Oracle® SQLcl

User's Guide

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Oracle SQLcl User's Guide, Release 23.1

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A SQL Performance Troubleshooting

Preface

This guide provides usage information about Oracle SQLcl (SQL Developer Command Line), a Java-based command-line interface for Oracle Database.

Audience

This guide is intended for those using Oracle SQLcl.

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++++++++++++++++++++++++ 4th party dependencies ++++++++++++++++++++++++++++++

com.google.code.findbugs:jsr305:3.0.2

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checker-qual, v2.11.1, MIT

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Apache Mina SSHD 2.9.2

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Apache MINA SSHD

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bouncycastle v1.60 (optional)

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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 Databind

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1

Changes in Release 23.1 for *Oracle SQLcl User's Guide*

This section lists the changes for this release.

New Features

New features in this release are:

- Enhancements to the CONNECT command to include Kerberos, OCI, RADIUS, REST and other connection types.

  See Connecting to a Database

2
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.

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> **Note:**
>
> - To run SQLcl , you need to install Oracle Java 11 or later versions. If the Java version is less than 11, then the SQLcl 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:`. Check the Java version using the`java -version` command.
> - 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`
>   - For SQLcl installed with Oracle Database: `%JAVA_HOME%\bin;%PATH%;..\jdk\jre\bin;%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.
> - JavaScript is not included with Oracle Java 14 and later versions. It is recommended to download and install GraalVM, and then install JavaScript on GraalVM by using the command `gu install js` (see Getting Started with GraalVM JavaScript).

This chapter contains the following topics:

- 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 ...]]

COMP[UTE] [function [LAB[EL] text] ... OF {expr | column | alias} ...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]

SAV[E] [FILE] file_name[.ext] [CRE[ATE] | REP[LACE] | 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] | CONTINUE[COMMIT | ROLLBACK | NONE]}

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

WHICH <filename>

XQUERY xquery_statement
```

> **Note:**
>
> 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.
action {default|prompt}	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	
comment {comment}	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

> **Note:**
>
> **Startup and Login Scripts**
>
> When you start SQLcl, it looks for a `startup.sql` script. This script is run only once during the program's runtime.
>
> For every connection, SQLcl looks for a `login.sql` file. This file is run for every connection created.
>
> The `Show Login` command displays the location of the `login.sql` file and verifies whether the file exists or not.

Logging In and Logging Out

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

```
SQL [[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 | 2 | 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.

```
{QUIT | EXIT} [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.

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\sqlcl\20.2\sqlcl\bin>SET JAVA_TOOL_OPTIONS=-
Duser.language=fr -Xmx800m
c:\SQLDev\sqlcl\20.2\sqlcl\bin>sql hr/oracle
Picked up JAVA_TOOL_OPTIONS: -Duser.language=fr -Xmx800m
SQLcl : version 20.2 Production sur mar. ao√t 25 15:57:21 2020
Copyright (c) 1982, 2020, Oracle. Tous droits rΘservΘs....
```

2.4 Connecting to a Database

You can connect to a database using the `CONNECT` command.

Syntax

```
conn[ect] {OPTIONS} {PARAMETERS}
```

The options specified automatically determine the kind of connection required, such as whether it is a traditional client-server connection or a wallet-based cloud connection. You can override this by using options that specify a particular connection type. For example, specify `-wallet` to use the wallet connection type.

The connection types supported in SQLcl are:

- KERBEROS
- OCI
- ORACLE
- OREST
- RADIUS
- SOCKS
- THIRD
- WALLET

To see the help description for CONNECT, enter:

```
help connect
```

To see examples for CONNECT in help, enter:

```
help connect examples
```

To see help for WALLET connection type, enter:

```
help connect wallet
```

To see examples for OREST, enter:

```
help connect orest examples
```

Options

Option	Description
-cloudconfig, cc	Specifies the wallet to use to establish the connection.
-edition, ed	Specifies the Oracle database edition. This is an alternative to providing it in the connection spec parameter.
-kerberos, ker	Specifies a Kerberos connection type.
-krb5_config, krb5c	Specifies a non-default Kerberos configuration file. This property is specified only when SQLcl is started.
-krb5ccname, krb5cc	Specifies a non-default Kerberos credential file.
-oci	Specifies an OCI connection type.
-oracle, o	Specifies an Oracle connection type.
-orest, or	Specifies a REST connection type.
-password, pw	Specifies the password. This is an alternative to providing it in the connection spec parameter.
-proxy, p	Specifies the network proxy to use.
-radius, rad	Specifies a RADIUS connection type.
-rest, rt	Specifies that the connection should be established using REST.

Option	Description
-role, r	Specifies the database role. This is an alternative to providing it in the connection spec parameter.
-socks|s	Specifies a SOCKS proxy connection type.
-socksproxy|sp	Specifies the SOCKS proxy.
-third, t	Specifies a third-party database connection type.
-url	Specifies the URL. This is an alternative to providing it in the connection spec parameter.
-user, u	Specifies the user name. This is an alternative to providing it in the connection spec parameter.
-wallet, w	Specifies a wallet connection type.
-verbose, v	Requests output of diagnostic information about the connection.

Parameters

Parameter	Description
<connectionspec>	Provides the connection specification for the target database.

Examples

To connect to an Oracle database:

```
SQL> CONNECT user/password@url
```

To connect to an Oracle database using the `SYSDBA` role:

```
SQL> CONNECT user/password@url as sysdba
```

2.4.1 KERBEROS Connection Type

Connect to a database using Kerberos authentication. The connection spec parameter has the following form:

```
[/][@<url>]
```

> **Note:**
>
> Currently, only Kerberos connections using [/][@<url>] are supported in SQLcl. Active Directory is not supported in this release.

See Enabling Kerberos Authentication in *Oracle Database Security Guide* for more information about Kerberos authentication in Oracle Database.

Options

Option	Description
-kerberos, ker	Specifies a KERBEROS connection type.
-krb5_config, krb5c	Specifies a non-default Kerberos configuration file. This property is specified only when SQLcl is started. These can be passed in by using the relevant -D system property name or environmental variables.
-krb5ccname, krb5cc	Specifies a non-default Kerberos credential file.
-url	Specifies the URL. This is an alternative to providing it in the connection spec parameter.
-role, r	Specifies the database role. This is an alternative to providing it in the connection spec parameter.
-edition, ed	Specifies the Oracle database edition. This is an alternative to providing it in the connection spec parameter.
-verbose, v	Requests output of diagnostic information about the connection.

Parameters

Parameter	Description
<*connectionspec*>	Provides the connection specification for the target database.

Example

To connect to a database using KERBEROS:

```
SQL> CONNECT -kerberos /@myhost:1521/myservice
```

See Also:

Support for Kerberos for troubleshooting information

2.4.2 OCI Connection Type

Connect to a database using OCI. Before connecting to OCI, it is necessary to specify the profile to use. For example, `OCI PROFILE frankfurt`.

The connection spec parameter has the following form:

```
ocid1.databasetoolsconnection.<id>.
```

Options

Option	Description
-oci	Specifies an OCI connection type.
-rest, rt	Specifies that the connection should be established using REST.

Option	Description
-proxy, p	Specifies the network proxy to use.
-verbose, v	Requests output of diagnostic information about the connection.

Parameters

Parameter	Description
<connectionspec>	Provides the connection specification for the target database.

Example

To connect using an OCID:

```
SQL> CONNECT ocid1.databasetoolsconnection.oc1.xxxyyyyzz.aabbccd
```

2.4.3 Oracle Connection Type

Connect to a database using Oracle Relational Database Management System.

The connection spec parameter has the following form:

```
<username>[/<password>][@<url>][as <role>][edition= <edition>]
```

where

- <username> may be <proxyuser>[<username>] if a proxy user is required. Note that the brackets around user name are required syntax.
- The <url> can take either of the following forms:

  ```
  //<host>:<port>/<service>
  <host>:<port>/<service>
  ```

  or it may be a TNS name or an LDAP specification.

Options

Option	Description
-oracle, o	Specifies an Oracle connection type.
-user, u	Specifies the user name. This is an alternative to providing it in the connection spec parameter.
-password, pw	Specifies the password. This is an alternative to providing it in the connection spec parameter.
-url	Specifies the URL. This is an alternative to providing it in the connection spec parameter.

Option	Description
-role, r	Specifies the database role. This is an alternative to providing it in the connection spec parameter.
-edition, ed	Specifies the Oracle database edition. This is an alternative to providing it in the connection spec parameter.
-verbose, v	Requests output of diagnostic information about the connection.

Parameters

Parameter	Description
<*connectionspec*>	Provides the connection specification for the target database.

Example

To connect using EZCONNECT:

```
SQL> CONNECT myuser/passwd@myhost:1521/myservice
```

2.4.4 OREST Connection Type

Connect to a database using REST. The connection spec parameter has the form:

```
<username>[/<password>][@<url>][as <role>][edition= <edition>]
```

The <url> can take the form:

```
http://<host>:<port>/ords/<schema>
```

Options

Option	Description
-orest, or	Specifies a connection type that uses REST.
-user, u	Specifies the user name. This is an alternative to providing it in the connection spec parameter.
-password, pw	Specifies the password. This is an alternative to providing it in the connection spec parameter.
-url	Specifies the URL. This is an alternative to providing it in the connection spec parameter.
-role, r	Specifies the database role. This is an alternative to providing it in the connection spec parameter.
-edition, ed	Specifies the Oracle database edition. This is an alternative to providing it in the connection spec parameter.

Option	Description
-verbose, v	Requests output of diagnostic information about the connection.

Parameters

Parameter	Description
<connectionspec>	Provides the connection specification for the target database.

