-changeset-ran

Marks the next change you apply as executed in your database.

Syntax

Liquibase|lb mark-next-changeset-ran|mancr OPTIONS

The mark-next-changeset-ran command is used when deploy errors occur due to Liquibase not being synchronized with changes made outside of Liquibase.

Option	Description	Default	Deprecated
Required -changelog-file -	The root changelog file.	-	changelogFile
Optional -database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-



Option	Description	Default	Deprecated
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me
-log -lo	Enable logging. Standard logging is INFO level (no debug flag).	False	-
	Debug logging is FINEST level (both log and debug flag).		
-search-path -sep	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

3.4.25 mark-next-changeset-ran-sql

Writes the SQL used to mark the next change you apply as executed in your database.

Syntax

Liquibase|lb mark-next-changeset-ran-sql|mancrs OPTIONS

Option	Description	Default	Deprecated
Required			
-changelog-file -chf	The root changelog file.	-	changelogFile
Optional			
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName



Option	Description	Default	Deprecated
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceN ame
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-output-default- schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true, they are qualified. If false, only objects outside the default schema are fully qualified.	False	 outputDefaultSchema
-search-path - sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-	searchPath
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	-	secureParsing

3.4.26 release-locks

Remove the Liquibase lock record from the ${\tt DATABASECHANGELOG}$ table.

Syntax

Liquibase|lb release-locks|rel OPTIONS

Option	Description	Default	Deprecated
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName



Option	Description	Default	Deprecated
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-secure-parsing -	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	-	secureParsing

3.4.27 rollback

Roll back changes made to the database based on the specified tag.

Syntax

Liquibase|lb rollback|rb OPTIONS

The rollback command is used to revert all changes that were made to the database after a defined tag. All deployed changes are rolled back until the tag row in the DATABASECHANGELOG table.

Option	Description	Default	Deprecated
Required			
-changelog-file -chf	The root changelog file.	-	changelogFile
-tag -ta	Generic 'tag to apply action to'.	-	-
Optional			
-change-exec- listener-class -chelc	Fully-qualified class that specifies a ChangeExecListener.	-	 changeExecListenerPr opertiesFile
-change-exec- listener- properties-file -chelpf	Path to a properties file for the ChangeExecListenerClass.	-	 changeExecListenerPr opertiesFile
-contexts -co	Context string to use for filtering which changes to operate on.	-	-



Option	Description	Default	Deprecated
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceN ame
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-rollback-script -ros	Rollback script to execute.	-	-
-search-path -sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-	searchPath
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	-	secureParsing

Roll back changes to tag.

```
-- Set default output path
SQL> cd <output-files-path>
-- Connect to target
SQL> connect <db-connect-string>
-- Apply update for versions adding new tag for each version
SQL> lb update -changelog-file controller.xml
SQL> lb tag -tag version1
SQL> lb update -changelog-file controller.xml
SQL> lb tag -tag version2
-- Roll back to version1
SQL> lb rollback-sql -tag version1 -changelog-file controller.xml
```



3.4.28 rollback-count

Roll back the specified number of changes made to the database.

Syntax

Liquibase|| b rollback-count|| rbc OPTIONS

The ${\tt rollback-count}$ command is used to revert the specified number of changes to the database starting from the most recent changes.

Option	Description	Default	Deprecated
Required			
-changelog-file -chf	The root changelog file.	-	changelogFile
-count -cu	The number of changes to apply.	-	-
Optional			
-change-exec- listener-class -chelc	Fully-qualified class that specifies a ChangeExecListener.	-	 changeExecListenerPr opertiesFile
-change-exec- listener- properties-file -chelpf	Path to a properties file for the ChangeExecListenerClass.	-	 changeExecListenerPr opertiesFile
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceN ame



Option	Description	Default	Deprecated
-log -lo	Enable logging. Standard logging is INFO level (no debug flag).	False	-
	Debug logging is FINEST level (both log and debug flag).		
-rollback-script -ros	Rollback script to execute.	-	-
-search-path -	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

Roll back the specified number of changes.

```
-- Set default output path
SQL> cd <output-files-path>
-- Connect to target
SQL> connect <db-connect-string>
-- Apply update for versions adding new tag for each version
SQL> lb update -changelog-file controller.xml
SQL> lb update -changelog-file controller.xml
-- Roll back to version1
SQL> lb rollback-count -count 1 -changelog-file controller.xml
```

3.4.29 rollback-count-sql

Generate the SQL to roll back the specified number of changes.

Syntax

Liquibase|lb rollback-count-sql|rbcs OPTIONS

The rollback-count command is used to revert the specified number of changes to the database starting from the most recent changes.

Option	Description	Default	Deprecated
Required			

Option	Description	Default	Deprecated
-changelog-file -	The root changelog file.	-	changelogFile
-count -cu	The number of changes to apply.	-	-
Optional			
-change-exec- listener-class - chelc	Fully-qualified class that specifies a ChangeExecListener.	-	 changeExecListenerPro pertiesFile
<pre>-change-exec- listener- properties-file - chelpf</pre>	Path to a properties file for the ChangeExecListenerClass.	-	 changeExecListenerPro pertiesFile
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-output-default- schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False	outputDefaultSchema
-output-file -ouf	The name of the file to write the output to.	-	outputFie
-rollback-script -ros	Rollback script to execute.	-	-
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		



Generate SQL to roll back the specified number of changes.

```
-- Set default output path

SQL> cd <output-files-path>
-- Connect to target

SQL> connect <db-connect-string>
-- Apply update for versions

SQL> lb update -changelog-file controller.xml

SQL> lb update -changelog-file controller.xml
-- Roll back to version1

SQL> lb rollback-count-sql -count1 -changelog-file controller.xml
```

3.4.30 rollback-sql

Generate the SQL to roll back changes made to the database after a defined tag.

Syntax

Liquibase||b rollback-sql|rbs OPTIONS

The SQL will contain all deployed changes being rolled back until the tag row in the DATABASECHANGELOG table.

Option	Description	Default	Deprecated
Required			
-changelog-file -chf	The root changelog file.	-	changelogFile
-tag -ta	Generic 'tag to apply action to'.	-	-
Optional			
-change-exec- listener-class - chelc	Fully-qualified class that specifies a ChangeExecListener.	-	 changeExecListenerPro pertiesFile
-change-exec- listener- properties-file - chelpf	Path to a properties file for the ChangeExecListenerClass.	-	changeExecListenerPro pertiesFile
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName



Option	Description	Default	Deprecated
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-output-default- schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False	outputDefaultSchema
-output-file -ouf	The name of the file to write the output to.	-	outputFie
-rollback-script -ros	Rollback script to execute.	-	-
-search-path -sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-	searchPath
-secure-parsing -	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	-	secureParsing

Generate SQL to roll back the specified number of changes.

```
-- Set default output path

SQL> cd <output-files-path>
-- Connect to target

SQL> connect <db-connect-string>
-- Apply update for versions adding new tag for each version

SQL> lb update -changelog-file controller.xml

SQL> lb tag -tag version1

SQL> lb update -changelog-file controller.xml

SQL> lb tag -tag version2
-- Roll back to version1

SQL> lb rollback-sql -tag version1 -changelog-file controller.xml
```



3.4.31 rollback-to-date

Roll back changes made to the database back to the specified date and time.

Syntax

Liquibase|lb rollback-to-date|rbtd OPTIONS

The rollback-to-date command is used to revert changes from today's date to the specified date and time..

Option	Description	Default	Deprecated
Required	2000pa.o	Dolault	2001000100
	The root changelog file.	-	changelogFile
-date -da [Date to use when determining what changes to apply. The date format is YYYY-MM-DD HH:MM:SS. If including time, enclose the entire date/time in double quotes.	-	-
Optional			
-change-exec- listener-class - chelc	Fully-qualified class that specifies a ChangeExecListener.	-	 changeExecListenerPro pertiesFile
<pre>-change-exec- listener- properties-file - chelpf</pre>	Path to a properties file for the ChangeExecListenerClass.	-	 changeExecListenerPro pertiesFile
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me



Option	Description	Default	Deprecated
-log -lo	Enable logging.	False	-
	Standard logging is INFO level (no debug flag).		
	Debug logging is FINEST level (both log and debug flag).		
-rollback-script -ros	Rollback script to execute.	-	-
-secure-parsing - scp	 If true, remove functionality from file parsers, which can be used insecurely. 	-	secureParsing
	An example is disabling remote XML entity support.		

Roll back to the specified date and time.

```
-- Set default output path
SQL> cd <output-files-path>
-- Connect to target
SQL> connect <db-connect-string>
-- Apply update update on 2022-09-01
SQL> lb update -changelog-file controller.xml
-- Apply update on 2022-09-02
SQL> lb update -changelog-file controller.xml
-- Apply update on 2022-09-03
SQL> lb update -changelog-file controller.xml
-- Roll back to version1
SQL> lb rollback-to-date -date 2022-09-02 -changelog-file controller.xml
```

3.4.32 rollback-to-date-sql

Generate SQL to roll back changes made to the database back to the specified date and time.

Syntax

Liquibase|| b rollback-to-date-sql|rbtds OPTIONS

The rollback-to-date-sql command is used to generate SQL to revert changes from today's date to the specified date and time.

Option	Description	Default	Deprecated
Required -changelog-file -chf	The root changelog file.	-	changelogFile



Option	Description	Default	Deprecated
-date -da [Date to use when determining what changes to apply. The date format is YYYY-MM-DD HH:MM:SS. If including time, enclose the entire date/time in double quotes.	-	-
Optional			
-change-exec- listener-class -chelc	Fully-qualified class that specifies a ChangeExecListener.	-	 changeExecListenerPr opertiesFile
-change-exec- listener- properties-file -chelpf	Path to a properties file for the ChangeExecListenerClass.	-	 changeExecListenerPr opertiesFile
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceN ame
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-output-default- schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False	 outputDefaultSchema
-output-file -	The name of the file to write the output to.	-	outputFie
-rollback-script -ros	Rollback script to execute.	-	-



Option	Description	Default	Deprecated
-search-path - sep	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

Generate SQL to roll back the specified date.

```
-- Set default output path
SQL> cd <output-files-path>
-- Connect to target
SQL> connect <db-connect-string>
-- Apply update on 2022-09-01
SQL> lb update -changelog-file controller.xml
-- Apply update on 2022-09-02
SQL> lb update -changelog-file controller.xml
-- Apply update on 2022-09-03
SQL> lb update -changelog-file controller.xml
-- Apply update on 2022-09-03
SQL> lb update -changelog-file controller.xml
-- Roll back to version1
SQL> lb rollback-to-date-sql -date 2022-09-02 -changelog-file controller.xml
```

3.4.33 snapshot

Capture the current state of a target database.

Syntax

Liquibase|| b snapshot|| sn OPTIONS

The snapshot command is used to:

- Review and track changes in your target database
- Compare a previous database state to an online database
- Compare a previous database state to another snapshot



Options

Option	Description	Default	Deprecated
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-output-file -ouf	The name of the file to write the output to.	-	outputFile
-schemas -sc	Schemas to include in diff.	-	-
-secure-parsing - scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		
-snapshot-format -snf	Output format to use (JSON, YAML, or TXT)	-	snapshotFormat

Example

Generate a snapshot capturing the current state of a database.

```
-- Set default output path

SQL> cd <output-files-path>
-- Connect to target

SQL> connect <db-connect-string>
-- Take a snapshot

SQL> lb snapshot -snapshot-format json -outputfile snaptgt20220901.json
```

3.4.34 snapshot-reference

Capture the current state of the reference source database.

Syntax

Liquibase|lb snapshot-reference|snr OPTIONS



The snapshot command is used to:

- Review and track changes in your source database
- Compare a previous database state to an online database
- Compare a previous database state to another snapshot

Option	Description	Default	Deprecated
Required			
-reference- password -rep	The reference database password.	-	referencePassword
-reference-url -reur	The JDBC reference database connection URL.	-	referenceUrl
-reference- username -reu	The reference database username.	-	referenceUsername
Optional			
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceN ame
-log -lo	Enable logging. Standard logging is INFO level (no debug flag).	False	-
	Debug logging is FINEST level (both log and debug flag).		
-output-file -	The name of the file to write the output to.	-	outputFile
-reference- default-schema- name -redsn	The reference default schema name to use for the database connection.	-	 referenceDefaultSche maName
-schemas -sc	Schemas to include in diff.	-	-
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		
-snapshot-format	Output format to use (JSON, YAML, or TXT)	-	snapshotFormat



Generate a snapshot capturing the current state of a database.

```
-- Set default output path
SQL> cd <output-files-path>
-- Connect to target
SQL> connect <db-connect-string>
-- Take a snapshot
SQL> lb snapshot-reference -snapshot-format json -outputfile
snaptgt20220901.json
-reference-url <source-url> -reference-username <source-user> -reference-password <source-password>
```

3.4.35 status

Generate a list of pending changesets.

Syntax

Liquibase|| b status|| st OPTIONS

Option	Description	Default	Deprecated
Required			
-changelog-file -chf	The root changelog file.	-	changelogFile
Optional			
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me



Option	Description	Default	Deprecated
-log -lo	Enable logging.	False	-
	Standard logging is INFO level (no debug flag).		
	Debug logging is FINEST level (both log and debug flag).		
-search-path -sep	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		
-verbose -ve	Verbose flag	True	-

Report the number of undeployed changesets and identify them.

```
-- Set default output path
SQL> cd <output-files-path>
-- Check the status
SQL> lb status -verbose -changelog-file controller.xml
```

3.4.36 tag

Mark the current database state with the specified tag to use for roll back.

Syntax

Liquibase|| tag|| ta OPTIONS

For example, you can use the tag to mark the current database state for version, release, and so on. The tag is added to the last row in the DATABASECHANGELOG table.

Option	Description	Default	Deprecated
Required			
-tag -ta	Generic 'tag to apply action to'.	-	changelogFile
Optional			
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName



Option	Description	Default	Deprecated
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceN ame
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

Create initial tag and version tags.

```
-- Set default output path

SQL> cd <output-files-path>
-- Connect to target and add base tag

SQL> connect <db-connect-string>

SQL> lb tag -tag baseversion1
-- Apply update for version adding and add new tag for each version

SQL> lb update -changelog-file controller.xml

SQL> lb tag -tag version1
```

3.4.37 tag-exists

Verify the existence of the specified tag.

Syntax

Liquibase|lb tag-exists|tae OPTIONS

Option	Description	Default	Deprecated
Required			
-tag -ta	Generic 'tag to apply action to'.	-	changelogFile



Option	Description	Default	Deprecated
Optional			
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me
-log -lo	Enable logging.	False	-
	Standard logging is INFO level (no debug flag).		
	Debug logging is FINEST level (both log and debug flag).		
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

3.4.38 unexpected-changesets

Generate a list of changesets that have been executed but are not in the current changelog.

Syntax

Liquibase|| b unexpected-changesets|| unc OPTIONS

This command detects and compares the changes between the DATABASECHANGELOG table and the current changelog and reports:

- Changesets in the DATABASECHANGELOG table that do not exist in the current changelog.
- Previously deployed changesets that were deleted from your current changelog.