Example

To connect using REST:

```
SQL> CONNECT myuser/passwd@http://myhost:9213/ords/myschema
```

2.4.5 RADIUS Connection Type

Connect to a database using RADIUS authentication. The connection spec parameter has the form:

```
[<username>][/<password>][@<url>]
```

RADIUS can also be configured to authenticate using *<number>* from two-factor authenication:

```
[<username>]/[<password>][<number from device or command>][<@url>]
```

> **Note:**
>
> Challenge response two-factor authentication for RADIUS is not supported in this release.

See Configuring RADIUS Authentication in *Oracle Database Security Guide* for more information about RADIUS authentication.

Options

Option	Description
-radius, rad	Specifies a RADIUS connection type.
-user, u	Specifies the user name. This is an alternative to providing it in the connection spec parameter.
-password, pw	Specifies the password. This is an alternative to providing it in the connection spec parameter.

Option	Description
-url	Specifies the URL. This is an alternative to providing it in the connection spec parameter.
-role, r	Specifies the database role. This is an alternative to providing it in the connection spec parameter.
-edition, ed	Specifies the Oracle database edition. This is an alternative to providing it in the connection spec parameter.
-verbose, v	Requests output of diagnostic information about the connection.

Parameters

Parameter	Description
<connectionspec>	Provides the connection specification for the target database.

Example

To connect using RADIUS:

```
SQL> CONNECT -radius myuser/passwd@myhost:1521/myservice
```

See Also:

- Support for RADIUS for troubleshooting information

2.4.6 SOCKS Connection Type

Connect to a database using a SOCKS proxy. Before connecting, set up the proxy process on the local machine by using the `ssh` command. For example:

```
ssh -N -D 127.0.0.1:1087
opc@123.456.789.120.
```

The connection spec parameter has the form:

```
[<username>][/<password>][@<url>]
```

Options

Option	Description
-socks|s	Specifies a SOCKS connection type.
-socksproxy|sp	Specifies the socks proxy.
-cloudconfig, cc	Specifies the wallet to establish the connection.
-proxy, p	Specifies the network proxy to use.

Option	Description
-user, u	Specifies the user name. This is an alternative to providing it in the connection spec parameter.
-password, pw	Specifies the password. This is an alternative to providing it in the connection spec parameter.
-url	Specifies the URL. This is an alternative to providing it in the connection spec parameter.
-role, r	Specifies the database role. This is an alternative to providing it in the connection spec parameter.
-edition, ed	Specifies the Oracle database edition. This is an alternative to providing it in the connection spec parameter.
-verbose, v	Requests output of diagnostic information about the connection.

Parameters

Parameter	Description
<connectionspec>	Provides the connection specification for the target database.

Example

To set the SOCKS and wallet properties and then connect:

```
SQL> SET socksproxy socks5h://localhost:1080
 SQL> SET cloudconfig mywallet.zip
 SQL> CONNECT myuser/passwd@mycloudtns
```

Alternatively, do it using one command:

```
SQL> CONNECT -socksproxy socks5h://localhost:1080 -cloudconfig
mywallet.zip
  myuser/passwd@mycloudtns
```

2.4.7 THIRD Connection Type

Connect to a third-party database. You need to add the appropriate driver jar to `<sqlcl-root>/lib/drivers/`. For example, for MYSQL you can download `mysql-connector-java-8.0.30.jar`.

The connection spec parameter is specific to the database but generally takes the form:

```
<username>[/<password>]@jdbc:<dbtype>://<host>:<port>
```

Options

Option	Description
-third, t	Specifies a THIRD connection type.
-user, u	Specifies the user name. This is an alternative to providing it in the connection spec parameter.
-password, pw	Specifies the password. This is an alternative to providing it in the connection spec parameter.
-url	Specifies the URL. This is an alternative to providing it in the connection spec parameter.
-role, r	Specifies the database role. This is an alternative to providing it in the connection spec parameter.
-edition, ed	Specifies the Oracle database edition. This is an alternative to providing it in the connection spec parameter.
-verbose, v	Requests output of diagnostic information about the connection.

Parameters

Parameter	Description
<connectionspec>	Provides the connection specification for the target database.

Example

To connect to MySQL:

```
SQL> CONNECT myuser/passwd@jdbc:mysql://myhost:9906
```

2.4.8 WALLET Connection Type

Connect to a database using a wallet. The connection spec parameter has the form:

```
[<username>][/<password>][@<url>]
```

Options

Option	Description
-wallet, w	Specifies a WALLET connection type.
-cloudconfig, cc	Specifies the wallet to establish the connection.
-proxy, p	Specifies the network proxy to use.
-user, u	Specifies the user name. This is an alternative to providing it in the connection spec parameter.
-password, pw	Specifies the password. This is an alternative to providing it in the connection spec parameter.
-url	Specifies the URL. This is an alternative to providing it in the connection spec parameter.

Option	Description
-role, r	Specifies the database role. This is an alternative to providing it in the connection spec parameter.
-edition, ed	Specifies the Oracle database edition. This is an alternative to providing it in the connection spec parameter.
-verbose, v	Requests output of diagnostic information about the connection.

Parameters

Parameter	Description
<*connectionspec*>	Provides the connection specification for the target database.

Example

To set the wallet property and then connect:

```
SQL> SET cloudconfig mywallet.zip
SQL> CONNECT myuser/passwd@mycloudtns
```

Alternatively, do it using one command:

```
SQL> CONNECT -cloudconfig mywallet.zip myuser/passwd@mycloudtns
```

2.5 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]

Starts an Oracle Database instance with several options, including mounting and opening a database.

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

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

2.6 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.

> **Note:**
>
> 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.

2.7 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 *sepchar*. You can omit the space between CHANGE and the first *sepchar*.

```
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). SQLcl 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] | CONTINUE [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.

2.8 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]
```

> **Note:**
>
> Currently only `NEW_V[ALUE]` variable syntax is supported.

Enter `COLUMN [{column |expr} FORMAT format]` where the *format* element specifies the display format for the column.

To change the display format of a NUMBER column, use `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.
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.
B	B9999	Displays blanks for the integer part of a fixed-point number when the integer part is zero, regardless of zeros in the format model.
C	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.
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.
U	U9999	Displays the dual currency symbol in the specified position.

```
COMP[UTE] [function [LAB[EL] text] ... OF {expr | column | alias} ...ON
{expr | column | alias | REPORT | ROW} ...]
```

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.

`SET SQLFORMAT JSON-FORMATTED` returns a query in well formatted JSON output.

```
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, *`.lst`* or *`.lis`*, is used.

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

2.9 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]
```

> **Note:**
>
> The brackets around *username* in *proxy* are required syntax.

Connects a given username to the Oracle Database. If you omit *connect_identifier*, SQLcl connects you to the default database. If you omit *username* and/or *password*, 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.

2.10 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;
```

> **Note:**
>
> 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.

> **Note:**
>
> 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*

2.10.1 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

2.10.2 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>*

2.10.3 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>`	Full path to the design's file name.
`-relmodel (rm) <name>`	Name of the relational model.
`-dbsite (ds) <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>`	Full path to the output file for the generated DDL content.
`-systemTypesDir (td) <path>`	Full path to the system types directory.
`-settingsFile (s) <file>`	Full path to the exported Data Modeler settings file.
`-ddlConfigFile (c) <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>`	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 of the generated HTML file.
`-outputpath (o) <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 of the relational model (for Tables and Table Views only).
`-title (tt) <name>`	(Optional) Title of the report.
`-standardTemplate (st) <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>`	(Optional) Name of the template for a custom report.
`-reportConfTemplate (c) <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>`	Full path to the system types directory.
`-settingsFile (s) <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"
```

2.10.4 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.

2.10.5 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 `aq 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;
```

2.10.5.1 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}]
```

Parameters

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

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.	NULL
-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.	ENQ_TIME
-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
-comment,-c	*<comment>* User-specified description of the queue table.	NULL
-primary_instance,-primary	*<primary_instance>* The primary owner of the queue table. Queue monitor scheduling and propagation for the queues in the queue table are done in this instance.	0
-secondary_instance,-secondary	*<secondary_instance>* The queue table fails over to the secondary instance if the primary instance is not available.	0
-secure,-sec	[TRUE|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.	False
-replication_mode,-repl	[0:NONE|1:REPLICATION_MODE]	0:NONE

2.10.5.2 Alter a Queue Table

Syntax

```
AQ ALTER QUEUE TABLE/ALTERQT -n[ame] table_name
  [-com[ment] string]
```

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

Parameters

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

2.10.5.3 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.	-
-force,-f	[TRUE|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.	False

2.10.5.4 Create a Queue

Syntax

```
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]
```

Parameters

Parameter	Description	Default
-name,-n	<*name*> Name of a queue to create.	-
-table_name,-tab	[schema].<*table_name*> Name of the queue table that will contain the queue.	-
-type,-t	[0:NORMAL QUEUE|1:EXCEPTION QUEUE] Specifies whether the queue being created is an exception queue or a normal queue.	0:NORMAL QUEUE
-max_retries,-max	*<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.	5
-retry_delay,-retry	*<retry_delay number>* Delay time, in seconds, before this message is scheduled for processing again after an application rollback.	0
-comment,-c	*<comment>* User-specified description of the queue table.	NULL
-retention_time,-rtime	*<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.	0

2.10.5.5 Alter a Queue

Syntax

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

Parameters

Parameter	Description	Default
`-name,-n`	*<name>* Name of a queue to alter.	-
`-max_retries,-max`	*<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.	NULL - current value will not be altered.
`-retry_delay,-retry`	*<retry_delay number>* Delay time, in seconds, before this message is scheduled for processing again after an application rollback.	NULL - current value will not be altered.
`-retention_time,-rtime`	*<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.	0
`-comment,-c`	*<comment>* User-specified description of the queue table.	NULL