Option	Description	Default	Deprecated
Required -changelog-file -chf	The root changelog file.	-	changelogFile
Optional			





Option	Description	Default	Deprecated
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceN ame
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-search-path - sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-	searchPath
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		
-verbose -ve	Verbose flag	True	-

Example

Report unexpected changesets.

```
-- Set default output path

SQL> cd <output-files-path>
-- Connect to target and run command

SQL> connect <db-connect-string>

SQL> lb unexpected-changesets -changelog-file controller.xml
```



3.4.39 update

Deploy any changes in the changelog file that have not been deployed.

Syntax

Liquibase|lb update|up OPTIONS

When you run the update command, the changesets in the changelog file are read sequentially. The unique identifiers (file::id::author) in the file are compared to those stored in the DATABASECHANGELOG table.

- If the unique identifiers do not exist, Liquibase will apply the changeset to the database.
- If the unique identifiers exist, the MD5Sum of the changeset is compared to the one in the database.

If they are different, Liquibase will produce an error message that someone has changed it unexpectedly.

If the status of the runOnChange or runAlways changeset attribute is set to TRUE, Liquibase will re-apply the changeset. Example: <changeSet id="2" author="bob" runAlways="true">

Option	Description	Default	Deprecated
Required			
<pre>-changelog-file -chf</pre>	The root changelog file.	-	changelogFile
Optional			
-change-exec- listener-class -chelc	Fully-qualified class that specifies a ChangeExecListener.	-	 changeExecListenerPr opertiesFile
-change-exec- listener- properties-file -chelpf	Path to a properties file for the ChangeExecListenerClass.	-	changeExecListenerPr opertiesFile
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-



Option	Description	Default	Deprecated
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceN ame
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-search-path -sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-	searchPath
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	-	secureParsing

3.4.40 update-count

Deploy the specified number of changes from the changelog file.

Syntax

Liquibase|| b update-count|| upc OPTIONS

The update-count command applies changes and updates changesets sequentially, starting from the top of the changelog file until the number specified is reached.

- If the unique identifiers do not exist, Liquibase will apply the changeset to the database.
- If the unique identifiers exist, the MD5Sum of the changeset is compared to the one in the database.

If they are different, Liquibase will produce an error message that someone has changed it unexpectedly.

If the status of the runOnChange or runAlways changeset attribute is set to TRUE, Liquibase will re-apply the changeset. Example: <changeSet id="2" author="bob" runAlways="true">

Option	Description	Default	Deprecated
Required			



Option	Description	Default	Deprecated
-changelog-file -	The root changelog file.	-	changelogFile
-count -cu	The number of changes to apply.	-	-
Optional			
-change-exec- listener-class - chelc	Fully-qualified class that specifies a ChangeExecListener.	-	 changeExecListenerPro pertiesFile
<pre>-change-exec- listener- properties-file - chelpf</pre>	Path to a properties file for the ChangeExecListenerClass.	-	 changeExecListenerPro pertiesFile
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me
-log -lo	Enable logging.	False	-
	Standard logging is INFO level (no debug flag).		
	Debug logging is FINEST level (both log and debug flag).		
-search-path -sep	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		



Example

Update database with the specified number of changesets in the changelog file.

```
SQL> cd <1b-changes-directory>
SQL> lb update -changelog-file controller.xml -count 2
```

3.4.41 update-count-sql

Generate the SQL to deploy the specified number of changes for review before running the update command.

Syntax

Liquibase|lb update-count-sql|upcs OPTIONS

Liquibase uses the raw SQL to apply database changes you have added to the changelog file.

Option	Description	Default	Deprecated
Required			
-changelog-file -chf	The root changelog file.	-	changelogFile
-count -cu	The number of changes to apply.	-	-
Optional			
-change-exec- listener-class - chelc	Fully-qualified class that specifies a ChangeExecListener.	-	 changeExecListenerPro pertiesFile
<pre>-change-exec- listener- properties-file - chelpf</pre>	Path to a properties file for the ChangeExecListenerClass.	-	changeExecListenerPro pertiesFile
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName



Option	Description	Default	Deprecated
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me
-log -lo	Enable logging. Standard logging is INFO level (no debug flag).	False	-
	Debug logging is FINEST level (both log and debug flag).		
-output-default- schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False	outputDefaultSchema
-output-file -ouf	The name of the file to write the output to.	-	outputFie
-search-path -sep	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

3.4.42 update-sql

Generate the SQL identified in the changelog for review before running the ${\tt update}$ command.

Syntax

Liquibase|| lb update-sql|| ups OPTIONS

Liquibase uses the raw SQL to apply database changes you have added to the changelog file.

Options

Optional

Option	Description	Default	Deprecated
Required -changelog-file -chf	The root changelog file.	-	changelogFile





Option	Description	Default	Deprecated
-change-exec- listener-class -chelc	Fully-qualified class that specifies a ChangeExecListener.	-	 changeExecListenerPr opertiesFile
-change-exec- listener- properties-file -chelpf	Path to a properties file for the ChangeExecListenerClass.	-	changeExecListenerPr opertiesFile
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceN ame
-log -lo	Enable logging.	False	-
	Standard logging is INFO level (no debug flag).		
	Debug logging is FINEST level (both log and debug flag).		
-output-default- schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False	 outputDefaultSchema
-output-file -	The name of the file to write the output to.	-	outputFie
-search-path - sep	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		



Option	Description	Default	Deprecated
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

3.4.43 update-testing-rollback

Updates database, then rolls back changes before updating again. It provides testing of rollback funtionality.

Syntax

Liquibase|| lb update-testing-rollback|| uptr OPTIONS

Use only when all pending changelogs have been verified as ready to be deployed.

A multi-step operation is used and runs in sequential order:

update changeset1; update changeset2; update changeset3\
rollback changeset3; rollback changeset2; rollback changeset1
update changeset1; update changeset3

Option	Description	Default	Deprecated
Required			
<pre>-changelog-file -chf</pre>	The root changelog file.	-	changelogFile
Optional			
-change-exec- listener-class -chelc	Fully-qualified class that specifies a ChangeExecListener.	-	 changeExecListenerPr opertiesFile
-change-exec- listener- properties-file -chelpf	Path to a properties file for the ChangeExecListenerClass.	-	 changeExecListenerPr opertiesFile
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName



Option	Description	Default	Deprecated
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceN ame
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-output-default- schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False	 outputDefaultSchema
-output-file -	The name of the file to write the output to.	-	outputFie
-search-path - sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-	searchPath
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling	-	secureParsing
	remote XML entity support.		

3.4.44 update-to-tag

Deploy changes sequentially from the newest changeset up to and including the changeset with the specified tag.

Syntax

Liquibase|lb update-to-tag|uptt OPTIONS

The update-to-tag command will deploy changes only when you have previously added a tag Database Change Type in your changelog file. You cannot use the update-to-tag command with the reference to a tag created in the DATABASECHANGELOG table using the tag command. An update-to-tag-sql should always be run to review the SQL before running update-to-tag.



Option	Description	Default	Deprecated
Required			
-changelog-file -chf	The root changelog file.	-	changelogFile
-tag -ta	Generic 'tag to apply action to'.	-	-
Optional			
-change-exec- listener-class -chelc	Fully-qualified class that specifies a ChangeExecListener.	-	 changeExecListenerPr opertiesFile
-change-exec-	Path to a properties file for	-	
<pre>listener- properties-file -chelpf</pre>	the ChangeExecListenerClass.		changeExecListenerPr opertiesFile
-contexts -co	Context string to use for filtering which changes to operate on.	-	-
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTa bleName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase- schema-name - lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaNam e
-liquibase- tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceN ame
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-search-path - sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-	searchPath



Option	Description	Default	Deprecated
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

Example

Update database with the changesets up to and including the changeset with the specified database tag.

```
SQL> cd <1b-changes-directory>
-- Edit changelog file and add tagDatabase entries for versions
-- Execute an update-to-tag using a tag specified in tagDatabase in the changelog file
SQL> lb update-to-tag -tag version1 -changelog-file controller.xml
```

3.4.45 update-to-tag-sql

Generate the SQL from the newest changeset up to and including the changeset with the specified tag.

Syntax

 $\verb| Liquibase| | \verb| lb update-to-tag-sql| uptts OPTIONS| \\$

An update-to-tag-sql should always be run to review the SQL before running update-to-tag The update-to-tag-sql command will generate SQL when you have previously added a tag Database Change Type in your changelog file. You cannot use the update-to-tag command with the reference to a tag created in the DATABASECHANGELOG table using the tag cde command.

Option	Description	Default	Deprecated
Required			
<pre>-changelog-file - chf</pre>	The root changelog file.	-	changelogFile
-tag -ta	Generic 'tag to apply action to'.	-	-
Optional			
-change-exec- listener-class - chelc	Fully-qualified class that specifies a ChangeExecListener.	-	 changeExecListenerPro pertiesFile
<pre>-change-exec- listener- properties-file - chelpf</pre>	Path to a properties file for the ChangeExecListenerClass.	-	 changeExecListenerPro pertiesFile
-contexts -co	Context string to use for filtering which changes to operate on.	-	-



Option	Description	Default	Deprecated
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-labels -la	Label expression to use for filtering the changes to operate on.	-	-
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me
-log -lo	Enable logging. Standard logging is INFO level (no debug flag).	False	-
	Debug logging is FINEST level (both log and debug flag).		
-output-default- schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False	outputDefaultSchema
-output-file -ouf	The name of the file to write the output to.	-	outputFie
-search-path -sep	Complete list of locations to search for files such as changelog files.	-	searchPath
	You can specify multiple paths by separating them with commas.		
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

Example

Update database with the changesets up to and including the changeset with the specified database tag.

```
SQL> cd <1b-changes-directory>
-- Edit changelog file and add tagDatabase entries for version1
SQL> lb update-to-tag-sql -tag version1 -changelog-file controller.xml
```



3.4.46 validate

Validate the changelog for errors that may cause an UPDATE to fail.

Syntax

Liquibase|lb validate|va OPTIONS

The following checks are done:

- XML, YAML, JSON, and SQL structure
- Referenced files exist
- Required or prohibited attributes are correct for your database
- Duplicated id, author, and file combinations
- Checksum errors

Option	Description	Default	Deprecated
Required			
-changelog-file -chf	The root changelog file.	-	changelogFile
Optional			
-database- changelog-table- name -dactn	Name of table to use for tracking change history.	-	 databaseChangelogTabl eName
-debug -de	Enable debug output.	False	-
-default-schema- name -desn	The default schema name to use for the database connection.	-	defaultSchemaName
-liquibase-schema- name -lbsn	Schema to use for Liquibase objects.	-	 liquibaseSchemaName
-liquibase- tablespace-name - lbtn	Tablespace to use for Liquibase objects.	-	 liquibaseTablespaceNa me
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	False	-
-search-path -sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-	searchPath



Option	Description	Default	Deprecated
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely.	-	secureParsing
	An example is disabling remote XML entity support.		

Example

Validate before running UPDATE.

```
-- Set default output path
SQL> cd <output-files-path>
-- Connect to target and validate
SQL> connect <db-connect-string>
SQL> lb validate -changelog-file controller.xml
```

3.4.47 version

Display version information.

Syntax

Liquibase||b version|ve

3.5 Using SQLcl Liquibase Functionality with Open-Source Liquibase

SQLcl Liquibase with Oracle Database provides extended functionality to the Liquibase experience compared to the vanilla Liquibase client. This includes dynamically altering tables using Liquibase and SQLcl-exclusive Liquibase commands, such as generating specialized snapshots for:

- A comprehensive schema (generate-schema)
- Oracle REST Data Service (ORDS) objects (generate-ords-module and generate-ords-schema)
- Oracle APEX objects (generate-apex)

By default, the Liquibase client does not include this enhanced functionality or enable you to read the specialized changelogs generated by SQLcl Liquibase.

You can add the functionality to read these specialized changelogs to the Liquibase client by copying certain jar files from SQLcl and updating your Liquibase properties file. The steps to do this are demonstrated using the following example:

1. Connect to your Oracle Database and start the SQLcl command-line interface. The example database has a few sample tables that you can view.

```
SQL> select table_name from user_tables;
```



```
TABLE NAME
```

REGIONS
LOCATIONS
DEPARTMENTS
JOBS
EMPLOYEES
JOB_HISTORY
COUNTRIES

7 rows selected.

2. Create a table Fruits. This will serve as an example table to track.

```
SQL> create table fruits (id number(1,0), type varchar2(50), price
number, constraint fruits_pk primary key (id));
Table FRUITS created.
```

The table is added to the list of sample tables.

```
SQL> select table_name from user_tables;

TABLE_NAME
_____
REGIONS
LOCATIONS
DEPARTMENTS
JOBS
EMPLOYEES
JOB_HISTORY
FRUITS
COUNTRIES
```

3. Generate a changelog for the Fruits table.

8 rows selected.

```
SQL> lb generate-object -object-type table -object-name fruits;
--Starting Liquibase at 13:43:52 (version 4.15.0 #0 built at 2022-08-19 14:45+000)

Changelog created and written to file fruits_table.xml

Operation completed successfully.
```

4. Delete the Fruits table so that you can run some tests generating it with the changelog created.

```
SQL> drop table fruits;
SQL> select table_name from user_tables;
```

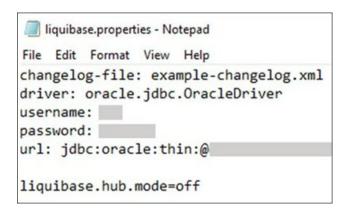


TABLE NAME

REGIONS
LOCATIONS
DEPARTMENTS
JOBS
EMPLOYEES
JOB_HISTORY
COUNTRIES

7 rows selected.

- 5. Switch to the vanilla Liquibase open-source command line client, which you can download from Liquibase's website.
- 6. You must provide the credentials of the Oracle Database that you are connected to in SQLcl for the vanilla Liquibase client. Create a liquibase.properties file from a blank text file. In this example, the liquibase.properties file is created in C:\Users\[username]\] folder on a Windows system. The following figure shows the properties file used in this example. For more information about providing database credentials for Liquibase, see Specifying Properties in a Connection Profile.



- 7. Copy and paste the fruits_table.xml changelog file created earlier from your SQLcl bin folder to the folder location of your liquibase.properties file (in this case, C:\Users\[username]\). To keep your changelog files in a different location, specify the path to the file location in the changelog-file field of your liquibase.properties file.
- 8. Run the update command.

>liquibase --changelog-file=fruits table.xml update



```
>liquibase --changelog-file=fruits_table.xml update
:\Users
               ##
##
                                                          ##
                                                          ##
                                                          ##
   Get documentation at docs.liquibase.com
Get certified courses at learn.liquibase.com
Free schema change activity reports at
https://hub.liquibase.com
                                                         ##
                                                          ##
                                                          ##
Starting Liquibase at 15:27:36 (version 4.15.0 #4001 built at 2022-08-05 16:17+0000)
Liquibase Version: 4.15.0
Liquibase Community 4.15.0 by Liquibase
nexpected error running Liquibase: Error parsing fruits_table.xml: Unknown change type 'createSxmlObject'
Check for spelling or capitalization errors and missing extensions such as liquibase-commercial.
or more information, please use the --log-level flag
 :\Users\
```

The update fails because the SQLcl specialized changelog is an unsupported format in the vanilla Liquibase client.

The next step is to add the functionality to read the changelogs of your SQLcl Liquibase in your vanilla Liquibase client so that you can run the changelog.

- 9. Copy five jar files from the lib and lib/ext folders in your SQLcl folder and add them to the lib folder of your vanilla Liquibase client (liquibase/lib):
 - dbtools-liquibase.jar(sqlcl/lib/ext)
 - dbtools-apex.jar (sqlcl/lib/ext)
 - quava-with-lf.jar(sqlcl/lib)
 - xmlparserv2_sans jaxp services.jar (sqlcl/lib)
 - dbtools-common.jar(sqlcl/lib)
- **10.** Update your liquibase.properties file by adding the following line:

```
change-exec-listener-class:
liquibase.changelog.visitor.OracleActionChangeListener
```

You can now read SQLcl Liquibase changelogs in your vanilla Liquibase client.

11. Run the SQL Liquibase changelog in the vanilla Liquibase client.

>liquibase update --changelog-file fruits table.xml

```
:\Users\
             >liquibase update --changelog-file fruits_table.xml
##
                                             ##
                                             ##
                                             ##
                                             ##
                                             ##
                                             ##
                                             ##
                                             ##
  Get documentation at docs.liquibase.com
                                             ##
  Get certified courses at learn.liquibase.com
                                             ##
  Free schema change activity reports at https://hub.liquibase.com
                                             ##
                                             ##
...............
Starting Liquibase at 09:43:37 (version 4.15.0 #4001 built at 2022-08-05 16:17+0000)
iquibase Version: 4.15.0
iquibase Community 4.15.0 by Liquibase
Running Changeset: fruits_table.xml::bb9e607c0432c87da2173ad3d5657029804a616e::(HR)-Generated
able "HR"."FRUITS" created.
iquibase command 'update' was executed successfully.
```

In another command-line window connected to SQL and your database, you can check if the table has been successfully created.

```
SQL> select table_name from user_tables;

TABLE_NAME
______
REGIONS
LOCATIONS
DEPARTMENTS
JOBS
EMPLOYEES
JOB_HISTORY
COUNTRIES
DATABASECHANGELOGLOCK
DATABASECHANGELOG
FRUITS
COUNTRIES

10 rows selected.
```

With this functionality added to your vanilla Liquibase client, you can also read changelogs for other changelog types such as Oracle Rest Data Services (ORDS), Oracle APEX, and full database schemas along with Oracle SQLcl scripts.



```
:\Users\
                 >liquibase update --changelog-file controller.xml
##
                                                          ##
   Get documentation at docs.liquibase.com
                                                          ##
   Get certified courses at learn.liquibase.com
Free schema change activity reports at
         https://hub.liquibase.com
...........
5tarting Liquibase at 07:27:00 (version 4.15.0 #4001 built at 2022-08-05 16:17+0000)
iquibase Version: 4.15.0
Liquibase Community 4.15.0 by Liquibase
Running Changeset: departments_seq_sequence.xml::93020a4f5c3fc570029b0695d52763142b6e44e1::(HR)-Generated
Statement executed successfully
unning Changeset: employees_seq_sequence.xml::42e3db1348e500dade36829bab3b7f5343ad6f09::(HR)-Generated
Statement executed successfully
unning Changeset: locations_seq_sequence.xml::7ec49fad51eb8c0b53fa0128bf6ef2d3fee25d35::(HR)-Generated
RUNNING CHANGESEC: locations_seq_sequence.xml::/ec49fad51eb8c0b53fa0128bf6ef2d3fee25d35::(HR)-Generated Running Changeset: departments_table.xml::62926485197be515dcecdf2174bca09c4331d020::(HR)-Generated Table "HR"."DEPARTMENTS" altered.
```

3.6 Dynamic Object Transformation with SQLcl Liquibase and DBMS METADATA Oracle Database Package

Oracle supplies many packages, which are automatically installed with Oracle Database, that extend database functionality. One of these packages, <code>DBMS_METADATA</code>, provides a way to retrieve metadata from the database dictionary as XML or SQL Data Definition Language (DDL) statements, and to submit the XML to recreate the object.

Oracle SQLcl Liquibase uses the <code>DBMS_METADATA</code> package to generate and execute specialized changelogs that transform the state of the database objects dynamically. This is a feature not available in the Liquibase open-source client. By using SQLcl-exclusive Liquibase commands such as <code>generate-schema</code>, a complete Oracle database schema can be updated. This includes altering tables and other objects already present according to the changelog's specification. In open-source Liquibase, if the <code>update</code> command is run for a changelog mentioning a table that is pre-existing, it will fail. This is because open-source Liquibase is incapable of altering pre-exising objects.

SQLcl Liquibase's specialized changelogs generated from commands such as <code>generate-schema</code> and <code>generate-object</code> use the SXML data format from the <code>DBMS_METADATA</code> package to execute these dynamic updates. SXML is an XML representation of object metadata that looks like a direct translation of SQL DDL into XML.

This section demonstrates this concept using a few examples. For these example, a Windows-based operating system is used.

Example 1



Connect to an Oracle database with SQLcl release 22.3. The one featured in this example includes a few sample tables. The tables that are going to be used for this example are employees and departments.

```
SQL> select table_name from user_tables;

TABLE_NAME
_____
REGIONS
LOCATIONS
DEPARTMENTS
JOBS
EMPLOYEES
JOB_HISTORY
HIRE_DATE
PERSON_COLLECTION
COUNTRIES

9 rows selected.
```

1. Generate a schema of the database state using SQLcl Liquibase.

```
SQL> 1b generate-schema
```

```
SQL> 1b generate-schema
 -Starting Liquibase at 15:59:29 (version 4.15.0 #0 built at 2022-08-19 14:45+0000)
Export Flags Used:
Export Grants
                          false
Export Synonyms
                          false
[Method loadCaptureTable]:
        [Type - TYPE_SPEC]:
[Type - TYPE_BODY]:
                                                        451 ms
         [Type - SEQUENCE]:
         [Type - DIRECTORY]:
                                                        112 ms
         Type - CLUSTER]:
                                                       1473 ms
                 TABLE]:
                                                      25672 ms
```

2. Switching over to another command-line window, use the open-source Liquibase client to generate a changelog of the database state. Because generate-schema is a SQLcl-exclusive command that uses extended functionality, the open-source Liquibase client must use the generate-changelog command.



You can download the open-source Liquibase client from the Liquibase website.

>liquibase --changelog-file=sql test.xml generate-changelog



The database state is now captured in both SQLcl Liquibase and the open-source Liquibase client.

3. In the SQLcl command-line window, make a few changes to the database.

```
SQL>alter table employees add height number;
Table EMPLOYEES altered.

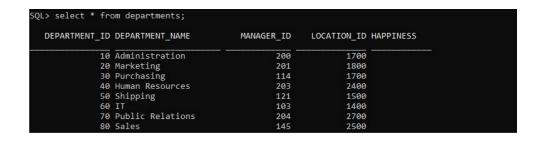
SQL>alter table employees add mood varchar2(50);
Table EMPLOYEES altered.

SQL>alter table departments add happiness varchar2(50);
Table DEPARTMENTS altered.
```

View these column additions in the database.

```
SQL> select * from departments;
SQL> select * from employees;
```







4. You need to use the Liquibase update command to alter the database to the state of the changelogs. This is the database state where employees and departments tables do not have the extra columns added.

To do that, in the command-line window **not** connected to SQLcl and that was used for running the open-source Liquibase client commands, enter the following command:

>liquibase --changelog-file=sql test.xml update



The update command fails because Liquibase encounters objects already existing in the database such as the tables. This standard version of Liquibase does not handle these objects dynamically.

5. In the SQLcl command-line window, the same step is repeated with SQLcl Liquibase.

First, examine the SQL that is used to complete the schema update using the update-sql command.

SQL>lb update-sql -changelog-file controller.xml



Examining the output, you see that departments and employees tables are recognized and that you need to drop the extra columns that you created to return to the state in the changelog.

```
-- Changeset departments_table.xml::18f3f88289eddcfc2b16fdae44a17169f8fe0d3f::(HR)-Generated ALTER TABLE "HR"."DEPARTMENTS" DROP ("HAPPINESS")

-- Changeset employees_table.xml::3679094045b7965245949695613df9351c236f3e::(HR)-Generated ALTER TABLE "HR"."EMPLOYEES" DROP ("HEIGHT")

/ ALTER TABLE "HR"."EMPLOYEES" DROP ("MOOD")
```

In actual use cases that are more complicated, there can often be risks involved with the SQL drop command. Examining the SQL code using the update-sql command is beneficial for review. Any manual changes can then be made to the changesets and checked as needed.

When you run the update command, the schema is successfully updated and the columns are dropped.

```
SQL> lb update -changelog-file controller.xml
--Starting Liquibase at 68:23:55 (version xml 4.15.0 #0 built at
2022-08-19 14:45+0000)
-- Loaded 38 change(s)
```

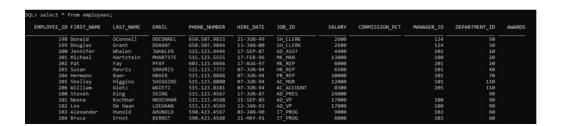
Example 2

This example also explains the same concept, this time adding columns and a table.

For this example, in the database, a table Activities has been previously created along with columns Head_Count and Retention in the departments table and Awards in the employees table.







Changelogs are generated and the Activities table and Head_count, Retention, and columns are deleted so as to showcase using Liquibase to create them.

1. Generate the schema in SQLcl.



Move the changelogs from the previous example to a separate folder to avoid issues.

```
SQL> lb generate-schema --Starting Liquibase at 09:33:52 (version 4.15.0 #0 built at 2022-08-19 14:45+0000)
```

2. Switching over to another command-line window to execute commands in the open-source Liquibase client, here also generate a changelog:

>liquibase --changelog-file=sql test2.xml generate-changelog



3. In the SQLcl command-line window, delete the Activities table and Head_count, Retention, and Awards columns, so that their creation can be demonstrated with the update command.

```
SQL> drop table activities;
Table ACTIVITIES dropped.

SQL> alter table employees drop column awards;
Table EMPLOYEES altered.

SQL> alter table departments drop column head_count;
Table DEPARTMENTS altered.

SQL> alter table departments drop column retention;
Table DEPARTMENTS altered.
```

- 4. In the open-source Liquibase command-line window, run the update command.
 - > liquibase --changelog-file=sql test2.xml update



The update fails when Liquibase encounters pre-existing objects.



5. In the SQLcl command-line window, generate the SQL to examine, then run the update with SQLcl Liquibase .

```
SQL>lb update-sql -changelog-file controller.xml
```

Looking at the SQL output, you can see sections involving the creation of the Activities table and SQLcl Liquibase generating the SQL statements to alter the Departments and Employees table to add the columns.

6. Run the update to see that the table and columns are added.

```
SQL> lb update -changelog-file controller.xml
```



```
-Starting Liquibase at 10:05:17 (version 4.15.0 #0 built at 2022-08-19 14:45+0000)

- Loaded 37 change(s)
Running Changeset: departments_seq_sequence.xml::93020a4f5c3fc570029b0695d52763142b6e44e1::(HR)-Generated Statement executed successfully
Running Changeset: employees_seq_sequence.xml::42e3db1348e500dade36829bab3b7f5343ad6f09::(HR)-Generated Statement executed successfully
Running Changeset: locations_seq_sequence.xml::7ec49fad51eb8c0b53fa0128bf6ef2d3fee25d35::(HR)-Generated Statement executed successfully
Running Changeset: departments_table.xml::62926485197be515dcecdf2174bca09c4331d020::(HR)-Generated Table "HR"."DEPARTMENTS" altered.
Table "HR"."DEPARTMENTS" altered.
Table "HR"."DEPARTMENTS" altered.
Table "HR"."EMPLOYEES" altered.
Table "HR"."EMPLOYEES "altered.
Table "HR"."EMPLO
```

```
SQL>select table_name from user_tables;
SQL>select * from employees;
SQL>select * from departments;

SQL> select table_name from user_tables;

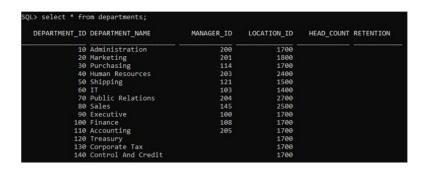
TABLE_NAME
________
REGIONS
LOCATIONS
DEPARTMENTS
JOBS
EMPLOYEES
JOB_HISTORY
DATABASECHANGELOG_ACTIONS
DATABASECHANGELOG
ACTIVITIES
```

11 rows selected.

COUNTRIES







3.7 Liquibase Open-Source Changesets with SQLcl Liquibase

You can use changesets generated in the open-source Liquibase solution with SQLcl Liquibase. This enables you to carry over previous change management projects to SQLcl to optimize them with your Oracle Database.

The following example demonstrates this using the ${\tt H2}$ database available in the open-source download of Liquibase and SQLcl Liquibase:

1. Download the open-source Liquibase client available on the Liquibase website. In your command-line interface, create a project folder and example H2 database with the following command:

>liquibase init project

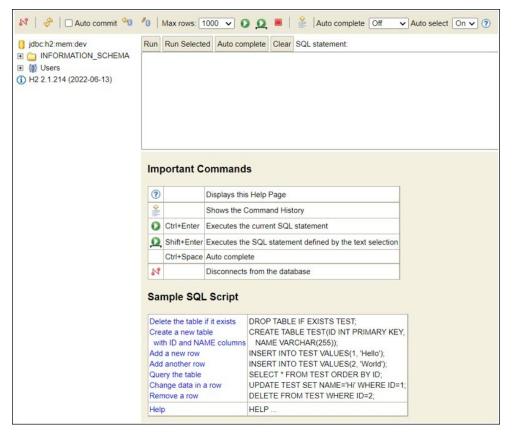


2. Start your H2 database:

>liquibase init start-h2

This also launches the database console of the empty H2 database in your browser.





3. In the browser console, create a sample table using the following command and click **Run**:

>create table pets (id int, name varchar(256), breed varchar(256), Primary Key (id));



4. Capture this schema consisting of the Pets table with a Liquibase changelog.
Open a new command-line window and generate the changelog:

>liquibase --changelog-file=examplepets.xml generate-changelog

Name the changelog file as examplepets.xml.



The output shows where the file is saved.

5. Connect to your Oracle Database from the SQLcl 22.3 bin location.

You can view the tables in your database with the following command. The example database shows a few sample tables.

```
SQL> select table_name from user_tables;

TABLE_NAME
_____
REGIONS
LOCATIONS
DEPARTMENTS
JOBS
EMPLOYEES
JOB_HISTORY
COUNTRIES

7 rows selected.
```

- 6. Copy the examplepets.xml changelog file to the SQLcl 22.3 bin folder.
- 7. In the SQL command-line interface, run the changelog to add the Pets table to your database, and check to see that the table is now included in your list.

```
SQL> lb update --changelog-file examplepets.xml
SQL> select table name from user tables;
```



```
SQL> lb update --changelog-file examplepets.xml
--Starting Liquibase at 14:40:11 (version 4.15.0 #0 built at 2022-08-19 14:45+0000)

    Loaded 1 change(s)

Running Changeset: examplepets.xml::1662750905905-1:: (generated)
Operation completed successfully.
SQL> select table_name from user_tables;
TABLE_NAME
REGIONS
OCATIONS
DEPARTMENTS
JOBS
MPLOYEES
JOB HISTORY
DATABASECHANGELOGLOCK
DATABASECHANGELOG_ACTIONS
DATABASECHANGELOG
PETS
COUNTRIES
11 rows selected.
```

3.8 DATABASECHANGELOG_DETAILS VIEW

DATABASECHANGELOG_DETAILS is a view that consolidates information from the DATABASECHANGELOG and DATABASECHANGELOG_ACTIONS tables for easier reporting and troubleshooting.