2.10.5.6 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.	-

2.10.5.7 Create a Sharded Queue

Syntax

```
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]
```

Parameters

Parameter	Description	Default
`-name,-n`	<*name*> Name of a queue table to create.	-
`-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.	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
`-comment,-c`	<*comment*> User-specified description of the queue table.	NULL
`-payload_type,-pt`	`[OBJECT NAME|TYPE NAME|JSON|JMS]` Type of the user data stored.	JMS
`-retry_delay,-retry`	<*retry_delay number*> Delay time, in seconds, before this message is scheduled for processing again after an application rollback.	0
`-retention_time,-rtime`	<*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.	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.	PRIORITY,ENQ_TIME

Parameter	Description	Default
-cache_hint,-cache	[1:AUTO|2:CACHED|3:UNCACHED] 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.	1:AUTO
-retention_type,-rtype	[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.	0:DEQUEUE_TIME
-replication_mode,-repl	[0:NONE|1:REPLICATION_MODE]	0:NONE

2.10.5.8 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]
```

Parameters

Parameter	Description	Default
-name,-n	<*name*> Name of a queue to alter.	-
-max_retries,-max	<*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.	NULL - current value will not be altered.
-comment,-c	<*comment*> User-specified description of the queue table.	NULL
-retry_delay,-retry	<*retry_delay number*> Delay time, in seconds, before this message is scheduled for processing again after an application rollback.	0

Parameter	Description	Default
-retention_time,-rtime	*<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.	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.	PRIORITY,ENQ_TIME
-cache_hint,-cache	[1:AUTO|2:CACHED|3:UNCACHED] 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.	1:AUTO
-retention_type,-rtype	[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.	0:DEQUEUE_TIME
-replication_mode,-repl	[0:NONE|1:REPLICATION_MODE]	0:NONE

2.10.5.9 Drop a Sharded Queue

Syntax

```
AQ DROP SHARDED QUEUE/DROPSQ -n[ame] queue_name
  [-for[ce] {NO | YES}]
```

Parameters

Parameter	Description	Default
-name,-n	<*name*> Name of a queue table to drop.	-
-force,-f	[TRUE|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.	False

2.10.5.10 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 of a queue to create.	NULL
-sharded_queue_name,-sharded	[schema].<*name*> The name of the sharded queue.	FALSE

2.10.5.11 Create a Transactional Event Queue

> **Note:**
>
> 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]
```

Parameters

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

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.	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	*<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.	5
-comment,-c	*<comment>* User-specified description of the queue table.	NULL
-payload_type,-pt	[OBJECT NAME|TYPE NAME|JSON|JMS] Type of the user data stored.	JMS
-retry_delay,-retry	*<retry_delay number>* Delay time, in seconds, before this message is scheduled for processing again after an application rollback.	0
-retention_time,-rtime	*<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.	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.	PRIORITY,ENQ_TIME

Parameter	Description	Default
-cache_hint,-cache	[1:AUTO|2:CACHED|3:UNCACHED] 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.	1:AUTO
-retention_type,-rtype	[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.	0:DEQUEUE_TIME
-replication_mode,-repl	[0:NONE|1:REPLICATION_MODE]	0:NONE

2.10.5.12 Alter a Transactional Event Queue

> **Note:**
>
> 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]
```

Parameters

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

Parameter	Description	Default
`-max_retries,-max`	*<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.	NULL - current value will not be altered.
`-comment,-c`	*<comment>* User-specified description of the queue table.	NULL
`-retry_delay,-retry`	*<retry_delay number>* Delay time, in seconds, before this message is scheduled for processing again after an application rollback.	0
`-retention_time,-rtime`	*<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.	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.	PRIORITY,ENQ_TIME
`-cache_hint,-cache`	`[1:AUTO|2:CACHED|3:UNCACHED]` 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.	1:AUTO
`-retention_type,-rtype`	`[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.	0:DEQUEUE_TIME
`-replication_mode,-repl`	`[0:NONE|1:REPLICATION_MODE]`	0:NONE

2.10.5.13 Drop a Transactional Event Queue

> **Note:**
>
> 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.	-
`-force,-f`	`[TRUE|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.	FALSE

2.10.5.14 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 of a queue to create.	NULL
`-teq_queue_name,-teq`	`[schema].`<*name*> The name of the transactional event queue.	FALSE

2.10.5.15 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*>	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.	

2.10.5.16 Stop a Queue

Syntax

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

Parameters

Parameter	Description	Default
-name,-n	<*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.	

2.10.5.17 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}]
```

Parameters

Parameter	Description	Default
`-name,-n`	Name of a producer or consumer of a message.	-
`-queue_name,-queue`	<*name*> Name of a queue.	-
`-subscriber_address,-sa`	<*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> Protocol to interpret the address and propagate the message.	0
`-rule,-r`	<*rule*> 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.	NULL
`-transformation,-trans`	<*transformation*> Specifies a transformation that will be applied when this subscriber dequeues the message.	NULL
`-queue_to_queue,-q2q`	`[TRUE|FALSE]` TRUE: propagation is from queue-to-queue	FALSE

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

2.10.5.18 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]
```

Parameters

Parameter	Description	Default
-name,-n	Name of a producer or consumer of a message.	-
-queue_name,-queue	<*name*> Name of a queue.	-
-subscriber_address,-sa	<*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> Protocol to interpret the address and propagate the message.	0
-rule,-r	<*rule*> 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.	NULL
-transformation,-trans	<*transformation*> Specifies a transformation that will be applied when this subscriber dequeues the message.	NULL

2.10.5.19 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.	-
-subscriber_address,-sa	<*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> Protocol to interpret the address and propagate the message.	0

2.10.5.20 Enqueue

Syntax

```
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]
```

Parameters

Parameter	Description	Default
-name,-n	<*name*> Name of the queue to which this message should be enqueued.	-
-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*> User-specified description of the queue table.	NULL
-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)	-

2.10.5.21 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 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.	NULL
-mode,-m	[1:PERSISTENT|2:BUFFERED|3:PERSISTENT_OR_BUFFERED] Delivery mode of the messages the subscriber is interested in.	PERSISTENT
-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)	-
-out_priority,-out_pri	Priority of the message. A smaller 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,-out_eqt	The time the message was enqueued. 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)	-

2.10.6 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 | 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=<proxyhost>:<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 COLSEP {_ | text}
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] {& | c | ON | 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] {\ | c | ON | OFF}
SET ESCCHAR {@ | ? | % | $ | OFF}
SET EXITC[OMMIT] {ON | OFF}
SET FEED[BACK] {6 | n | ON | OFF} [SQL_ID]
SET FLU[SH] {ON | OFF}
SET HEA[DING] {ON | OFF}
SET HEADS[EP] {| | c | ON | OFF}
```

```
SET HISTORY [FAILS [LIMIT [ n | DEFAULT ] ] | NOFAILS |FILTER [DEFAULT
<command list>?|<command list>?] |LIMIT [n|DEFAULT]]
SET LDAPCON
SET LIN[ESIZE] {80 | 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 | n}
SET MAXROWS {n>1 | DEFAULT}
SET MAXSPOOLROWSTRUNCATE [ON | OFF | DEFAULT]
SET NET {ON | OFF | READONLY}
SET NEWP[AGE] {1 | n | NONE}
SET NOVERWRITE {ON | OFF | WARN}
SET NULL text
SET NUMF[ORMAT] format
SET NUM[WIDTH] {10 | n}
SET PAGES[IZE] {14 | n}
SET PARAMETERPOLICY {default | isolate}
SET PAU[SE] {ON | OFF | text}
SET RECSEPCHAR {_| c}
SET SERVEROUT[PUT] {ON | OFF} [SIZE {n | 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] {> | text}
SET SQLFORMAT {csv | html | xml | json | ansiconsole | insert | loader |
fixed | default}
SET SQLPLUSCOMPAT[IBILITY] {x.y[.z]}
SET SQLPRE[FIX] {# | c}
SET SQLP[ROMPT] {SQL> | text}
SET SUF[FIX] {SQL | 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 `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

2.10.7 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 *system_variable*. SHOW SGA can only be used by a DBA user. Use one of the following terms or clauses in place of *option*:

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
PNO
RECYC[LEBIN] [*original_name*]
REL[EASE]
REPF[OOTER]
REPH[EADER]
SGA
SPOO[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.

2.11 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.

2.11.1 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
```

```
row_terminator default
skip_rows 0
skip_after_names

--Number of rows processed: 30
--Number of rows in error:
0 - SUCCESS: Load processed without errors

--Check the number of rows in countries table
select count(*) from countries;

COUNT(*)
---------
30
```

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

csv
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
```

2.11.1.1 SET LOAD Command

`SET LOAD` enables you to set options for loading data when using the `LOAD` command.

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 `CLEAN_NAMES` and `MAP_COLUMN_NAMES` 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.

  > **Note:**
  >
  > 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.

`QUOTE`

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

`QUOTE128`

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.

  `ROUND|ROUNDED` uses a size a little larger than the largest size found during the scan.

  `MAX|MAXIMUM` 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}`

  `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.

2.11.1.2 SET LOADFORMAT Command

`SET LOADFORMAT` enables you to set format properties for loading data when using the `LOAD` command.

Syntax