This view enables a better understanding of the status and work performed by each change applied to the database. The SQL column shows the actual SQL that was run in the database. The SXML column shows the state of the object prior to the change being applied.

Example

SQL> desc DATABASECHANGELOG DETAILS

Name	Null?	Туре
DEPLOYMENT_ID		VARCHAR2(10)
ID		VARCHAR2 (255)
AUTHOR		VARCHAR2 (255)
FILENAME		VARCHAR2 (255)
SQL		CLOB
SXML		CLOB
DATEEXECUTED	NOT NULL	TIMESTAMP(6)
EXECTYPE	NOT NULL	VARCHAR2 (10)
MD5SUM		VARCHAR2 (35)
DESCRIPTION		VARCHAR2 (255)
COMMENTS		VARCHAR2 (255)
LIQUIBASE		VARCHAR2(20)



CONTEXTS LABELS

VARCHAR2 (255) VARCHAR2 (255)

3.9 ChangeSets in Liquibase

The following table lists the changeSets and provides a description for each of them. To learn more about changeSets, see <changeSet> tag.

ChangeSet	Description
CreateOracleConstraint	Creates a constraint from SQL.
CreateOracleDirectory	Creates a directory from SQL.
CreateOracleFunction	Creates a function from SQL.
CreateOracleGrant	Creates a grant from SQL.
CreateOraclePackageBody	Creates a package body from SQL.
CreateOracleJob	Creates a DBMS_Scheduler job from SQL.
CreateOraclePackageSpec	Creates a package specification from SQL.
CreateOracleProcedure	Creates a procedure from SQL.
CreateOraclePublicSynonym	Creates a public synonym from SQL.
CreateOracleRefConstraint	Creates a referential constraint from SQL.
CreateOracleSynonym	Creates a synonym from SQL.
CreateOracleTrigger	Creates a trigger from SQL.
CreateOracleTypeBody	Creates a type body from SQL.
CreateOracleTypeSpec	Creates a type spec from SQL.
CreateSxmlObject	Creates a function from SQL.
DropOracleConstraint	Drops a constraint.
DropOracleFunction	Drops a function.
DropOracleGrant	Drops a grant.
DropOraclePackageBody	Drops a package body.
DropOraclePackageSpec	Drops a package specification.
DropOracleProcedure	Drops a procedure.
DropOracleRefConstraint	Drops a referential constraint.
DropOracleTrigger	Drops a trigger.
DropOracleTypeBody	Drops a type body.
DropOracleTypeSpec	Drops a type specification.
DropOracleSynonym	Drops a synonym.
DropSxmlObject	Drops an SXML object. If the object was created through createSxmlObject, this rolls back the object to the last state. If not created, the object is just dropped. This is primarily used internally for SXML object handling.
RunOracleScript	Executes a SQL script using the SQLcl engine and therefore supports all SQLcl commands. Supports script, file, and URL sources.



3.10 Examples Using Liquibase

Some examples of using the Liquibase functionality for database change management tasks:

- Review SQL
- · Capture and Deploy an Object
- · Capture and Deploy a Schema
- Execute Custom SQL with RunOracleScript

3.10.1 Review SQL

To review SQL before running maintenance commands:

1. Optionally, set up to save SQL updates.

```
cd <1b-changes-directory>
spool update.sql
```

2. Connect to HR and capture the object.

```
connect <db-connect1-string>
lb update-sql
spool off
```

3.10.2 Capture and Deploy an Object

To deploy the EMPLOYEES table from HR to HR2:

1. Set default output path.

```
cd <output-files-path>
```

2. Connect to HR and capture the object.

```
connect <db-connect1-string>
lb generate-object -object-type table -object-name employees
```

3. Connect to HR2 and ensure the object does not exist.

```
connect <db-connect2-string>
drop table employees
```

4. Create the object in HR2 and verify that it was created.

```
lb update -changelog-file employees_table.xml
desc employees
```



3.10.3 Capture and Deploy a Schema

To capture HR schema and reproduce it in HR2 schema:

Set default output path.

```
cd <output-files-path>
```

2. Connect to HR and capture the schema.

```
connect <db-connect1-string>
lb generate-schema
```

3. Setup the HR2 user.

```
connect <db-connect-dba-string>
drop user hr2 cascade;
create user hr2 identified by hr2;
grant connect,resource, create view to hr2;
alter user hr2 quota unlimited on users;
alter user hr2 quota unlimited on sysaux;
```

4. Create the schema objects deployed from HR in HR2 and verify.

```
lb update -changelog-file controller.xml
tables
```

3.10.4 Execute Custom SQL with RunOracleScript

Create a RunOracleScript changeset to create a table and use PL/SQL variables in the script.

```
<?xml version="1.0" encoding="UTF-8"?>
<databaseChangeLog
   xmlns="http://www.liquibase.org/xml/ns/dbchangelog"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xmlns:n0="http://www.oracle.com/xml/ns/dbchangelog-ext"
xsi:schemaLocation="http://www.liquibase.org/xml/ns/dbchangelog
http://www.liquibase.org/xml/ns/dbchangelog/dbchangelog-3.6.xsd">
   <changeSet id="runScriptString" author="jdoe">
<n0:runOracleScript objectName="myScript" ownerName="JDOE"
sourceType="STRING">
<n0:source><![CDATA[
DEFINE table name = RUNNERSTRING;
create table &&table name (id number);
]]></n0:source>
    </n0:runOracleScript>
  </changeSet>
</databaseChangeLog>
```



4

Using Cloud Storage

Starting from SQLcl release 21.2, you can use the <code>DBMS_CLOUD</code> package for authentication to access objects in Cloud Storage.

The following actions can be performed with either OCI or DBMS CLOUD:

- Put, get, delete, and peek objects in Cloud Storage.
- Load database objects from objects in Cloud Storage.
- Unload a database table to an object in Cloud Storage.

Table 4-1 Accessing the cloud storage

Using OCI	Using DBMS_CLOUD
Can access on-premises database and cloud database	Can access cloud database only
Set a default Cloud Storage URL, list compartments, buckets and objects, and view some of the contents of an object in Cloud Storage	Set a default Cloud Storage URL, list objects, and view some of the contents of an object in Cloud Storage
Create an OCI profile for authentication and access as a prerequisite step	Authentication is done using existing OCI or Swift credentials

Use the Cloud Storage (cs) command to set a default Cloud Storage URI, list compartments, buckets and objects, and view some of the contents of an object in Cloud Storage.

Topics

- Using DBMS CLOUD for Authentication
- Creating the OCI profile for OCI Authentication
- About the Cloud Storage Command Options
- Examples

See Also:

- Loading a File
- Calling Oracle Cloud Infrastructure REST APIs Using the OCI Command

4.1 Using DBMS_CLOUD for Authentication

You can access the cloud storage using the $DBMS_CLOUD$ Credential command. Presently, the $DBMS_CLOUD$ Credential supports Oracle Cloud database.

With the DBMS CLOUD Credential command (dbcc), you can:

- Create a credential using Swift, OCI credentials, or an existing OCI profile.
- Enable, disable, update, and drop a credential.
- List the credentials.
- · Set the default credential.

Create a Credential

To create authentication using the Swift credential, use the following command:

```
dbcc create <new-credential-name> user <username> pass <password>
```

To create authentication using the OCI credential, use the following command:

dbcc create <new-credential-name> fingerprint <fingerprint> user_ocid
<user-id> tenancy_ocid <tenancy-id> private_path path-to-private-key>

To create authentication using OCI profile, use the following command:

dbcc create <new-credential-name> profile <oci-profile-name>

Enable, Disable, Update, and Drop a Credential

To enable a credential, use the following command:

dbcc enable <credential-name>

To disable a credential, use the following command:

dbcc disable <credential-name>

To update a credential, use the following command:

dbcc update <credential-name> <attribute> <value>

where <attribute> : [user_ocid] [tenancy | tenancy_id] [key_path |
private_key_path] [print | fingerprint]

To drop a credential, use the following command:

dbcc drop <credential-name>

List the Credentials

To display a list of available credentials, use the following command:

dbcc list



Set the Default Credential

To set mycred as the default credential, use the following command:

dbcc mycred

To find help on the dbcc command, use the following command:

help dbccred

An Example to Create and Set a DBMS_CLOUD Credential

The following example details the steps to create and set different types of DBMS_CLOUD credentials.

```
--Set the path to the Wallet zip file on your system
SQL> set cloudconfig <path-to-Wallet-file>
Operation is successfully completed.
--Supply the database user name, password and the database service name
provided in the tnsnames.ora
SQL> connect admin/<password>@adw20200526 high
Connected.
--Set Cloud Storage URL to the bucket
SQL> cs https://objectstorage.us-ashburn-1.example.com/n/test/b/example
DBMS CLOUD Credential: Not Set
OCI Profile: Not Set
Transer Method: Not Set
URI as specified: https://objectstorage.us-ashburn-1.example.com/n/test/b/
example
--create CREDENTIAL using Swift authentication
SQL> dbcc create swiftcred user <username> pass <password>
Credential SWIFTCRED created.
DBMS CLOUD Credential set to SWIFTCRED.
Transfer method set to DBMS CLOUD.
--create CREDENTIAL using OCI authentication
SQL> dbcc create ocicred fingerprint ec:98:83:**:**:b5
     user ocid ocid1.user.oc1.....**g4xoca
     tenancy ocid ocid1.tenancy.oc1....a**3n3a
     private path C:\\Users\\test\\.oci/freedb api key.pem
Credential OCICRED created.
DBMS CLOUD Credential set to OCICRED.
Transfer method set to DBMS CLOUD.
--create CREDENITAL using an existing OCI profile called freedb
--If profile name is not passed as a parameter, it takes the default
   OCI profile details which is already set.
SQL> dbcc create profcred profile [freedb]
Credential PROFCRED created.
```



DBMS_CLOUD Credential set to PROFCRED. Transfer method set to DBMS CLOUD.

4.2 Creating the OCI profile for OCI Authentication

For using the OCI authentication scheme, you must first set the OCI profile.

For more information about how to set up the required SSH keys and configure your Oracle Cloud Infrastructure Software Development Kits, see Setup and Prerequisites in the Oracle Cloud Infrastructure Documentation.

Note the following points:

- Generate a RSA key pair in PEM format (minimum 2048 bits required) without a
 passphrase. Use this key_file in the profile.
- Do not use relative paths inside the configuration file because relative paths
 resolve based on the SQLcl launch directory. Therefore, the key_file may not be
 found.
- Use double backslashes (\\) instead of a single backslash (\) for specifying the path of the key file in Windows.

To display the list of profiles contained in the OCI configuration file at ~/.oci/config, use the following command:

oci profile

To set the profile as demo, use the following command:

oci profile demo

4.3 About the Cloud Storage Command Options

You can invoke the Cloud Storage command in SQLcl with cloudstorage or cloud storage or cs.

The Cloud Storage Command provides Cloud Storage functions to:

- Set and show the default cloud storage URI.
- Set and show the transfer method, profile and credential.
- List compartment, bucket and objects in cloud storage.
- Get, put, delete, and peek a Cloud Storage Object.

For a list of the Cloud Storage command options in SQLcl, enter:

help cs

The command options are:



• cs [uri] <uri>: Sets the default Cloud Storage URI. The URI must contain the host and optionally the namespace, bucket, and object.

```
Example:
--host
cs https://objectstorage.us-ashburn-1.oraclecloud.com
--namespace
cs https://objectstorage.us-ashburn-1.oraclecloud.com/n/test
--bucket
cs https://objectstorage.us-ashburn-1.oraclecloud.com/n/test/b/example
--object
cs https://objectstorage.us-ashburn-1.oraclecloud.com/n/test/b/example/o/employees.csv
```

- cs oci [<profile>]: Sets the default transfer as OCI. Optionally, specify the profile to be used.
- cs {DBC | DBMS_CLOUD} [<credential>]: Sets the default transfer as DBMS_CLOUD. Optionally, specify the credential to use.
- cs clear: Clears the Cloud Storage URI including URI and transfer options.
- cs show: Shows the current default Cloud Storage URI, transfer method, profile and credential.
- cs listc [<compartment>]: Lists the compartments in the specified compartment. If compartment is not specified, lists the compartments in the namespace as identified by the profile. (OCI only)
- cs listb <compartment>: Lists the buckets in a compartment. (OCI only)
- cs listo [<bucket>]: Lists the objects in a bucket. Bucket must be specified in the URI or on the listo command.
- cs delete [<qualifier>]: Delete the object from cloud storage.
- cs get [<qualifier>]: Get the object from cloud storage.
- cs PUT [file-to-send-as-body] <qualifier>: Copy the file to cloud storage.
- cs peek [<qualifier>] [{ pos | position} <position>] [size <size>]:
 Displays the contents of the object where:

qualifier is the name of the object, optionally qualified by the namespace and the bucket. The qualified name combined with the default URI specified must fully identify the object URI.

position is the start location in the object for display.

size is the number of characters to display. If omitted, 2000 characters are displayed.

4.4 Examples

This section provides some examples:

- Load a Cloud Storage File into a Table
- Unload Table Data into Cloud Storage
- List Compartments, Buckets, and Objects
- Load a Local File into Cloud Storage using the PUT command



- Get a File from Cloud Storage using the GET Command
- Delete a File in Cloud Storage using the DELETE Command
- Grant a DBMS CLOUD Credential to Another User

Load a Cloud Storage File into a Table

The following example shows how to load a cloud storage file into a database table:

Use Case 1: When using the DBMS_CLOUD authentication scheme, the DBMS_CLOUD credential is set and transfer method is set to dbms cloud.

```
--Set the DBMS_CLOUD credential
SQL> cs dbc swiftcred

--Set Cloud Storage URI to the bucket
SQL> cs https://objectstorage.us-ashburn-1.example.com/n/test/b/example

DBMS_CLOUD Credential: SWIFTCRED
OCI Profile: Not Set
Transfer Method: dbms_cloud
URI as specified: https://objectstorage.us-ashburn-1.example.com/n/test/b/example
```

Use Case 2: When using the OCI Profile authentication scheme, the OCI profile is set and transfer method is set to oci.

```
--Set the OCI profile
SQL> cs oci demo
--Set Cloud Storage URI to the bucket
SQL> cs https://objectstorage.us-ashburn-1.example.com/n/test/b/example
DBMS CLOUD Credential: Not Set
OCI Profile: Demo
Transfer Method: oci
URI as specified: https://objectstorage.us-ashburn-1.example.com/n/
test/b/example
--Create Table "locations"
SQL> create table locations (location id NUMBER(5), location name
VARCHAR2 (40));
Table LOCATIONS created
--Load data from LOCATIONS DATA TABLE.csv in cloud storage into
"locations" table of the schema for the current user
SQL> load locations cs /o/LOCATIONS DATA TABLE.csv
format csv
column names on
delimiter ,
enclosure left "
```



```
enclosure right "
encoding UTF8
row limit off
row terminator default
skip rows 0
skip after names
--Number of rows processed: 50
--Number of rows in error: 0
--Last row processed in final committed batch: 50
0 - SUCCESS: Load processed without errors
SQL> select count(*) from locations;
COUNT(*)
_____
50
--Load data from LOCATIONS DATA TABLE.csv in your current local folder into
"locations" table
  of the schema for the current user
SQL> load locations cs LOCATIONS DATA TABLE.csv
```

Unload Table Data into Cloud Storage

The following example shows how to unload data from the locations table into cloud storage. The data is unloaded to the cloud storage location and is named LOCATIONS DATA TABLE.csv.

```
--Set Cloud Storage URI to the bucket
SQL> cs https://objectstorage.us-ashburn-1.oraclecloud.com/n/test/b/example
--Specify delimiter as | and terminator as <eol>
SQL> set loadformat delimiter | term <eol> csv
--Unload locations table into cloud storage
SQL> unload locations cs
DBMS CLOUD Credential: SWIFTCRED
                                           --Using DBMS CLOUD authentication
OCI Profile: Not Set
Transfer Method: dbms cloud
URI as specified: https://objectstorage.us-ashburn-1.oraclecloud.com/n/
test/b/example/o/
Final URI: https://objectstorage.us-ashburn-1.oraclecloud.com/n/test/b/
example/o/
format csv
column names on
delimiter |
enclosure left "
enclosure right "
encoding UTF8
row terminator <eof>
```



```
** UNLOAD Start ** at 2020.09.10-17.08.34
Export Separate Files to https://objectstorage.us-
ashburn-1.oraclecloud.com/n/test/b/example
DATA TABLE LOCATIONS
File Name: LOCATIONS DATA TABLE.csv
Number of Rows Exported: 23
** UNLOAD End ** at 2020.09.10-17.08.39
-- Show file contents
SQL> cs peek /o/LOCATIONS DATA TABLE.csv
"LOCATION ID" | "LOCATION NAME" < eof > 01 | "California" < eof > 02 | "Alaska < eof > 03
|"Florida"<eof>04|"Texas"<eof>05|"Virginia"<eof>
06|"Louisiana"<eof>07|"Massachusetts"<eof>08|"Arkansas"<eof>09|"Oregon"
<eof>10|"Hawaii"<eof>11|"Maryland"<eof>
12|"Pennsylvania"<eof>13|"Colorado<eof>14|"Michigan"<eof>15|"Minnesota"
<eof>16|"Ohio"<eof>17|"Maine"<eof>18|"Arizona"<eof>
19|"Missouri"<eof>20|"Vermont"<eof>21|"Kansas"<eof>22|"Nevada"<eof>23|"
Illinois"
```

List Compartments, Buckets, and Objects

The following example shows how to list compartments, buckets, and objects in cloud storage:



When using <code>DBMS_CLOUD</code> credential, you can only list the objects in the bucket. <code>DBMS_CLOUD</code> transfer method does not support listing compartments and buckets.

```
cs https://objectstorage.us-ashburn-1.oraclecloud.com/n/test
--Lists the compartments in the namespace
SQL> cs listc

COMP_APEX
dbtst
old
ords
pdf-fn-compartment
sandbox
sqldev
--Lists the compartments in the compartment sqldev
SQL> cs listc sqldev

--Lists the buckets in the compartment sqldev
SQL> cs listb sqldev
```



```
example
test

--Lists the objects in the bucket transfer
SQL> cs listo /b/example

COUNTRIES_DATA_TABLE.csv
DEPARTMENTS_DATA_TABLE.csv
REGIONS_DATA_TABLE.csv
LOCATIONS_DATA_TABLE.csv

--Displays the first 2000 characters of LOCATIONS_DATA_TABLE file
SQL> cs peek /o/LOCATIONS_DATA_TABLE.csv
```

Load a Local File into Cloud Storage using the PUT command

The following example shows how to load a local file into cloud storage using the CS PUT command and the Cloud Storage command:

Get a File from Cloud Storage using the GET Command

The following example shows how to get a file from cloud storage using the CS GET command and the Cloud Storage command:

```
--Set Cloud Storage URI to the bucket

SQL> cs https://objectstorage.us-ashburn-1.oraclecloud.com/n/test/b/
example/o/

--Set the local directory

SQL> cd C:\\Users\JDOE\\TempCS

--Get the myemployees.csv file from cloud storage

SQL> cs get /o/myemployees.csv
```



```
Get Object https://objectstorage.us-ashburn-1.oraclecloud.com/n/test/b/example/o/myemployees.csv
copied to C:\Users\JDOE\TempCSemployees.csv
```

Delete a File in Cloud Storage using the DELETE Command

The following example shows how to delete a file in cloud storage using the CS DELETE command and the Cloud Storage command:

```
--Set Cloud Storage URI to the bucket
SQL> cs https://objectstorage.us-ashburn-1.oraclecloud.com/n/test/b/
example/o/

--Set the local directory
SQL> cd C:\\Users\JDOE\\TempCS

--Delete the myemployees.csv file in cloud storage
SQL> cs delete /n/test/b/example/o/myemployees.csv

Deleted Object
https://objectstorage.us-ashburn-1.oraclecloud.com/n/test/b/example/o/
myemployees.csv
```

Grant a DBMS CLOUD Credential to Another User

The following example shows how to create and grant a DBMS_CLOUD credential to another user:

```
-- Create a DBMS CLOUD credential using oci-profile
SQL> dbcc create jdoecred profile freedb
DBMS CLOUD Credential: JDOECRED
OCI Profile: Not Set
Transfer Method: dbms cloud
URI as specified: https://objectstorage.us-ashburn-1.example.com/n/
test/b/example
-- Grant jdoecred to user jdoe
SQL> grant all on jdoecred to jdoe;
-- Connect to the Cloud instance as jdoe
SQL> connect jdoe/******@adw20200526 high
-- Create a synonym for jdoecred
SQL> create synonym mycred for admin.jdoecred;
-- Set the transfer method using the synonym mycred
SQL> cs dbc mycred
-- User can now list the objects in the Cloud Storage 'test' bucket
because jdoe.mycred exists (as synonym)
```



SQL> cs listo



5

Using Data Pump

You can import and export data and metadata using Data Pump. Data Pump is made available in SQLcl using the PL/SQL package, DBMS DATAPUMP.

You can do the following:

- Export one or more schemas.
- Import one or more schemas with the remap schema option.
- Use DATAPUMP export and import for Oracle Database and Oracle Autonomous Database Cloud Services.
- Use database directory or Oracle Object Store for dump files, which can be optionally encrypted.
- Perform parallel processing of dump files.
- Filter objects by object types or names.
- Use the SET DATAPUMP command to set defaults and save them with the STORE command.
- Use the Cloud Storage feature to put or get from the database directory.

Topics

- Getting Started
- Data Pump Command Syntax and Arguments
- Use Cases
- Tips and Troubleshooting

5.1 Getting Started

The following sections provide information needed to get started with the DATAPUMP command in SQLcl.

5.1.1 Prerequisites

To use Datapump in SQLcl, you need to know the following:

- When you are the logged-in user that is exporting or importing:
 - You must have the appropriate system privileges or adequate user space resource on the tablespace.
 - If you do not have the DBA or PDB_DBA role, you need access to the Oracle Directory for importing or exporting your own schema.

For example:

grant read, write on directory DATA PUMP DIR to dpumpnotdba;

- When using other schemas:
 - See Required Roles to learn about the required roles for data pump import and export operations.
 - You must have permissions for the tablespace to import.
- If you are unable to use Data Pump, you can instead load a file using Loading a
 File.
- To connect to an Autonomous Database:
 - Download the wallet file for the Oracle Cloud connection. See Download Client Credentials.

For importing to Autonomous, see Cloud Premigration Advisor Tool (CPAT).

- To use object storage from Oracle Database:
 - See About the Cloud Storage Command Options and Setup and Prerequisites in the Oracle Cloud Infrastructure Documentation.
 - You must install an OCI profile configuration file.
 - The OCI profile must be set using OCI PROFILE <name> or CS OCI <profile>.
 - You can copy dump files to object storage as the last step of an export using the -copycloud option on the data pump export.
 - You can copy dump files from object storage as the first step of an import using the -copycloud option on the data pump import.
 - You can copy dump files between cloud storage and Oracle Directories using the Cloud Storage command (put and get).
- To use object storage from Autonomous Database:
 - See Using DBMS CLOUD for Authentication.
 - You must set the credential for object storage using Cloud Storage, SET
 DATAPUMP or DATAPUMP command.
 - You can export dump files directly to object storage without using a database directory.
 - You can import dump files directly from object storage without using a database directory.
 - You cannot write log files directly to object storage but you can copy them to cloud storage using the Cloud Storage command.
- The Time Zone File version is shown during export. The dump file can only be imported into a database with the same (or later) time zone file version.
- Transparent and Dual encryption modes require Transparent Data Encryption (TDE). If TDE is not available, you can use only password encryption.



5.1.2 Usage

The DATAPUMP command creates and submits data pump jobs using the DBMS_DATAPUMP package.

- For importing to Autonomous, see Cloud Premigration Advisor Tool (CPAT).
- You can have different hardware, operating systems, character sets, time zones, and versions in the source and target databases.
- All object types and data types existing in Oracle Database release 11g and later versions are supported.
- You can transfer and filter data and metadata.
- You can transform schema names, tablespace names, and metadata at import time.
- You can unload and load data in an Oracle proprietary format.
- You can encrypt dump files to ensure your data is secure. You can use transparent if available on the database or use password as the encryption mode.
- You can filter the import or export process to limit the objects types and objects included.

Export

Data Pump export is used to unload metadata and data into a dump file, which can be stored in an Oracle Directory or object storage.

- If a schema or list of schemas is not provided, the current schema is exported.
- If a directory or object storage and a credential are not provided, the dump file is stored in DATA PUMP DIR.
- Job name is created as ESQL <n>, if one is not provided.
- If a dump file name is not provided, the dump file is stored as < jobname>. DMP.
- If a log file name is not provided, the log file is stored as <jobname>.LOG.

Import

Data Pump import is used to load metadata and data from a previously exported dump file, which was stored in an Oracle Directory or object storage.

- If a schema or list of schemas is not provided, all the objects in the dump file are imported (FULL import by default). You can use a filter to limit the number of objects imported.
- If a database directory or object storage and a credential are not provided, the dump file is stored in DATA PUMP DIR.
- Job name is created as ISQL <n>, if one is not provided.
- If a dump file name is not provided, the dump file is stored as < jobname>. DMP.
- If a log file name is not provided, the log file is stored as <jobname>.LOG.



5.2 Data Pump Command Syntax and Arguments

You can invoke the Data Pump command using dp or datapump.

Syntax

```
dp help [examples|syntax] | export [<optional-argument>,...] | import
[<optional-argument>,...] |
```

To see the help description for data pump in SQLcl, type:

dp help

To quickly view the syntax and exclude other details, type:

dp help syntax

To only view the examples in help, type:

dp help examples

<optional argument>: The following table describes the possible optional arguments
along with default values for each of them.

Table 5-1 Optional Arguments

File Argument	Description	Default
-credential, -c	Credential for dump file access in Oracle Object Store.	As specified in the Cloud Storage command
-directory,-d	Default database directory for reading and writing dump and log files.	DATA_PUMP_DIR
-dumpdirectory,-dd	Database directory for dump file.	-directory if specified or DATA_PUMP_DIR
-dumpfile,-f	<pre><file-name>[,] Dump file name(s) when using database directory.</file-name></pre>	<jobname><n>.DMP</n></jobname>
	You can specify multiple files whether parallelism is enabled or not. The number of files specified must be at least as large as the degree of parallelism.	



Table 5-1 (Cont.) Optional Arguments

File Argument	Description	Default
-dumpuri,-u	[<uri>[,] <qualified- name>[,]]</qualified- </uri>	Default object name is <jobname>.DMP</jobname>
	<ur>curi>: Complete URI for theOracle Object Store file if adefault is not set on CloudStorage command.</ur>	
	<qualifier>: Name of the object, optionally qualified by the namespace and the bucket. The qualified name concatenated to the URI specified on Cloud Storage command must fully identify the object URI.</qualifier>	
	Credential must be set for direct read/write access to Oracle Object Store from Autonomous database. For -copycloud between database directory and Oracle Object Store, OCI PROFILE must be set.	
	You can specify multiple URIs whether parallelism is enabled or not. The number of files specified should be at least as large as the degree of parallelism.	
-logdirectory,-ld	Database directory for log file.	-directory if specified or DATA_PUMP_DIR
-logfile,-lf	Log file name in the database directory.	<pre><jobname><n>.LOG</n></jobname></pre>

Table 5-2 Command Arguments

Command Argument	Description	Default
-noexec,-ne	[TRUE FALSE]	FALSE
	TRUE: Validate and generate the	
	PL/SQL, but do not execute it.	
-verbose,-ve	[TRUE FALSE]	FALSE
	TRUE: Show additional diagnostic	;
	output.	



Table 5-3 Common Arguments

Common Argument	Description	Default
-copycloud,-cc	[TRUE FALSE]	FALSE
	TRUE: Copy the dump file between database directory and Oracle Object Store.	
	For export, copy the dump file from the database directory to Oracle Object Store after the data pump job completes.	
	For import, copy the dump file from Oracle Object Store to the database directory before the data pump job starts.	
	Set the OCI PROFILE using OCI command or CLOUDSTORAGE command. Set the cloud storage URI using the CLOUDSTORAGE command, SET DATAPUMP command or DATAPUMP command.	
-encryptionpassword,-enp	<password></password>	None
	If password is not specified, a prompt for the password is given. For export, the dump files are encrypted using the password. For import, the same password used for export is provided.	
-excludeexpr,-ex	<pre><object_type_expression> Specify an expression identifying an object type or set of object types to exclude from the job. Example:- excludeexpr "IN ('GRANT','INDEX','TRIGG ER')"</object_type_expression></pre>	None
-excludelist,-el	<object-type>[,]</object-type>	None
	Specify a comma-separated- value list of object types to exclude from the job.	
	Example:-excludelist GRANT, INDEX, TRIGGER	



Table 5-3 (Cont.) Common Arguments

Common Argument	Description	Default
-includeexpr,-ix	<pre><object_type_expression> Specify an expression identifying an object type or set of object types to include in the job. Only matching object types and their dependents are included in the job. Use -excludelist or - excludeexpr to exclude dependent objects. Example: -includeexpr "IN ('TABLE','VIEW')"</object_type_expression></pre>	None
-includelist,-il	<pre><object_type>[,] Specify a comma-separated- value list of object types to include in the job. Only matching object types and their dependents are included in the job. Use -excludelist or - excludeexpr to exclude dependent objects. Example: -includelist TABLE, VIEW</object_type></pre>	None
-includemetadata,-im	[TRUE FALSE] TRUE: Include metadata in the job.	TRUE
-includerows,-ir	[TRUE FALSE] TRUE: Include data in the job.	TRUE
-jobname,-j	Name for the data pump job. Job name is appended with a data pump generated number, unless it ends with a number. jobname <n> is used when submitting the data pump job and as a default name for dump and log file names or object names.</n>	ESQL_ <n> ISQL_<n> where n is a data pump generated number.</n></n>
-nameexpr,-nx	<pre>{<object-type>=<name- expression="">}[;] For specified object type, provide an expression identifying a set of object names to include in the job. Example: -nameexpr TABLE="IN ('EMPLOYEES', 'DEPARTMENTS')"; PROCEDU RE="IN ('ADD_JOB_HISTORY', 'SEC URE_DML')"</name-></object-type></pre>	None



Table 5-3 (Cont.) Common Arguments

Common Argument	Description	Default
-namelist,nl	{ <object-type>=<name>[,]} [;] For specified object type, provide a comma-separated- value list of objects to include in the job. Example: - namelist TABLE=employees, departm ents; PROCEDURE=add_job_ history, secure_dml</name></object-type>	None
-parallel,-p	<degree_integer></degree_integer>	1
	Adjusts the degree of parallelism within a job allowing multiple processes simultaneously. Specify the same number of files as the degree or some processes may remain idle.	
-schemas,-s	<pre><schema>[,] - The schema or list of schemas to process. For example: -schemas schema1, schema2</schema></pre>	For export, schema for the current connection. For import, the default is FULL and all objects in the dump file are imported.
-version,-v	{ <nn.n> COMPATIBLE LATEST}</nn.n>	COMPATIBLE
	<nn.n>: A specific database version, for example, 11.0.0.</nn.n>	
	When exporting from Oracle Database 11g release 2 (11.2.0.3) or later into an Oracle Database 12 c Release 1 (12.1), specify a value of 12 to allow all existing database features, components, and options to be exported. This applies to a multitenant container database (CDB) or a non-CDB. COMPATIBLE: Uses the metadata version from the database compatibility level and the compatibility release level for the feature. LATEST: The version of the	
	metadata corresponds to the database version.	