```
SET LOADFORMAT [ default|csv|delimited|html|insert|json|json-formatted|
loader|t2|xml] [options...]
```

where

- `default`: Load format properties return to default values.
- `csv`: Comma-separated values.
- `delimited` : (csv synonym) Delimited format, comma separated values by default.
- `html` : Hypertext Markup Language. For the `UNLOAD` command only.
- `insert` : SQL insert statements. For the `UNLOAD` command only.
- `json` : JavaScript Object Notation. For the `UNLOAD` command only.
- `json-formatted` : Pretty-formatted JSON. For the `UNLOAD` command only.
- `loader` : Oracle SQL Loader format. For the `UNLOAD` command only.
- `t2` : T2 Metrics. For the `UNLOAD` command only.
- `xml` : Extensible Markup Language. For the `UNLOAD` command only.

options represent the following clauses:

- `COLUMN_NAMES|COLUMNNAMES|NAMES {ON|OFF}`: Header row with column names.
- `DELIMITER` {separator}: Delimiter separating fields in the record.
- `DOUBLE [OFF]` : (Import only) Embedded right enclosures are doubled. OFF indicates embedded right enclosures are not doubled and embedded right enclosures can lead to unexpected results.
- `ENCLOSURES {enclosures|OFF}` : Optional left and right enclosures.
  - OFF indicates no enclosures
  - If 1 character is specified, sets left and right enclosures to this value.
  - If 2 or more characters are specified, sets left to the first character, right to the second character and ignores the remaining characters.
  - To set multiple character enclosures, use Set ENCLOSURE_LEFT and ENCLOSURE_RIGHT.
- `ENCODING {encoding|OFF|""}`: Encoding of load file. OFF and "" reset to default encoding for environment.
- `LEFT|ENCLOSURE_LEFT|ENCLOSURELEFT {enclosure|OFF}`: Set a 1 or more character left enclosure. If no ENCLOSURE_RIGHT is specified, it is used for both left and right. OFF indicates no enclosures.

- `RIGHT|ENCLOSURE_RIGHT|ENCLOSURERIGHT {enclosure|OFF}`: Set a 1 or more character right enclosure. OFF indicates no right enclosure.
- `ROW_LIMIT|ROWLIMIT|LIMIT} {number_of_rows|OFF|""}`: Maximum number of rows to read, including the header. OFF and "" set to not limit.
- `SKIP|SKIP_ROWS|SKIPROWS {number_of_rows|OFF|""}`: Number of rows to skip.
- `[[SKIP_AFTER_NAMES|SKIPAFTERNAMES|AFTER]|[SKIP_BEFORE_NAMES|SKIPBEFORENAMES|BEFORE]]`: Skip the rows before or after the (header) Column Names row.
- `TERM|ROW_TERMINATOR {terminator|""|DEFAULT|CR|CRLF|LF}`: Character(s) indicating end of row. If the file contains standard line end characters, the line_end does not need to be specified.
  - "" or DEFAULT specifies the default (any standard terminator) for the `LOAD` command.
  - "" or DEFAULT specifies the environment default for the `UNLOAD` command.
  - CRLF specifies WINDOWS terminator, generally for the `UNLOAD` command.
  - LF specifies UNIX terminator, generally for the `UNLOAD` command.
  - CR specifies MAC terminator, generally for the `UNLOAD` command.

Examples

```
SQL> set loadformat delimited
7369,"SMITH","CLERK",7902,17-DEC-80,800,,20,5555555555554444

SQL> set loadformat delimited enclosures <> line_end {eol}
7369,<SMITH>,<CLERK>,7902,17-DEC-80,800,,20,5555555555554444{eol}

SQL> set loadformat default (restore default settings)
7369,"SMITH","CLERK",7902,17-DEC-80,800,,20,5555555555554444
```

2.12 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.

> **See Also:**
>
> 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:

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.

> **Note:**
>
> 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 lb 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 SQLcl 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.	rollback { -count }

New Command	Description	Deprecated SQcl Command
rollback-count-sql	Writes SQL to roll back the last <value> changesets to STDOUT.	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.	-
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.	-
update-count-sql	Writes SQL to apply the next <value> changesets to STDOUT.	-
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.	-

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 SQLcl Command
history	Lists all deployed changesets and their deploymentIds.	-
status	Outputs the count (or list, if --verbose) 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|lb 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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`--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

Example

Calculate a checksum for changeset:

```
SQL> lb calculate-checksum --changelog-file countries_table.xml --changeset-identifier
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 | -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.	-	--databaseChangelogTableName
`-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.		--liquibaseTablespaceName
`-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. 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

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|lb changelog-sync-sql|chss
```

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.	-	--databaseChangelogTableName
`-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.		--liquibaseTablespaceName
`-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

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|lb 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.	-	--databaseChangelogTableName
`-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.		--liquibaseTablespaceName
`-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. An example is disabling remote XML entity support.	-	--secureParsing

Example

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

```
cd <lb-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 -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|lb 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.	-	--databaseChangelogTableName
-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.		--liquibaseTablespaceName
`-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

Example

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

```
cd <lb-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.	-	--databaseChangelogTableName
`-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.		--liquibaseTablespaceName
`-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. An example is disabling remote XML entity support.	-	--secureParsing

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|lb data|da OPTIONS
```

Options

Option	Description	Default	Deprecated
`-database-changelog-table-name | -dactn`	Name of table to use for tracking change history.	-	--databaseChangelogTableName
`-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.		--liquibaseTablespaceName
`-log | -lo`	Enable logging. Standard logging is `INFO` level (no debug flag). Debug logging is `FINEST` level (both log and debug flag).	False	-
`-schemas | -sc`	Schemas to include in diff.	-	-
`-secure-parsing | -scp`	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	-	--secureParsing

3.4.8 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.	-	--databaseChangelogTableName
`-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.		--liquibaseTablespaceName
`-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

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

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.	-	--databaseChangelogTableName
`-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.		--liquibaseTablespaceName

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	-

Examples

```
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
```

Options

Option	Description	Default	Deprecated
Required			
`-changelog-file | -chf`	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.	-	--databaseChangelogTableName
`-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
`-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.	-	--liquibaseSchemaName
`-liquibase-tablespace-name | -lbtn`	Tablespace to use for Liquibase objects.		--liquibaseTablespaceName

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.	-	--referenceDefaultSchemaName
`-schemas | -sc`	Schemas to include in diff	-	-
`-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

Examples

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|lb future-rollback-count-sql|furcs OPTIONS
```

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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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

Example

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
```

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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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

Example

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
```

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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName

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	-
`-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

Example

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
```

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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseSchemaName
`-liquibase-tablespace-name | -lbtn`	Tablespace to use for Liquibase objects.		--liquibaseTablespaceName
`-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. 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

Examples

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> lb 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
```

Options

Option	Description	Default	Deprecated
Required			
`-changelog-file | -chf`	The root changelog file.	-	--changelogFile
Optional			
`-debug | -de`	Enable debug output.	False	-

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	-

Example

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 `UPDATE` commands.

Options

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 replaceIfExists 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	-

Example

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|lb 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|lb 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|lb 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.

Options

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	DATABASECHANGELOG	--databaseChangelogTableName
`-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 replaceIfExists 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	-

Examples

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> lb generate-schema -filter "IN ('DEPARTMENTS','EMPLOYEES')"
```

3.4.22 history

List all deployed changesets and their deployment ID.

Syntax

```
Liquibase|lb history|hi OPTIONS
```

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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`--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

Example

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|lb list-locks|lil OPTIONS
```

The `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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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. An example is disabling remote XML entity support.	-	--secureParsing

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.

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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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

3.4.25 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
```

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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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 `DATABASECHANGELOG` table.

Syntax

```
Liquibase|lb release-locks|rel OPTIONS
```

Options

Option	Description	Default	Deprecated
`-database-changelog-table-name | -dactn`	Name of table to use for tracking change history.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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. 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.

Options

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.	-	--changeExecListenerPropertiesFile
`-change-exec-listener-properties-file | -chelpf`	Path to a properties file for the ChangeExecListenerClass.	-	--changeExecListenerPropertiesFile
`-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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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

Example

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|lb rollback-count|rbc OPTIONS
```

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

Options

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.	-	--changeExecListenerPropertiesFile
`-change-exec-listener-properties-file | -chelpf`	Path to a properties file for the ChangeExecListenerClass.	-	--changeExecListenerPropertiesFile
`-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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName

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	-
`-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

Example

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.

Options

Option	Description	Default	Deprecated
Required			

Option	Description	Default	Deprecated
`-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.	-	--changeExecListenerPropertiesFile
`-change-exec-listener-properties-file | -chelpf`	Path to a properties file for the ChangeExecListenerClass.	-	--changeExecListenerPropertiesFile
`-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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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. An example is disabling remote XML entity support.	-	--secureParsing

Example

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|lb rollback-sql|rbs OPTIONS
```

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

Options

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.	-	--changeExecListenerPropertiesFile
`-change-exec-listener-properties-file | -chelpf`	Path to a properties file for the ChangeExecListenerClass.	-	--changeExecListenerPropertiesFile
`-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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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 | -scp`	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	-	--secureParsing

Example

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..

Options

Option	Description	Default	Deprecated
Required			
`-changelog-file | -chf`	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.	-	--changeExecListenerPropertiesFile
`-change-exec-listener-properties-file | -chelpf`	Path to a properties file for the ChangeExecListenerClass.	-	--changeExecListenerPropertiesFile
`-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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName

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	-
`-rollback-script | -ros`	Rollback script to execute.	-	-
`-secure-parsing | -scp`	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	-	--secureParsing

Example

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|lb 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.