Table 5-3 (Cont.) Common Arguments

Common Argument	Description	Default
-wait,-w	[TRUE FALSE]	TRUE
	TRUE: Wait for the data pump job to finish and show summary results.	
	FALSE: Submit the data pump job without waiting and without showing results.	t

Table 5-4 Export Only Arguments

Export-Only Arguments	Description	Default
-compression,-cm	{ALL DATA_ONLY METADATA ONLY NONE}	METADATA_ONLY
	Indicates if compression is needed for user data and metadata.	
	ALL: Compress user data and metadata.	
	DATA_ONLY: Compress only user data.	
	METADATA_ONLY: Compress only metadata.	
	NONE: Do not compress user data or metadata.	
-estimate,-e	{BLOCKS STATISTICS}	
	Specifies the estimate method for the size of the tables. It should be performed before starting the job.	
	BLOCKS: Estimate is calculated using the count of blocks allocated to the user tables.	
	STATISTICS: Estimate is calculated using the statistics for each table. If no statistics are available for a table, BLOCKS is used.	
-encryption,-en	{ALL DATA_ONLY ENCRYPTED_COLUMNS_ONLY METADATA_ONLY NONE}	NONE, or ALL if any other encryption option is specified.
	Specifying any encryption option will turn on encryption if you do not specify -encryption NONE.	
-encryptionalgorithm,-ena	{AES128 AES192 AES256}	AES128
	Identifies the cryptographic algorithm to use.	



Table 5-4 (Cont.) Export Only Arguments

Export-Only Arguments	Description	Default
-encryptionmode,-enm	{DUAL PASSWORD TRANSPARENT}	TRANSPARENT, or PASSWORD if -encryptionpassword is
	Identifies the types of security used for encryption and decryption.	specified.
	PASSWORD encrypts the dump files using the provided password.	
	TRANSPARENT enables encryption if the Oracle Encryption Wallet is available.	
	DUAL enables import using the Oracle Encryption Wallet or the password. When using DUAL, - encryptionpassword must be specified.	
-filesize,-fs	{ <n>{B KB MB GB TB}}</n>	500 MB
	Limit for the size of files.	
-flashbackscn,-fb	[TRUE FALSE]	FALSE
	TRUE: Use consistent database content based on system change number (SCN) at the start time of execution.	
-reusefile,-r	[TRUE FALSE]	TRUE
	TRUE: Replace existing dump file(s) with a new file.	

Table 5-5 Import Only Arguments

Import-Only Arguments	Description	Default
-columnencryption,-ce	[TRUE FALSE]	TRUE if supported by database
	TRUE: Include column encryption clause on table metadata.	
	FALSE Omit column encryption clause.	
-objectid,-oid	[TRUE FALSE]	TRUE
	TRUE: Assign the exported OID.	
	FALSE: Assign a new OID	



Table 5-5 (Cont.) Import Only Arguments

Import-Only Arguments	Description	Default
-remapschemas,-rs	{ <oldschema>=<newschema >[,]} <oldschema> objects in the job are moved to <newschema>. Example: oldschema1=newschema1,old schema2=newschema2.</newschema></oldschema></newschema </oldschema>	Not Applicable
-remaptablespaces,-rt	{ <oldtablespace>=<newtable space>[,]} <oldtablespace> storage segment in the job is relocated to <newtablespace>. Example: oldtablespace1=newtablespac e1,oldtablespace2=newtables pace2</newtablespace></oldtablespace></newtable </oldtablespace>	Not Applicable
-segmentattributes,-sa	[TRUE FALSE] TRUE: Include segment attributes clauses (physical attributes, storage attributes, tablespace, logging).	TRUE
-skipunusableindexes,-sui	[TRUE FALSE] TRUE: Rows are inserted into tables having unusable indexes.	TRUE
-storage,-st	[TRUE FALSE]	TRUE
	TRUE: Include storage clauses.	
-tableexists,-te	{APPEND REPLACE SKIP TRUNCATE} Action to take if table exists during import. APPEND: New rows are added to the existing rows in the table. REPLACE: Before creating the new table, the old table is dropped. SKIP: The preexisting table is left unchanged. TRUNCATE: Rows are removed from a preexisting table before inserting rows from the import.	SKIP when - includemetadata true, otherwise APPEND action is taken if table exists during import.



Table 5-5 (Cont.) Import Only Arguments

Import-Only Arguments	Description	Default
-tablecompression,-tc	[TRUE FALSE]	TRUE
	TRUE: The table compression clause is included if supported.	
	FALSE: The table has the default compression for the tablespace.	

5.3 Use Cases

The following use cases illustrate how to use the ${\tt DATAPUMP}$ command to import and export data.

Use Case 1

Copy tables, views and functions in current schema from database to database.

- 1. Export the current schema into DATA_PUMP_DIR.
- 2. Import the schema from DATA_PUMP_DIR.

```
-- Export the current schema into DATA_PUMP_DIR
SQL> connect <db-connect1-string>
SQL> dp export -dumpfile my_dump.dmp -includelist table, view, function
-- Import from DATA_PUMP_DIR
SQL> connect <db-connect2-string>
SQL> dp import -dumpfile my_dump.dmp
```

Use Case 2

Copy current schema from database to Autonomous Database. Encryption is done using prompt for password.

- 1. Set up for Oracle access to Oracle Object Store using an OCI profile.
- 2. Export current schema into an encrypted dump file in DATA_PUMP_DIR and copy it to the CS bucket using profile.
- 3. Import encrypted file from Oracle Object Store using credential.
- -- Set up for Oracle access to Oracle Object Store using an OCI profile SQL> oci profile my-profile SQL> cs https://swiftobjectstorage.us-ashburn-1.oraclecloud.com/v1/abc123/testing-bucket/
- -- Export current schema into an encrypted dump file in DATA_PUMP_DIR and copy it to the CS bucket using profile SQL> connect <db-connect-string> SQL> dp export -copycloud -dumpfile my dump.dmp -encryptionpassword



```
-- Import encrypted file from Oracle Object Store using credential
SQL> set cloudconfig <wallet>
SQL> connect <cloud-connect-string>
SQL> dp import -dumpuri /o/my_dump.dmp -encryptionpassword -c SWIFTCRED
```

Use Case 3

Copy multiple schemas from database to Autonomous Database with remap schemas.

- 1. Set up for Oracle access to Oracle Object Store using an OCI profile.
- 2. Export schemas into database directory and copy to cloud.
- 3. Import from Oracle Object Store using credential. Remap the schemas.

```
-- Set up for Oracle access to Oracle Object Store using an OCI profile SQL> oci profile my-profile SQL> cs https://swiftobjectstorage.us-ashburn-1.oraclecloud.com/v1/abc123/testing-bucket/

-- Export schemas into database directory and copy to cloud SQL> connect <db-connect-string>
SQL> dp export -schemas dpumptest1,dpumptest11 -dumpfile DPUMPTEST1_11.DMP -cc

-- Import from Oracle Object Store using credential. Remap the schemas SQL> set cloudconfig <wallet>
SQL> connect <cloud-connect-string>
SQL> dp import -dumpuri /o/DPUMPTEST1_11.DMP -c SWIFTCRED -rs dpumptest1=dpumptest2,dpumptest11=dpumptest21
```

Use Case 4

Remap the tablespace.

Copy multiple schemas from database to Autonomous Database with remap tablespace using OCI profile only.

- 1. Set up for Oracle access to Oracle Object Store using an OCI profile.
- 2. Export the current schema into DATA_PUMP_DIR and copy it to the CS bucket using profile.
- 3. Copy from Oracle Object Store into directory and import from directory. Remap the tablespace.

```
-- Set up for Oracle access to Oracle Object Store using an OCI profile
SQL> oci profile my-profile
SQL> cs https://swiftobjectstorage.us-ashburn-1.oraclecloud.com/v1/abc123/
testing-bucket/
-- Export the current schema into DATA_PUMP_DIR and copy it to the CS bucket
using profile
SQL> connect <db-connect-string>
SQL> dp export -copycloud
-- Copy from Oracle Object Store into directory and import from directory.
```



```
SQL> set cloudconfig <wallet>
SQL> connect <cloud-connect-string>
SQL> dp import -copycloud -dumpuri /o/ESQL <n>.DMP -rt DATA=USERS
```

Use Case 5

Copy current schema from database to Autonomous Database using parallel processors.

- 1. Set up for Oracle access to Oracle Object Store using an OCI profile.
- 2. Export the current schema into DATA_PUMP_DIR and copy all files to the CS bucket using profile.
- 3. Import from Oracle Object Store using credential.

```
-- Set up for Oracle access to Oracle Object Store using an OCI profile SQL> oci profile my-profile
SQL> cs https://swiftobjectstorage.us-ashburn-1.oraclecloud.com/v1/
abc123/testing-bucket/

-- Export the current schema into DATA_PUMP_DIR and copy all files to the CS bucket using profile
SQL> connect <db-connect-string>
SQL> dp export -copycloud -parallel 3 -dumpfile
my_dump1.dmp,my_dump2.dmp,my_dump3.dmp

-- Import from Oracle Object Store using credential
SQL> set cloudconfig <wallet>
SQL> connect <cloud-connect-string>
SQL> dp import -dumpuri /o/my_dump1.dmp,/o/my_dump2.dmp,/o/
my_dump3.dmp -c SWIFTCRED
```

5.4 Tips and Troubleshooting

The Datapump command builds PL/SQL that uses the DBMS_DATAPUMP package to execute exports and imports.

- Preview the PL/SQL and Parameters
 - Use the -noexec option to validate the export or import. This option shows the generated PL/SQL and parameters but does not submit the job for execution.
- Get additional information about the command processing
 - Use the -verbose option to see additional diagnostic information.
 - This option also provides queries that you can copy to view the last line of the log and percentage completed.
- View the job log
 - When using the -wait option, the log is written to the console.
 - When using -wait false, you can copy the log to object storage if you cannot see files in the directory.



 When using -wait false, you can view the log file with the following code block for Oracle Database release 12.2 and later versions:

```
var c clob;
set long 32000
begin select to_clob(BFILENAME('DATA_PUMP_DIR','ESQL_<n>.LOG'))
into :c from dual; end;
/
print c
```

- When importing or exporting as the logged-in user, it is recommended not to use the SYS role.
- Inserting a row into a table confirms you have quota on the tablespace. If you do not have quota, you see the following error after you run a DATAPUMP command: ORA-31626: job does not exist.

The following code snippet illustrates this problem:

```
*** Error with DataPump command
grant connect, resource, create session to user1 identified by user1;
grant read on directory DATA PUMP DIR to user1;
grant write on directory DATA PUMP DIR to user1;
SQL> connect <db-connect-string>
Connected
SQL> datapump export -schemas user1
Datapump Command Start ** at 2022.03.10-15.51.28
Initiating DATA PUMP
DATABASE TIME ZONE: VERSION:32 CON ID:0
Location: DATA PUMP DIR: ESQL 1614.LOG
ORA-31626: job does not exist
ORA-06512: at "SYS.DBMS SYS ERROR", line 79
ORA-06512: at "SYS.DBMS DATAPUMP", line 1849
ORA-06512: at "SYS.DBMS DATAPUMP", line 6869
ORA-06512: at line 25
** Datapump Command End ** at 2022.03.10-15.51.30
SQL> exit
***Resolve Error by Granting Tablespace Quota to User
Oracle Database 19c Enterprise Edition Release 19.0.0.0 - Production
Version 19.3.0.0.0
SQL> alter user user1 quota 128M on users;
Grant succeeded.
SQL> connect <db-connect-string>
Connected.
SQL> datapump export -schemas user1
```

```
** Datapump Command Start ** at 2022.03.10-15.54.15
Initiating DATA PUMP
DATABASE TIME ZONE: VERSION:32 CON ID:0
Log Location: DATA PUMP DIR: ESQL 1616.LOG
Starting "USER1"."ESQL 1616":
Processing object type SCHEMA EXPORT/TABLE/TABLE DATA
Processing object type SCHEMA EXPORT/TABLE/INDEX/STATISTICS/
INDEX STATISTICS
Processing object type SCHEMA EXPORT/TABLE/STATISTICS/
TABLE STATISTICS
Processing object type SCHEMA EXPORT/PRE SCHEMA/PROCACT SCHEMA
Processing object type SCHEMA EXPORT/TABLE/TABLE
Processing object type SCHEMA EXPORT/TABLE/COMMENT
Processing object type SCHEMA EXPORT/TABLE/INDEX/INDEX
Master table "USER1"."ESQL 1616" successfully loaded/unloaded
***************
*****
Dump file set for USER1.ESQL 1616 is:
 /opt/oracle/admin/DB193C/dpdump/D9C3824B6E651CA4E053020014C3358C/
ESQL 1616.DMP
Job "USER1"."ESQL 1616" successfully completed at Thu Mar 10
15:54:52 2022 elapsed 0 00:00:33
DataPump Operation Status 'COMPLETED'
Jobname = ESQL 1616
** Datapump Command End ** at 2022.03.10-15.54.56
```



6

Using the Cloud Premigration Advisor Tool

The Cloud Premigration Advisor Tool (CPAT) helps you evaluate an existing Oracle database for compatibility with Oracle Autonomous Database before migration. CPAT identifies potential user actions, prioritizes their importance, and suggests resolutions. Oracle recommends using CPAT to accelerate your migration to Oracle Cloud.

For more information about CPAT, see the document CPAT Analyzes Databases for Suitability of Cloud Migration (Doc ID 2758371.1) in My Oracle Support.

You can use SQLcl to run CPAT by using the MIGRATEADVISOR command.