Options

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.	-	--changeExecListenerPropertiesFile
`-change-exec-listener-properties-file | -chelpf`	Path to a properties file for the ChangeExecListenerClass.	-	--changeExecListenerPropertiesFile
`-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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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.	-	-

Option	Description	Default	Deprecated
`-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

Example

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
-- 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|lb 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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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. An example is disabling remote XML entity support.	-	--secureParsing
`-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

Options

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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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
`-reference-default-schema-name | -redsn`	The reference default schema name to use for the database connection.	-	--referenceDefaultSchemaName
`-schemas | -sc`	Schemas to include in diff.	-	-
`-secure-parsing | -scp`	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	-	--secureParsing
`-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-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|lb status|st OPTIONS
```

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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName

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	-
`-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
`-verbose | -ve`	Verbose flag	True	-

Example

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|lb 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.

Options

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.	-	--databaseChangelogTableName

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.	-	--liquibaseSchemaName
`-liquibase-tablespace-name | -lbtn`	Tablespace to use for Liquibase objects.	-	--liquibaseTablespaceName
`-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. An example is disabling remote XML entity support.	-	--secureParsing

Example

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
```

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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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. An example is disabling remote XML entity support.	-	--secureParsing

3.4.38 unexpected-changesets

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

Syntax

```
Liquibase|lb 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.

Options

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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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
`-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">

Options

Option	Description	Default	Deprecated
Required			
`-changelog-file | -chf`	The root changelog file.	-	--changelogFile
Optional			
`-change-exec-listener-class | -chelc`	Fully-qualified class that specifies a ChangeExecListener.	-	--changeExecListenerPropertiesFile
`-change-exec-listener-properties-file | -chelpf`	Path to a properties file for the ChangeExecListenerClass.	-	--changeExecListenerPropertiesFile
`-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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseSchemaName
`-liquibase-tablespace-name | -lbtn`	Tablespace to use for Liquibase objects.	-	--liquibaseTablespaceName
`-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|lb 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">

Options

Option	Description	Default	Deprecated
Required			

Option	Description	Default	Deprecated
`-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.	-	--changeExecListenerPropertiesFile
`-change-exec-listener-properties-file | -chelpf`	Path to a properties file for the ChangeExecListenerClass.	-	--changeExecListenerPropertiesFile
`-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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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

Example

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

```
SQL> cd <lb-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.

Options

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.	-	--changeExecListenerPropertiesFile
`-change-exec-listener-properties-file | -chelpf`	Path to a properties file for the ChangeExecListenerClass.	-	--changeExecListenerPropertiesFile
`-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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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
`-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

3.4.42 update-sql

Generate the SQL identified in the changelog for review before running the `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

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

Option	Description	Default	Deprecated
`-change-exec-listener-class | -chelc`	Fully-qualified class that specifies a ChangeExecListener.	-	--changeExecListenerPropertiesFile
`-change-exec-listener-properties-file | -chelpf`	Path to a properties file for the ChangeExecListenerClass.	-	--changeExecListenerPropertiesFile
`-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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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
`-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. An example is disabling remote XML entity support.	-	--secureParsing

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 changeset2; update changeset3
```

Options

Option	Description	Default	Deprecated
Required			
`-changelog-file | -chf`	The root changelog file.	-	--changelogFile
Optional			
`-change-exec-listener-class | -chelc`	Fully-qualified class that specifies a ChangeExecListener.	-	--changeExecListenerPropertiesFile
`-change-exec-listener-properties-file | -chelpf`	Path to a properties file for the ChangeExecListenerClass.	-	--changeExecListenerPropertiesFile
`-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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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
`-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

3.4.44 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.

Options

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.	-	--changeExecListenerPropertiesFile
`-change-exec-listener-properties-file | -chelpf`	Path to a properties file for the ChangeExecListenerClass.	-	--changeExecListenerPropertiesFile
`-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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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. An example is disabling remote XML entity support.	-	--secureParsing

Example

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

```
SQL> cd <lb-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

```
Liquibase|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.

Options

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.	-	--changeExecListenerPropertiesFile
`-change-exec-listener-properties-file | -chelpf`	Path to a properties file for the ChangeExecListenerClass.	-	--changeExecListenerPropertiesFile
`-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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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
`-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

Example

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

```
SQL> cd <lb-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

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.	-	--databaseChangelogTableName
`-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.	-	--liquibaseTablespaceName
`-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. An example is disabling remote XML entity support.	-	--secureParsing

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|lb 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

8 rows selected.
```

3. Generate a changelog for the `Fruits` table.

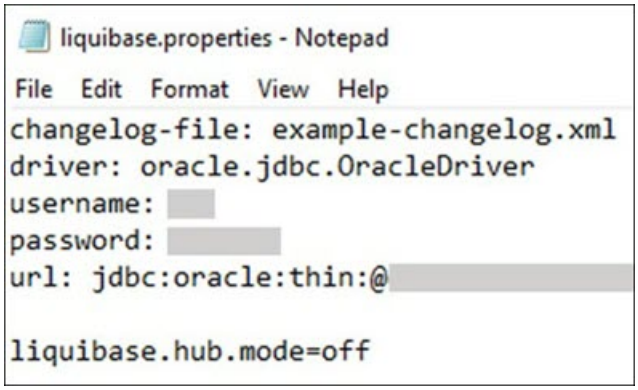
```
SQL> lb generate-object -object-type table -object-name fruits;

--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
```

```
C:\Users\      >liquibase --changelog-file=fruits_table.xml update
##################################################
##                                              ##
##  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

Unexpected 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.

For more information, please use the --log-level flag

C:\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.

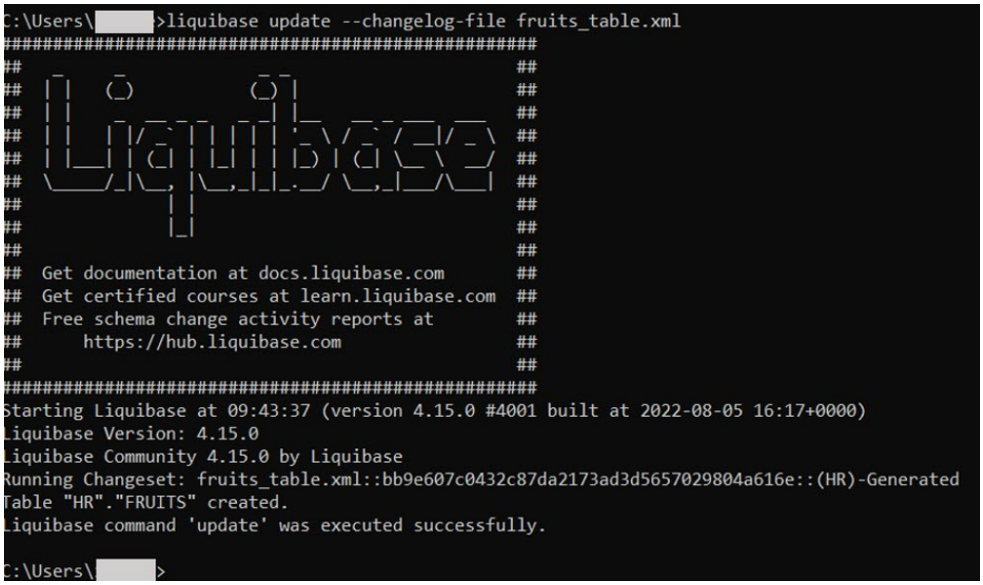
9. Copy five jar files from the `lib` and `lib/ext` folders in your SQLcl folder and add them to the `lib` folder of your vanilla Liquibase client (`liquibase/lib`):
   - `dbtools-liquibase.jar` (`sqlcl/lib/ext`)
   - `dbtools-apex.jar` (`sqlcl/lib/ext`)
   - `guava-with-lf.jar` (`sqlcl/lib`)
   - `xmlparserv2_sans_jaxp_services.jar` (`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.

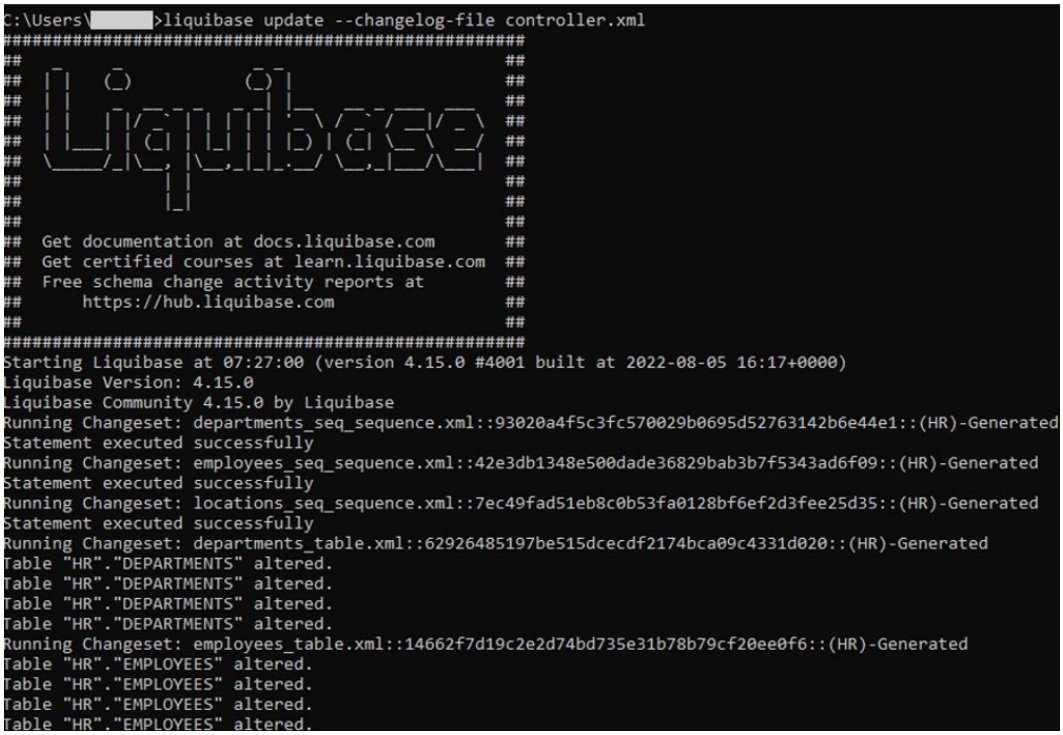
```
>liquibase update --changelog-file fruits_table.xml
```



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.



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, DBMS_METADATA, 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 DBMS_METADATA 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 generate-schema, 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 update 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 generate-schema and generate-object use the SXML data format from the DBMS_METADATA 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.