Topics:

- Overview
- Prerequisites
- About the MIGRATEADVISOR Command
- Examples
- Tips and Troubleshooting

6.1 Overview

Using the MIGRATEADVISOR command in SQLcl, you can:

- Analyze an Oracle database to a generic autonomous type or specific instance, and create reports identifying actions recommended for successful migration to Oracle Cloud. A report can be generated in HTML, text or JSON format.
- Optionally, generate a target properties file that will provide more details specific to an autonomous instance.

The following image shows a CPAT report in HTML format.

```
SQL> migrateadvisor advise -schemas hr -outfileprefix xschemas -targettype adws -reportformat HTML
Cloud Premigration Advisor Tool Version 22.5.6-30
Cloud Premigration Advisor Check Summary
Cloud Premigration Advisor Tool completed with overall result: Action Required
    38 Checks run
   79 Schemas in source DB
    1 Schemas analyzed: HR
   1 Action Required: Checks with this result typically need to be resolved before attempting migration
       Data in Custom Tablespaces (Shared) (25 relevant objects)
   5 Review Required
   3 Review Suggested
   29 Passed
Cloud Premigration Advisor Tool generated report location(s):
    /private/tmp/xschemas_premigration_advisor_report2.json
    /private/tmp/xschemas_premigration_advisor_report2/premigration_advisor_report.html
    /private/tmp/xschemas_premigration_advisor2.log
```

CPAT Concepts

The source analysis in CPAT is done generically for different cloud types:

- ATPS (Autonomous Transaction Processing on Shared Infrastructure)
- ATPD (Autonomous Transaction Processing on Dedicated Infrastructure)
- ADWS (Autonomous Data Warehouse on Shared Infrastructure)
- ADWD (Autonomous Data Warehouse on Dedicated Infrastructure)
- Default (Oracle Database)

The source analysis consists of a series of tests that are executed as SQL Statements. The scope of the tests fall into three categories:

- SCHEMA: Checks that are only applicable to data within schemas. For example, tables are checked for usage of deprecated and desupported features.
- INSTANCE: Checks that are only applicable to the database instance as a whole.
 For example, certain parameters and values in the V\$PARAMETER table are checked.
- UNIVERSAL: Checks that are always run.

The source analysis can run in FULL mode, SCHEMA MODE or FULL SCHEMA mode.

- **FULL**: (Default) Executes all applicable checks in all appropriate schemas. SCHEMA, INSTANCE, and UNIVERSAL scope checks are executed.
- **SCHEMA**: Executes all applicable checks for schemas specified on the command line and UNIVERSAL checks. INSTANCE scope checks are not executed.
- SCHEMA FULL: Executes all applicable checks for schemas specified on the command line and UNIVERSAL and INSTANCE checks.

6.2 Prerequisites

The prerequisites for using the migrateadvisor command are:

- Oracle Database 11g Release 2 and later versions are supported.
- The PROPERTIES command is available only if the connected user is granted the SELECT ANY DICTIONARY privilege.
- The ADVISE command is available only if the connected user is granted:
 - the select any dictionary privilege
 - the SELECT privilege to access SYSTEM.DUM\$COLUMNS and SYSTEM.DUM\$DATABASE



You need access to the DUM\$ tables only if the source and target character sets indicate that Oracle Database Migration Assistant for Unicode (DMU) is needed.



6.3 About the MIGRATEADVISOR Command

You can run the CPAT command in SQLcl using ma or migrateadvisor.

This command inclues the following sub-commands:

- **Properties**: Generates a target properties file for Oracle or Autonomous Database that provides instance-specific analysis.
- Advise: Analyzes the database and produce reports containing information to assist in a successful migration.
- Info: Shows version information for CPAT.

Syntax

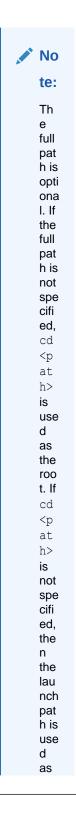
```
migrateadvisor help [examples|syntax] |
advise {{-targettype,-t} {ATPS|ATPD|ADWS|ADWD|DEFAULT} } [<-optional-
argument>,...] |
properties [<optional-argument>,...] |
info
```

The following table lists the required and optional arguments for advise.

Argument	Description	Default
Required		
-targettype,-t	(ATPS ATPD ADWS ADWD DEFAULT}	None
	The type of target database to analyze for migration.	
Optional		



Argument	Description	Default
-analysisprops,-a	<pre><pre><pre><pre><pre><pre></pre></pre></pre></pre></pre></pre>	None
	The path and name of a properties file.	





Argument	Description	Default
	the roo t.	
	A properties file that was created using the properties sub-command while connected to the target database.	
-excludeschemas,-x	<pre><schema>[,] The schema or comma- separated-value list of schemas to exclude from analysis.</schema></pre>	None
-full, -f	[TRUE: FALSE] Execute the full set of tests.	FALSE when -schemas is not specified, otherwise the default is TRUE
-maxrelevantobjects,-m	<maxrelevantobjects> The maximum number of "relevant objects" to be included in all reports. This option overrides - maxtextdatarows for TEXT reports.</maxrelevantobjects>	Include all objects
-maxtextdatarows,-n	<maxtextdatarows> Relevant object rows to be included in text reports (does not apply to JSON reports).</maxtextdatarows>	-maxrelevantobjects if specified, otherwise all relevant objects are included.
-migrationmethod,-mm	{DATAPUMP DATAPUMP_DBLINK GOLDENGATE } [,] A comma-separated-value list of methods or tooling that will be used to do the migration. Example: DATAPUMP, GOLDENGATE	DATAPUMP
-outdir,-o	<pre><directory> Identifies location for log and report files.</directory></pre>	Current SQLcl directory
-outfileprefix,-p	<pre><outfileprefix> A prefix to the standard base file name of "premigration_advisor_report".</outfileprefix></pre>	No prefix
-reportformat,-r	{HTML JSON TEXT } [,] Specify one or more <reportformats> where <reportformat> is HTML, JSON, or TEXT.</reportformat></reportformats>	HTML



Argument	Description	Default
-schemas,-s	<schema>[,]</schema>	All schemas
	The schema or comma separated value list of schemas to analyze. Example: schema1, schema2	
-sqltext,-q	Include SQL query used for checks in TEXT reports.	Do not include sql text in TEXT reports. Ignored for JSON reports.
-verbose,-ve	[TRUE FALSE]	FALSE
	TRUE shows additional diagnostic output.	

The following table lists the optional arguments for properties.

Argument	Description	Default
-outdir,-o	<directory></directory>	Current SQLcl directory
	Identifies location for log and report files.	
-outfileprefix,-p	<outfileprefix></outfileprefix>	No prefix
	A prefix to the standard base file name of "premigration_advisor_report".	

6.4 Examples

The following examples illustrate how to use the MIGRATEADVISOR command.

Example 1

Generate the target properties file for Autonomous Database.

```
-- Set default directory
SQL> cd <directory>
-- Connect to target
SQL> set cloudconfig <config-file>
SQL> connect <autonomous-connect-string>
-- Generate the properties file
SQL> migrateadvisor properties -outfileprefix cloud
```

Example 2

Create the HTML Advisor report for a single schema using target properties.

```
-- Set default directory
SQL> cd <directory>
-- Connect to source
SQL> connect <database-connect-string>
-- Generate the report
```



Example 3

Create the HTML Advisor report for the full database using target properties.

```
-- Set default directory

SQL> cd <directory>
-- Connect to source

SQL> connect <database-connect-string>
-- Generate the report

SQL> migrateadvisor advise -outfileprefix fulldb -targettype adws -analysisprops propertyFile>
```

Example 4

Create the JSON Advisor report excluding schemas.

```
-- Set default directory
SQL> cd <directory>
-- Connect to source
SQL> connect <database-connect-string>
-- Generate the report
SQL> migrateadvisor advise -excludeschemas hr,sales -outfileprefix xschemas -targettype adws -reportformat json
```

Example 5

Create the HTML Advisor report for multiple schemas including instance tests.

```
-- Set default directory

SQL> cd <directory>
-- Connect to source

SQL> connect <database-connect-string>
-- Generate the report

SQL> migrateadvisor advise -schemas hr,sales -full -outfileprefix fullmulti -targettype adws -analysisprops propertyFile>
```

Example 6

Create HTML Advisor report for a single schema for migration to an Oracle database with target properties.

```
-- Set default directory
SQL> cd <directory>
-- Connect to target
SQL> connect <database-connect-string>
-- Generate the properties file
SQL> migrateadvisor -gettargetproperties -outfileprefix cloud
-- Connect to source
SQL> connect <database-connect-string>
-- Generate the report
```



SQL> migrateadvisor advise -schemas hr -outfileprefix ora -targettype adws -analysisprops propertyFile>

6.5 Tips and Troubleshooting

Some points to note are:

- If the source is an Autonomous Database, running the ADVISE command is not a supported use of CPAT and the result may be unpredictable.
- The PROPERTIES and ADVISE commands require that the connected user has the SELECT ANY DICTIONARY privilege.

If you do not have the <code>SELECT ANY DICTIONARY</code> privilege, you see the following error:

```
SQL> grant connect, resource, unlimited tablespace to jdoe
identified by jdoe;
Grant succeeded.
SQL> connect jdoe/jdoe
Connected.
SQL> migrateadvisor advise -schemas hr -outfileprefix pre -
targettype adws -reportformat json
CPAT-1004: SQL error while initializing premigration application.
ORA-00942: table or view does not exist
--Ensure the JDBC connection information is correct. See the log
file for more details.
Additional Information: 255: Internal error - please contact
**Exception**: /Users/xyz/pre premigration advisor report.json
Log file contains:
Caused by: Error: 942, Position: 20, Sql = SELECT VERSION FROM
V$INSTANCE,
OriginalSql = SELECT VERSION FROM V$INSTANCE,
Error Msg = ORA-00942: table or view does not exist
```



7

Using the PGQL Plug-in

Property Graph Query Language (PGQL) is a graph pattern-matching query language for the property graph data model. The PGQL plug-in enables execution and translation of PGQL statements from the command line in SQLcl.

The PGQL plug-in for SQLcl is available with Oracle Graph Server and Client Release 20.3 and later releases.



Property Graph Query Language for more information about PGQL.

This chapter covers the following topics:

- Downloading and Installing
- About PGQL Commands
- Examples

7.1 Downloading and Installing

You can download the plug-in either from Oracle Software Delivery Cloud (search for "Oracle Graph Server and Client") or from Oracle Graph Server and Client Downloads.

To install the PGQL plug-in for SQLcl, you need to unzip the downloaded plug-in into the lib/ext directory of your local SQLcl installation.

7.2 About PGQL Commands

To run PGQL statements against a database, start SQLcl and then turn on PGQL mode by using the following command:

```
pgql auto on;
```

After PGQL mode is turned on, all subsequent SELECT, INSERT, UPDATE, DELETE, CREATE, and DROP statements are considered as PGQL statements.

You can also provide different arguments when turning on PGQL mode:

```
pggl auto on [args]
```

The possible arguments are:

- graph <graph name>: Make queries run against the specified graph.
- execute: Turn on PGQL execution.
- executeonly: Turn on PGQL execution and do not show PGQL-to-SQL translation.
- translate: Show PGQL-to-SQL translation.
- translateonly: Show PGQL-to-SQL translation and turn off PGQL execution.
- parallel <parallel>: Run (or translate) PGQL queries using the specified parallel value.
- dynamic_sampling <dynamic_sampling>: Run (or translate) PGQL queries using the specified dynamic sampling value.

By default, the graph value is not set, PGQL execution is turned on, and PGQL to SQL translation is turned off. The default value for parallel is 0, and the default value for dynamic sampling is 6.

To run SQL statements again, turn PGQL mode off:

```
pggl auto off;
```

To reset all parameters to their default values, turn PGQL mode off and then turn on again.

7.3 Examples

This section provides some examples:

- Turn On PGQL Mode
- Create a Property Graph and Execute a Query
- Define a Graph Parameter
- Show SQL Translation Using Parallel Value 2
- Turn Off PGQL Mode

Turn On PGQL Mode

This example turns PGQL mode on. The PGQL prompt appears when PGQL is enabled.

```
SQL> pgql auto on;
PGQL Auto enabled for graph=[null], execute=[true], translate=[false]
PGQL>
```



Create a Property Graph and Execute a Query

This example creates a property graph and executes a query against the newly created "scott_hr" graph.

```
PGQL> CREATE PROPERTY GRAPH scott hr
     VERTEX TABLES (
      emp KEY(empno) LABEL Employee
        PROPERTIES ARE ALL COLUMNS EXCEPT ( deptno ),
       dept KEY(deptno) LABEL Department
  5
         PROPERTIES ( deptno, dname )
  6
 7
 8
    EDGE TABLES (
 9
      emp AS works for
 10
          SOURCE KEY ( empno ) REFERENCES emp
 11
          DESTINATION KEY ( deptno ) REFERENCES dept
 12
          NO PROPERTIES
 13
     );
Graph created
PGQL> column name format a15;
PGQL> SELECT e.ename AS name
 2 FROM MATCH (e:Employee) ON scott hr
 3 ORDER by e.ename
 4 LIMIT 4;
NAME
_____
ADAMS
ALLEN
BLAKE
CLARK
```

Define a Graph Parameter

You can define a graph parameter to run all PGQL queries against a particular graph. This example sets graph to scott_hr. Note that the query does not need an ON clause.



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Show SQL Translation Using Parallel Value 2

This example shows the SQL translation of a PGQL query using a parallel value of 2. Note that the SQL translation has a hint using the defined parallel value.

```
SQL> pgql auto on translateonly parallel 2;

PGQL Auto enabled for graph=[null], execute=[false], translate=[true]

PGQL> SELECT id(n) FROM MATCH (n) ON scott_hr;

SELECT /*+ parallel(2) */ * FROM(SELECT 7 AS "id(n)$T",

to_nchar(T0$0.VID,'TM9','NLS_Numeric_Characters=''.,''') AS "id(n)$V",

T0$0.VID AS "id(n)$VN",

to_timestamp_tz(null) AS "id(n)$VT"

FROM "SCOTT".SCOTT HRVD$ T0$0);
```

Turn Off PGQL Mode

This example shows how to turn PGQL mode off.

```
PGQL> pgql auto off;
PGQL Auto disabled
SQL>
```



A

SQL Performance Troubleshooting

This appendix provides a list of SQL coding patterns that cause potential performance issues in SQL queries.