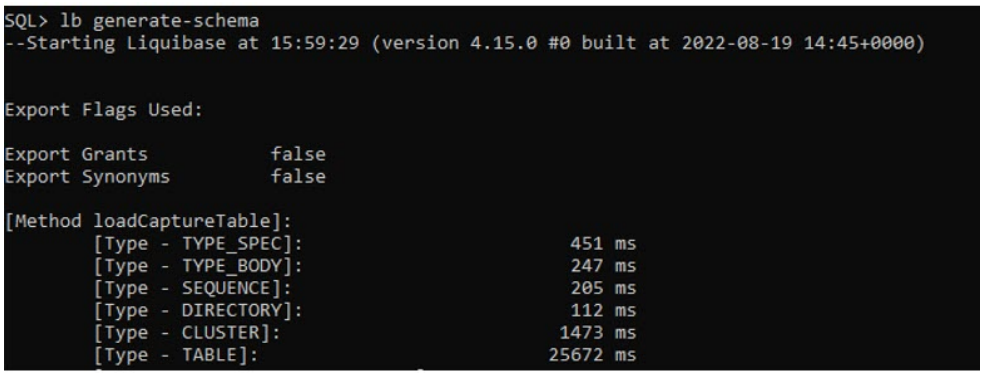
Example 1

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.

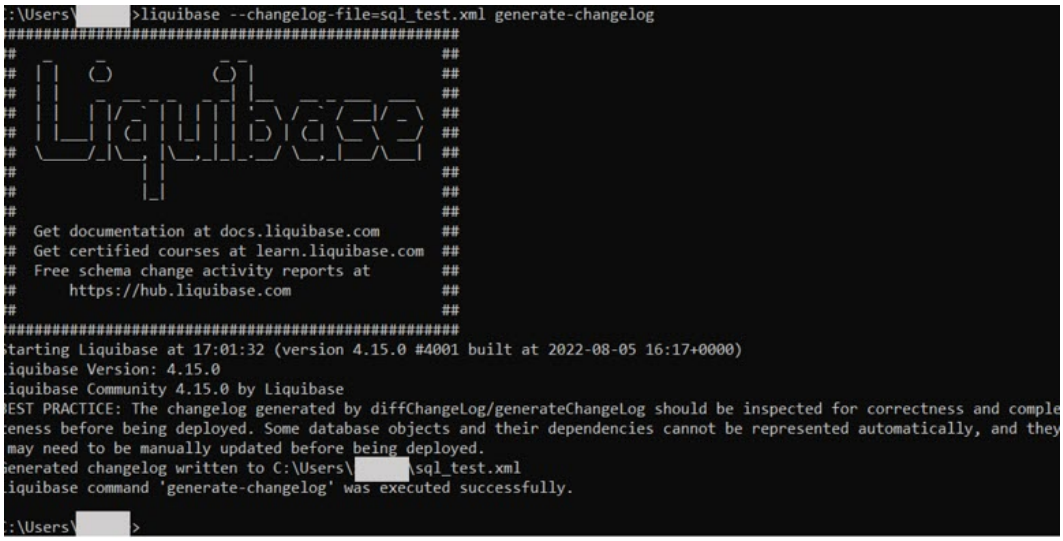
   ```
   SQL> lb generate-schema
   ```

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.

   > **Note:**
   >
   > You can download the open-source Liquibase client from the Liquibase website.

   ```
   >liquibase --changelog-file=sql_test.xml generate-changelog
   ```



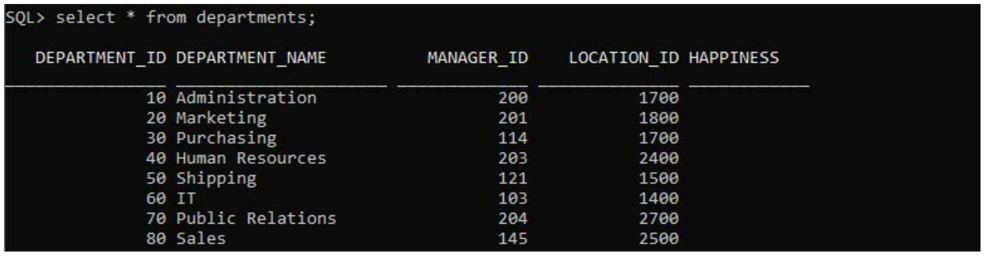
The database state is now captured in both SQLcl Liquibase and the open-source Liquibase client.

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;
```



```
SQL> select * from departments;

  DEPARTMENT_ID DEPARTMENT_NAME          MANAGER_ID   LOCATION_ID HAPPINESS
  ------------- ----------------------  -----------  ------------ ----------
             10 Administration                  200          1700
             20 Marketing                       201          1800
             30 Purchasing                      114          1700
             40 Human Resources                 203          2400
             50 Shipping                        121          1500
             60 IT                              103          1400
             70 Public Relations                204          2700
             80 Sales                           145          2500
```

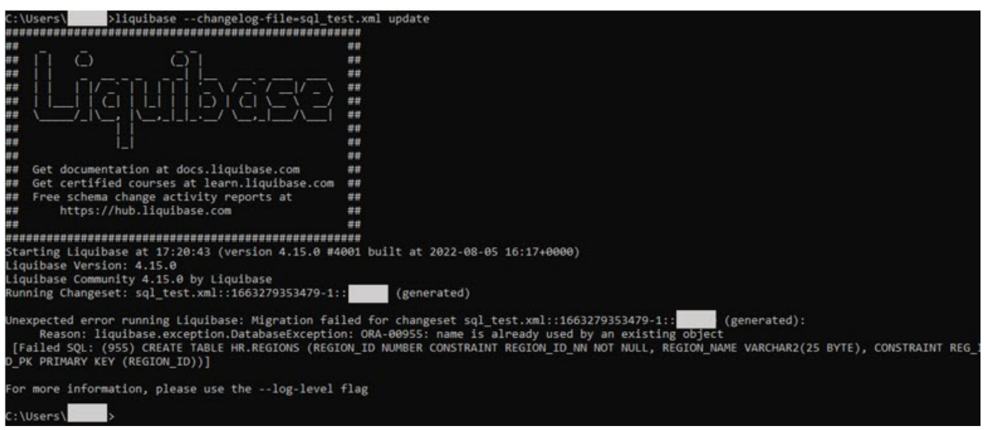
SQL> select * from employees;

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALARY	COMMISSION_PCT	MANAGER_ID	DEPARTMENT_ID	HEIGHT	MOOD
198	Donald	OConnell	DOCONNEL	650.507.9833	21-JUN-99	SH_CLERK	2600		124	50		
199	Douglas	Grant	DGRANT	650.507.9844	13-JAN-00	SH_CLERK	2600		124	50		
200	Jennifer	Whalen	JWHALEN	515.123.4444	17-SEP-87	AD_ASST	4400		101	10		
201	Michael	Hartstein	MHARTSTE	515.123.5555	17-FEB-96	MK_MAN	13000		100	20		
202	Pat	Fay	PFAY	603.123.6666	17-AUG-97	MK_REP	6000		201	20		
203	Susan	Mavris	SMAVRIS	515.123.7777	07-JUN-94	HR_REP	6500		101	40		
204	Hermann	Baer	HBAER	515.123.8888	07-JUN-94	PR_REP	10000		101	70		
205	Shelley	Higgins	SHIGGINS	515.123.8080	07-JUN-94	AC_MGR	12000		101	110		
206	William	Gietz	WGIETZ	515.123.8181	07-JUN-94	AC_ACCOUNT	8300		205	110		
100	Steven	King	SKING	515.123.4567	17-JUN-87	AD_PRES	24000			90		
101	Neena	Kochhar	NKOCHHAR	515.123.4568	21-SEP-89	AD_VP	17000		100	90		
102	Lex	De Haan	LDEHAAN	515.123.4569	13-JAN-93	AD_VP	17000		100	90		
103	Alexander	Hunold	AHUNOLD	590.423.4567	03-JAN-90	IT_PROG	9000		102	60		
104	Bruce	Ernst	BERNST	590.423.4568	21-MAY-91	IT_PROG	6000		103	60		

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
   ```

   ```
   C:\Users\[redacted]>liquibase --changelog-file=sql_test.xml update
   ##  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 17:20:43 (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
   Running Changeset: sql_test.xml::1663279353479-1::[redacted] (generated)

   Unexpected error running Liquibase: Migration failed for changeset sql_test.xml::1663279353479-1::[redacted] (generated):
        Reason: liquibase.exception.DatabaseException: ORA-00955: name is already used by an existing object
    [Failed SQL: (955) CREATE TABLE HR.REGIONS (REGION_ID NUMBER CONSTRAINT REGION_ID_NN NOT NULL, REGION_NAME VARCHAR2(25 BYTE), CONSTRAINT REG_I
   D_PK PRIMARY KEY (REGION_ID))]

   For more information, please use the --log-level flag

   C:\Users\[redacted]>
   ```

   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
   ```

```
SQL> lb update-sql -changelog-file controller.xml
--Starting Liquibase at 09:59:36 (version 4.15.0 #0 built at 2022-08-19 14:45+0000)

-- Loaded 37 change(s)
-- ******************************************************************
-- Update Database Script
-- ******************************************************************
-- Change Log: controller.xml
-- Ran at: 9/16/22, 9:59 AM
-- Against:
-- Liquibase version: 4.15.0
-- ******************************************************************
```

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.

```
SQL> select * from departments;

   DEPARTMENT_ID DEPARTMENT_NAME              MANAGER_ID    LOCATION_ID    HEAD_COUNT RETENTION
________________ ____________________________ _____________ ______________ ___________ _____________
              10 Administration               200                      1700
              20 Marketing                    201                      1800
              30 Purchasing                   114                      1700
              40 Human Resources              203                      2400
              50 Shipping                     121                      1500
              60 IT                           103                      1400
              70 Public Relations             204                      2700
              80 Sales                        145                      2500
              90 Executive                    100                      1700
             100 Finance                      108                      1700
             110 Accounting                   205                      1700
             120 Treasury                                              1700
             130 Corporate Tax                                         1700
             140 Control And Credit                                    1700
```

```
SQL> select * from employees;

   EMPLOYEE_ID FIRST_NAME           LAST_NAME                 EMAIL                PHONE_NUMBER         HIRE_DATE            JOB_ID               SALARY COMMISSION_PCT    MANAGER_ID    DEPARTMENT_ID AWARDS
______________ ___________________ _________________________ ____________________ ____________________ ____________________ ____________________ _____________ _____________ _____________ _____________ _____
           198 Donald              OConnell                  DOCONNEL             650.507.9833         21-JUN-99            SH_CLERK                2600                        124            50
           199 Douglas             Grant                     DGRANT               650.507.9844         13-JAN-00            SH_CLERK                2600                        124            50
           200 Jennifer            Whalen                    JWHALEN              515.123.4444         17-SEP-87            AD_ASST                 4400                        101            10
           201 Michael             Hartstein                 MHARTSTE             515.123.5555         17-FEB-96            MK_MAN                 13000                        100            20
           202 Pat                 Fay                       PFAY                 603.123.6666         17-AUG-97            MK_REP                  6000                        201            20
           203 Susan               Mavris                    SMAVRIS              515.123.7777         07-JUN-94            HR_REP                  6500                        101            40
           204 Hermann             Baer                      HBAER                515.123.8888         07-JUN-94            PR_REP                 10000                        101            70
           205 Shelley             Higgins                   SHIGGINS             515.123.8080         07-JUN-94            AC_MGR                 12000                        101           110
           206 William             Gietz                     WGIETZ               515.123.8181         07-JUN-94            AC_ACCOUNT              8300                        205           110
           100 Steven              King                      SKING                515.123.4567         17-JUN-87            AD_PRES                24000                                      90
           101 Neena               Kochhar                   NKOCHHAR             515.123.4568         21-SEP-89            AD_VP                  17000                        100            90
           102 Lex                 De Haan                   LDEHAAN              515.123.4569         13-JAN-93            AD_VP                  17000                        100            90
           103 Alexander           Hunold                    AHUNOLD              590.423.4567         03-JAN-90            IT_PROG                 9000                        102            60
           104 Bruce               Ernst                     BERNST               590.423.4568         21-MAY-91            IT_PROG                 6000                        103            60
```

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.

> **Note:**
>
> 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:

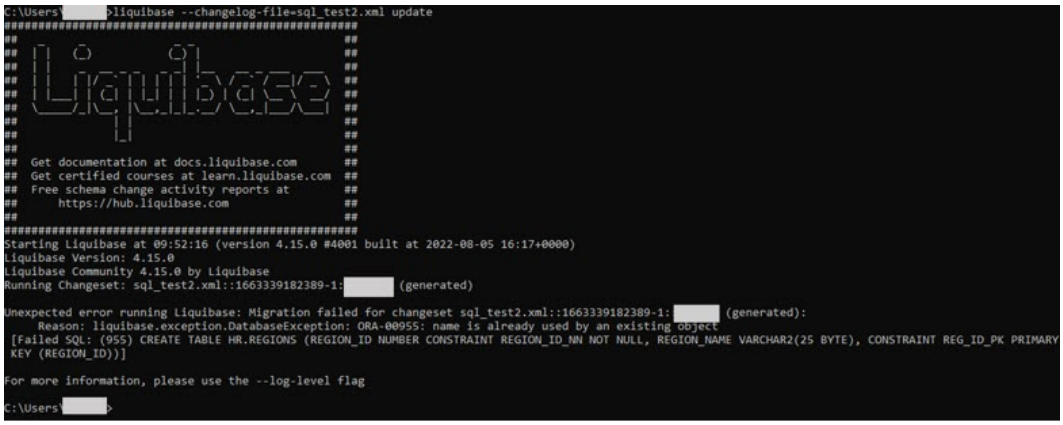
```
>liquibase --changelog-file=sql_test2.xml generate-changelog
```

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
```

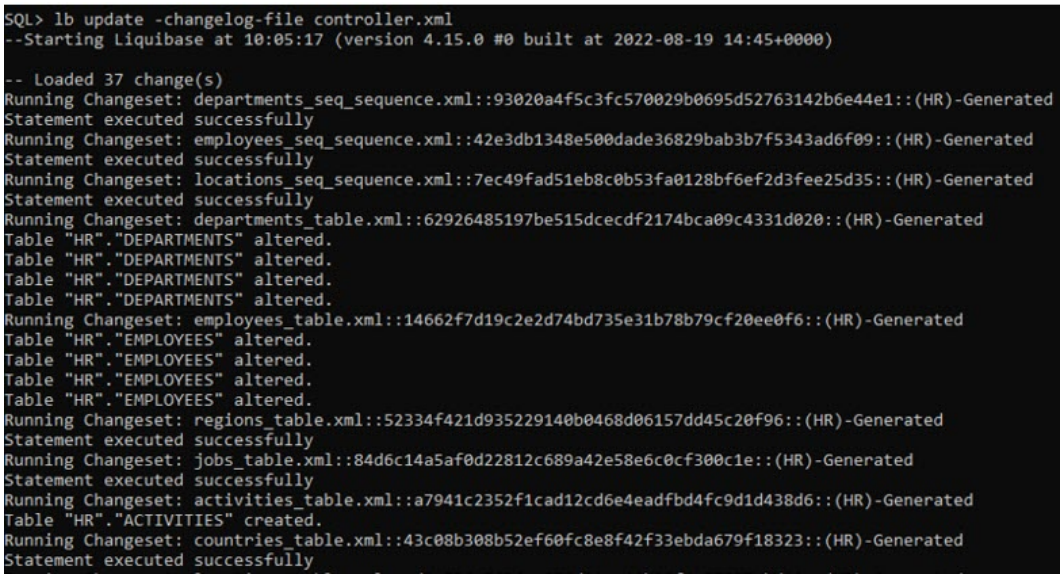
```
SQL> lb update-sql -changelog-file controller.xml
--Starting Liquibase at 09:59:36 (version 4.15.0 #0 built at 2022-08-19 14:45+0000)

-- Loaded 37 change(s)
-- ******************************************************************************
-- Update Database Script
-- ******************************************************************************
-- Change Log: controller.xml
-- Ran at: 9/16/22, 9:59 AM
-- Against:
-- Liquibase version: 4.15.0
-- ******************************************************************************
```

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.

```
-- Changeset departments_table.xml::62926485197be515dcecdf2174bca09c4331d020::(HR)-Generated
ALTER TABLE "HR"."DEPARTMENTS" ADD ("HEAD_COUNT" NUMBER)
/
  ALTER TABLE "HR"."DEPARTMENTS" ADD ("RETENTION" VARCHAR2(50))
/


-- Changeset employees_table.xml::14662f7d19c2e2d74bd735e31b78b79cf20ee0f6::(HR)-Generated
ALTER TABLE "HR"."EMPLOYEES" ADD ("AWARDS" NUMBER)
/



-- Changeset activities_table.xml::a7941c2352f1cad12cd6e4eadfbd4fc9d1d438d6::(HR)-Generated
CREATE TABLE "HR"."ACTIVITIES"
   (    "ID" NUMBER,
        "NAME" VARCHAR2(50),
        "COST" NUMBER,
        "LOCATION" VARCHAR2(50),
        "DIFFICULTY" VARCHAR2(50)
   ) SEGMENT CREATION DEFERRED
  PCTFREE 10 PCTUSED 40 INITRANS 1 NOCOMPRESS LOGGING
  TABLESPACE "USERS";
```

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

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




```
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
COUNTRIES

11 rows selected.
```

```
SQL> select * from employees;

EMPLOYEE_ID FIRST_NAME     LAST_NAME    EMAIL       PHONE_NUMBER      HIRE_DATE    JOB_ID          SALARY  COMMISSION_PCT  MANAGER_ID  DEPARTMENT_ID  AWARDS
----------- -------------- ------------ ----------- ----------------- ------------ ------------ ---------- --------------- ----------- -------------- --------
        198 Donald         OConnell     DOCONNEL    650.507.9833      21-JUN-99    SH_CLERK          2600                          124             50
        199 Douglas        Grant        DGRANT      650.507.9844      13-JAN-00    SH_CLERK          2600                          124             50
        200 Jennifer       Whalen       JWHALEN     515.123.4444      17-SEP-87    AD_ASST           4400                          101             10
        201 Michael        Hartstein    MHARTSTE    515.123.5555      17-FEB-96    MK_MAN           13000                          100             20
        202 Pat            Fay          PFAY        603.123.6666      17-AUG-97    MK_REP            6000                          201             20
        203 Susan          Mavris       SMAVRIS     515.123.7777      07-JUN-94    HR_REP            6500                          101             40
        204 Hermann        Baer         HBAER       515.123.8888      07-JUN-94    PR_REP           10000                          101             70
        205 Shelley        Higgins      SHIGGINS    515.123.8080      07-JUN-94    AC_MGR           12000                          101            110
        206 William        Gietz        WGIETZ      515.123.8181      07-JUN-94    AC_ACCOUNT        8300                          205            110
        100 Steven         King         SKING       515.123.4567      17-JUN-87    AD_PRES          24000                                          90
        101 Neena          Kochhar      NKOCHHAR    515.123.4568      21-SEP-89    AD_VP            17000                          100             90
        102 Lex            De Haan      LDEHAAN     515.123.4569      13-JAN-93    AD_VP            17000                          100             90
        103 Alexander      Hunold       AHUNOLD     590.423.4567      03-JAN-90    IT_PROG           9000                          102             60
        104 Bruce          Ernst        BERNST      590.423.4568      21-MAY-91    IT_PROG           6000                          103             60
```

```
SQL> select * from departments;

   DEPARTMENT_ID DEPARTMENT_NAME             MANAGER_ID    LOCATION_ID    HEAD_COUNT RETENTION
________________ ________________________ _____________ ______________ _____________ ____________
              10 Administration                     200           1700
              20 Marketing                          201           1800
              30 Purchasing                         114           1700
              40 Human Resources                    203           2400
              50 Shipping                           121           1500
              60 IT                                 103           1400
              70 Public Relations                   204           2700
              80 Sales                              145           2500
              90 Executive                          100           1700
             100 Finance                            108           1700
             110 Accounting                         205           1700
             120 Treasury                                         1700
             130 Corporate Tax                                    1700
             140 Control And Credit                               1700
```