- Columns Defined as Literal Constants in Sub-Query Joined Later in Main Query
- Redundant Table in LEFT OUTER JOIN
- Too Many Join Conditions Between Factored WITH Sub Queries
- Data Security Predicates Wrapped Inside Redundant Sub-Query
- Aggregate Functions in Correlated Scalar Sub-query
- Use XMLTYPE Data Type Instead of CLOB
- Large Number of UNION (ALL) Query Blocks in a Single SQL
- Function Calls in WHERE Clause Predicates
- Long CASE Expressions in SELECT and WHERE Clauses
- Long in IN-LISTs in SQL Clauses
- Scalar Sub-Queries with DISTINCT Modifier or ROWNUM Keyword
- Custom PL/SQL Calls in SELECT Clause

Columns Defined as Literal Constants in Sub-Query Joined Later in Main Query

In cases where you have literal constants defined as columns in a single sub-query and later used in joins in the main query, consider passing them as direct filters instead. Refer to the following example of such usage:

```
(SELECT
...
UPPER('HXT') AS DUMMY
...
) V1,
(SELECT
    T2.C2 AS C2
FROM T2
) V2
WHERE
    V1.DUMMY = V2.C2
...
```

The more efficient SQL design is to pass it directly to the main query:

```
(SELECT ... ) V1, (SELECT
```



```
T2.C2 AS C2
FROM T2
) V2
WHERE
V2.C2 = UPPER('HXT')
```

Redundant Table in LEFT OUTER JOIN

Some of Left Outer Joins (LOJ) may be redundant if you join two tables through LOJ but do not select any attributes from the table on the 'optional' side of the LOJ. Review the following example:

```
SELECT
  b.book_title,
  b.author,
  b.language
FROM
  books b,
  book_languages 1
WHERE
  b.language = 1.language (+);
```

The table BOOK_LANGUAGES is on the optional side of the OUTER join and no columns from it are in the SELECT clause. The query above is functionally equivalent (that is, it produces the same exact result set) with both the table and LOJ removed:

```
SELECT
    b.book_title,
    b.author,
    b.language
FROM
    books b;
```

Complex SQL queries with redundant OUTER joined tables may result in additional performance overhead during parse time as well as at run time. The optimizer may be unable to eliminate unused outer joined table as outer joins are usually harder to process than the ordinary inner joins. Make sure you carefully validate your functionality to evaluate the impact from removing such joins and tables in your reports.

Too Many Join Conditions Between Factored WITH Sub Queries

When you join two factored WITH sub-queries using too many join conditions, the optimizer may estimate low join cardinality for the respective tables and not choose the best execution plan. Refer to the following example, showing the sub-optimal generated SQL pattern as the result of having too many joins between two factored WITH sub-queries:

```
FROM SAWITH1 D1

FULL OUTER JOIN SAWITH2 D2

ON SYS_OP_MAP_NONNULL(D1.c3) = SYS_OP_MAP_NONNULL(D2.c3)

AND SYS_OP_MAP_NONNULL(D1.c5) = SYS_OP_MAP_NONNULL(D2.c5)

AND SYS_OP_MAP_NONNULL(D1.c12) = SYS_OP_MAP_NONNULL(D2.c12)
```



```
AND SYS OP MAP NONNULL(D1.c14) = SYS OP MAP NONNULL(D2.c14)
AND SYS OP MAP NONNULL(D1.c11) = SYS OP MAP NONNULL(D2.c11)
AND SYS OP MAP NONNULL(D1.c2) = SYS OP MAP NONNULL(D2.c2)
AND SYS OP MAP NONNULL(D1.c13) = SYS OP MAP NONNULL(D2.c13)
AND SYS OP MAP NONNULL(D1.c15) = SYS OP MAP NONNULL(D2.c15)
AND SYS OP MAP NONNULL(D1.c9) = SYS OP MAP NONNULL(D2.c9)
AND SYS OP MAP NONNULL(D1.c10) = SYS OP MAP NONNULL(D2.c10)
AND SYS OP MAP NONNULL(D1.c8) = SYS OP MAP NONNULL(D2.c8)
AND SYS OP MAP NONNULL(D1.c7) = SYS OP MAP NONNULL(D2.c7)
AND SYS OP MAP NONNULL(D1.c18) = SYS OP MAP NONNULL(D2.c18)
AND SYS OP MAP NONNULL(D1.c21) = SYS OP MAP NONNULL(D2.c21)
AND SYS OP MAP NONNULL(D1.c4) = SYS OP MAP NONNULL(D2.c4)
AND SYS OP MAP NONNULL(D1.c6) = SYS OP MAP NONNULL(D2.c6)
AND SYS OP MAP NONNULL(D1.c22) = SYS OP MAP NONNULL(D2.c22)
AND SYS OP MAP NONNULL(D1.c20) = SYS OP MAP NONNULL(D2.c20)
AND SYS OP MAP NONNULL(D1.c16) = SYS OP MAP NONNULL(D2.c16)
AND SYS OP MAP NONNULL(D1.c17) = SYS OP MAP NONNULL(D2.c17)
AND SYS OP MAP NONNULL(D1.c19) = SYS OP MAP NONNULL(D2.c19)
```

Carefully review all the joins in your SQL logic, and keep them to the bare minimum to address the functional requirements.

Data Security Predicates Wrapped Inside Redundant Sub-Query

Securing data in your reports requires very thorough analysis, and careful coding in your SQL queries. Data Security Predicates (DSP) or security clauses, that you append to ensure secure reporting in your SQLs, could have a performance impact on your SQL execution. For example, if you choose to re-use DSPs from other SQLs that pull in View Object security clauses, you could end up with the pattern described below:

In this example, table $\[mu 2\]$ got secured through two DSP predicates in a separate sub-query. As part of the overall optimization process, Oracle optimizer performs recursive optimization of each inline view (sub query) before optimizing the main query. Such a pattern could affect the query parsing time and possibly produce a less efficient execution plan. Consider using a more efficient pattern rewrite:



Aggregate Functions in Correlated Scalar Sub-query

Aggregate functions such as MAX/MIN/COUNT in scalar subquery can be safely and efficiently replaced by performing alternative rewrites. Refer to the following example:

--Sub-optimal pattern:

```
SELECT t1.c1,
       (SELECT MAX(t2.c2) as maxc2
          FROM t2
          WHERE t2.id=t1.id
        ) as c2
FROM t1;
--Optimal pattern:
SELECT t1.c1,
      t2alias.max c2
FROM t1,
     (SELECT MAX(t2.c2) as max c2
            T2.id as id
        FROM t2
       GROUP BY t2.id
     ) t2alias
WHERE t2alias.id=t1.id;
```

A scalar sub-query is executed for every row returned by the enclosing query block's row sources (here t1). It means the aggregated MAX is executed as many times as the number of fetched rows in the main query, resulting in slower performance. Moving the aggregated MAX into the FROM clause of the main query will aggregate the data once and speed up the overall query.

Note:

If the number of rows returned by the enclosing block (here t1) is moderate/low and the scalar sub-query is correlated on a selective indexed column, then the aggregate operation can be kept inside the correlated scalar sub-query.

Use XMLTYPE Data Type Instead of CLOB

Avoid using CLOB data type for storing XML data. The conversion of CLOB to XML on the fly using XMLTYPE function during report runtime could be very expensive. Instead, consider using XMLTYPE for storing XML documents in the database.

Large Number of UNION (ALL) Query Blocks in a Single SQL

A single SQL with multiple UNION (or UNION ALL) query blocks should be carefully analyzed to consolidate UNIONs into fewer sub-queries. The excessive use of UNIONs is a strong indicator of logic redundancy and SQL complexity. It results in a much larger SQL statement, which would take much longer to parse and execute in the database, as each UNION query block by default is executed serially, one-by-one.



Forcing /*+ PARALLEL */ hint would not help to run multiple UNION branches at the same time. The hint /*+ PQ_CONCURRENT_UNION */ could help with parallel UNION branch executions, but it could result in more database workload, especially if the UNION branches have very expensive tables and no selective filters.

In the most cases, the Union branches may be nearly identical with minor differences such as slightly different filters or different expressions on columns in SELECT lists, and so on. Consider reworking multiple-UNION query into a much simpler shape by factoring out one or two common denominator WITH sub-queries and reusing them as per functional requirements. Such an approach results in much less logical reads, lesser database impact and faster query performance. If the same WITH factored sub-query is called more than once, Oracle would 'materialize' its result set in a temporary segment and use it throughout the SQL.

Function Calls in WHERE Clause Predicates

Expressions in WHERE clauses employ filter and join expressions to constrain rows from data sources (tables, views, inline views). When the estimated number of rows after filter/join operation using indexed attributes is low, the optimizer will choose an index to directly access the required data blocks. Applying SQL or PL/SQL functions to columns in filter/join expressions disables index usage and reverts table access to full table scan.

Alternatively, if there is a function-based index (FBI) defined, but filter or join expressions do not use the exact function in the join predicates, the optimizer chooses less optional full table scan as well. For example, the PERSON_NUMBER column in the table PER_ALL_PEOPLE_F is indexed via function-based index (FBI) using UPPER(PERSON_NUMBER). The appropriate use for PERSON_NUMBER in WHERE clause will be UPPER(PERSON_NUMBER). Refer to two separate sections on the recommended use of UPPER and TRUNC in WHERE clauses.

Consider the following example:

```
SELECT * FROM XLA AE HEADERS WHERE AE HEADER ID = '1511989';
```

There is a unique index defined on the primary key column AE_HEADER_ID, that makes access to desired data very fast and efficient through the INDEX RANGE SCAN operation:

```
| Id | Operation
                      | Name | Rows |
Bytes | Cost (%CPU)| Time |
_____
_____
215 | 4 (0) | 00:00:01 |
| 0 | SELECT STATEMENT
                         1 | TABLE ACCESS BY INDEX ROWID BATCHED| xla ae headers | 1 |
215 | 4 (0) | 00:00:01 |
| * 2 | INDEX RANGE SCAN
                          | XLA AE HEADERS U1 | 1
   3 (0) | 00:00:01 |
_____
Predicate Information (identified by operation id):
  2 - access("AE HEADER ID"=1511989)
```



When the function TO_CHAR() is used on AE_HEADER_ID column, the plan changes to:

There may be valid cases where SQL or PL/SQL functions in WHERE clause are required by functional design. For example, aggregate functions in WHERE clauses (MAX, MIN, COUNT, AVG,) may be needed for the functional logic. In such cases, ensure you have effective filters on other columns with supporting indexes to ensure optimal performance.

Long CASE Expressions in SELECT and WHERE Clauses

Complex CASE expressions can affect query performance in multiple ways. CASE expressions found in SELECT list are CPU-intensive operations. CASE expressions in WHERE clause (filter and join predicates) may result in incorrect join cardinality estimate and miscalculating the costs. As a result, sub-optimal join method can be selected causing potentially long run time of the query, increasing probability of **ORA-01555** (snapshot too old) error and significant TEMP tablespace usage by the SQL. Carefully inspect your SQL for any large CASE clauses and explore the options to simplify the logic. Refer to the following sub-optimal and rewritten CASE structures:

-- Sub-optimal structure:

```
(CASE WHEN .. THEN
(CASE WHEN .. THEN
(CASE WHEN .. THEN
(...)
END)
END)
ELSE ... END)
```

-- Rewritten optimal structure:

```
(CASE WHEN ... THEN WHEN ... THEN
```



```
ELSE ... END)
```

Long in IN-LISTs in SQL Clauses

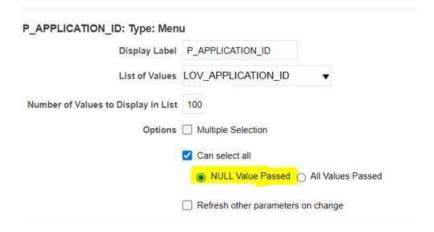
The option to pass more than one value to SQL through bind parameters makes reports very flexible and versatile. However, if the number of passed values is not limited, it could generate a SQL with very large number of IN-LIST values, possibly hitting the internal Oracle limit of maximum 1,000 IN-LIST values (and get ORA-01795 maximum number of expressions in a list is 1000).

The Oracle optimizer converts IN-list expressions into Boolean OR-expressions. For instance, the following expression: COL_A IN (1, 2, 3) is converted into COL_A = 1 OR COL_A = 2 OR COL_A = 3. Depending on how statistics are collected on a table and its columns, the optimizer may produce incorrect cardinality estimate for that IN-list expression. The more literals are in the IN-LIST, the larger the deviation from the actual cardinality. The incorrect cardinality may cause the optimizer to select less join method. Refer to the following example of long IN-LIST in CASE clause:

```
CASE WHEN d1.c40 NOT IN (
    'CALL',
    'CALL IB',
    'DEMAND GENERATION',
    'DEMO',
    'DEMO IN PERSON',
    'DISCOVERY',
    'DISCOVERY PERSON',
    'EMAIL',
    'EMAIL ELOQUA ENGAGE',
    'EMAIL ELOQUA ENGCAMPAIGN',
    'EMAIL IB',
    'EMAIL OUTLOOK',
    'INPERSON INTRO MEETING',
    'INPERSON MEETING',
    'INTRO MEETING',
    'MANUAL CALL',
    'MEETING',
    'RESEARCH',
    'SALES CHAT'
    'SOCIAL MEDIA',
    'TODO',
    'WORKSHOPS'
    ) THEN ...
```

Carefully design the parameters and lists of values that get passed to reports to avoid generating long IN-LISTs in the SQL queries. Do not create long checklists and an option to check all, as that would lead to generate such IN-clauses and affect performance. To avoid passing 'all' and causing the performance with long IN-LISTs, select 'NULL Value Passed' when you define the parameters for your data model. Then NULL is passed to the bind variable instead of the long IN-LIST:





Scalar Sub-Queries with DISTINCT Modifier or ROWNUM Keyword

Scalar sub-query is a SQL query block that is used as a column in a SELECT clause. It is called scalar because it must produce exactly one value (a scalar) to use in the main SELECT. If a sub-query is written in such a way that it returns more than one row, ORA-01427 exception is raised.

A typical usage pattern of scalar sub-queries is to deliver a single column value by joining a table inside the sub-query to an external table using a unique (primary key) column. That guarantees a single scalar value to be returned by such a sub-query.

If a scalar sub-query produces more than one row, either DISTINCT or ROWNUM may get (wrongly) used as workarounds to enforce a single scalar value. Both workarounds could result in incorrect functionality as well as cause performance overhead, as they get applied as the last step to potentially a very large result set produced by the sub-query.

```
SELECT
  mpm.level_member_id,
  archive.archive_id,
  mat.category_name,
    (
    SELECT DISTINCT category_name
    FROM msc_catalog_categories mcc1
    WHERE mcc1.category_id = mat.parent_category_id
    AND mcc1.parent_category_id IS NOT NULL
  ) cgt_category_name,
```

Note:

When you design your SQLs with correlated sub-queries in SELECT, ensure that they use index access path, as they get executed once for every single row. If a sub-query employs a full table scan due to the lack of indexes in join predicate, you end up with as many full table scans as the number of fetched rows in the main sub-queries. In that case, you should rewrite it to use the join logic in WHERE clause instead of SELECT.



Custom PL/SQL Calls in SELECT Clause

Use of PL/SQL functions in SELECT clauses could lead to slower SQL performance. The optimizer has no methods to merge the code from PL/SQL functions into the main SQL query, so the functions are called as many times as the number of rows fetched by the main query. The PL/SQL complexity multiplied by a number of its executions could become a major performance factor, often overlooked in SQL optimization.

Refer to the following example, showing the use of such function call, with another SELECT wrapped inside, with both the function and the SELECT invoked once for every fetched row from the main SELECT:

```
SELECT ...

ff_user_tables_pkg.get_table_value(
    (SELECT l_data_grp.legislative_data_group_id
        FROM    per_legislative_data_groups_vl l_data_grp
        WHERE l_data_grp.name = 'US'),
    'RETIREMENT_ELIGIBILITY',
    'AGE',
    to_char((months_between(sysdate, pp.date_of_birth) / 12)),
    trunc(sysdate)
    ) l_data_grp_pkg_call,
    ....
```

Ensure you review the use of such PL/SQL functions, and if their use is required by the functional logic, apply effective filters to reduce the number of fetched rows and the result number of PL/SQL executions for the SQL.