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 `H2` database available in the open-source download of Liquibase and SQLcl Liquibase:

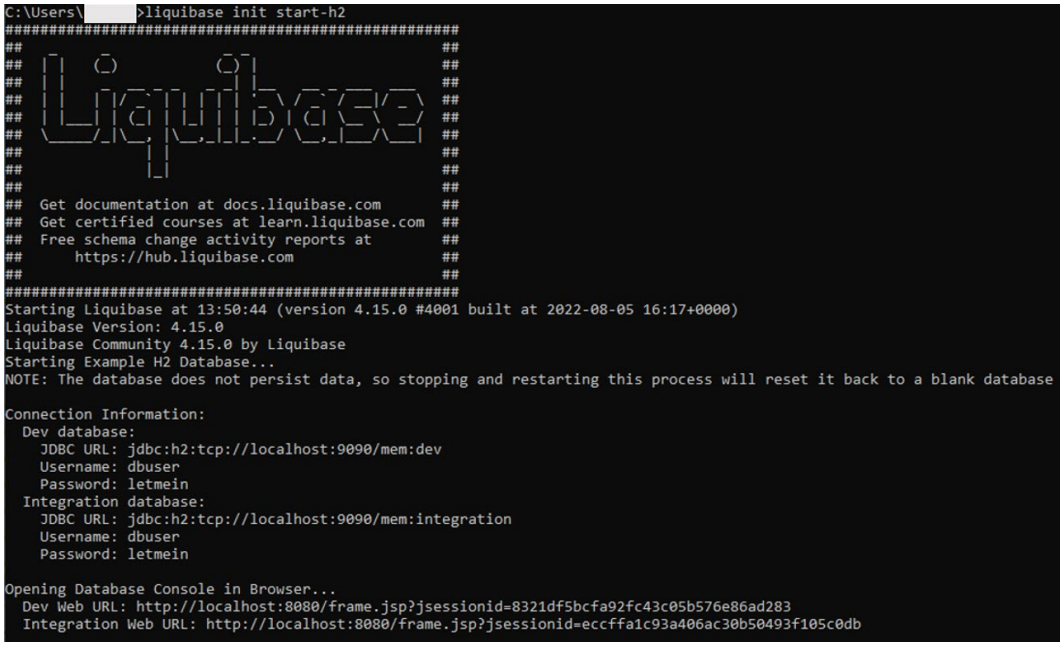
1. Download the open-source Liquibase client available on the Liquibase website. In your command-line interface, create a project folder and example `H2` database with the following command:

   ```
   >liquibase init project
   ```

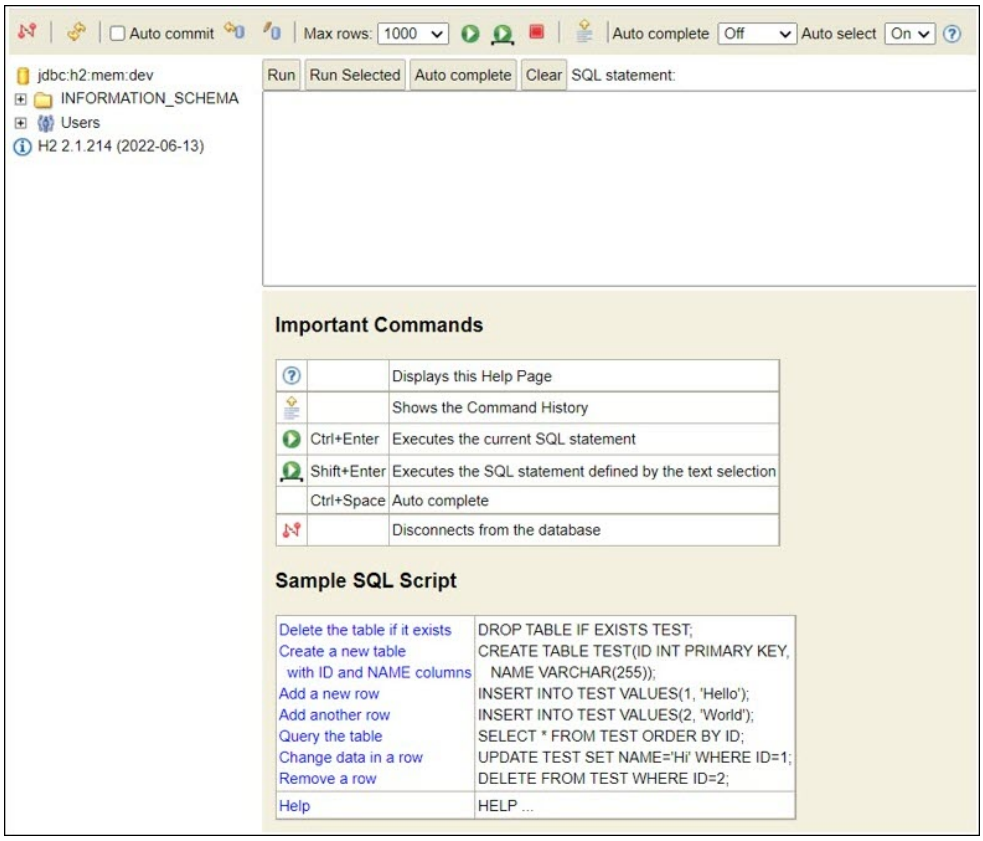
   ```
   C:\Users\[redacted]>liquibase init project
   ####################################################
   ##   _     _             _ _                      ##
   ##  | |   (_)           (_) |                     ##
   ##  | |    _  __ _ _   _ _| |__   __ _ ___  ___   ##
   ##  | |   | |/ _` | | | | | '_ \ / _` / __|/ _ \  ##
   ##  | |___| | (_| | |_| | | |_) | (_| \__ \  __/  ##
   ##  \_____/_|\__, |\__,_|_|_.__/ \__,_|___/\___|  ##
   ##              | |                               ##
   ##              |_|                               ##
   ##                                                ##
   ##  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 13:47:17 (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
   Setup new liquibase.properties and sample changelog? Enter (Y)es with defaults, yes with (C)ustomization, or (N)o. [Y]:
   y
   Setting up new Liquibase project in 'C:\Users\[redacted]\.'...
   To use the new project files make sure your database is active and accessible by opening a new terminal window to run "liquibase init start-h2",
   and then return to this terminal window to run "liquibase update" command.
   For more details, visit the Getting Started Guide at https://docs.liquibase.com/start/home.html
   Liquibase command 'init project' was executed successfully.

   C:\Users\[redacted]>
   ```

2. Start your `H2` database:

```
>liquibase init start-h2
```

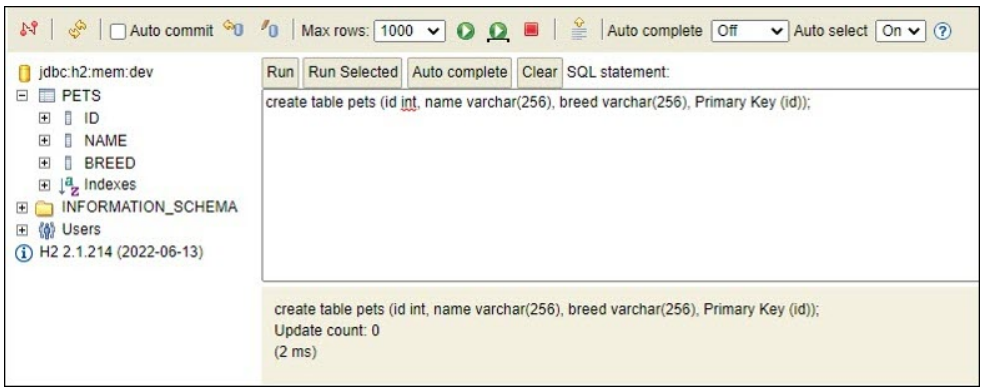


This also launches the database console of the empty `H2` database in your browser.



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));
```

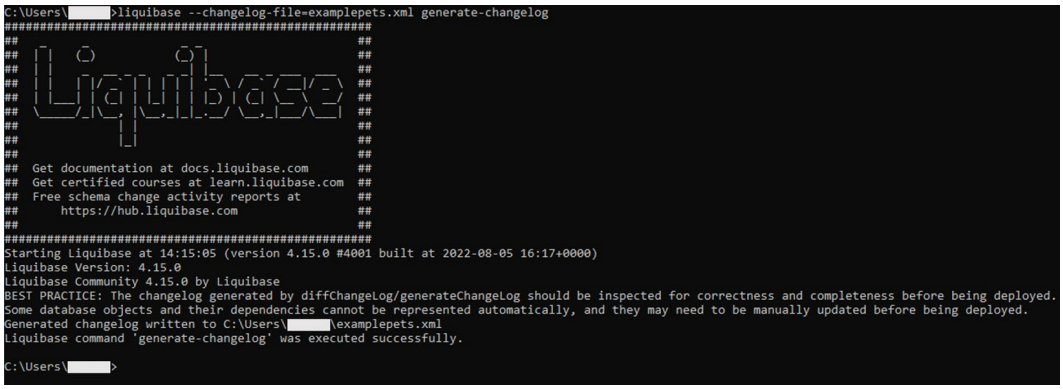


4. Capture this schema consisting of the `Pets` table with a Liquibase changelog.

   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.

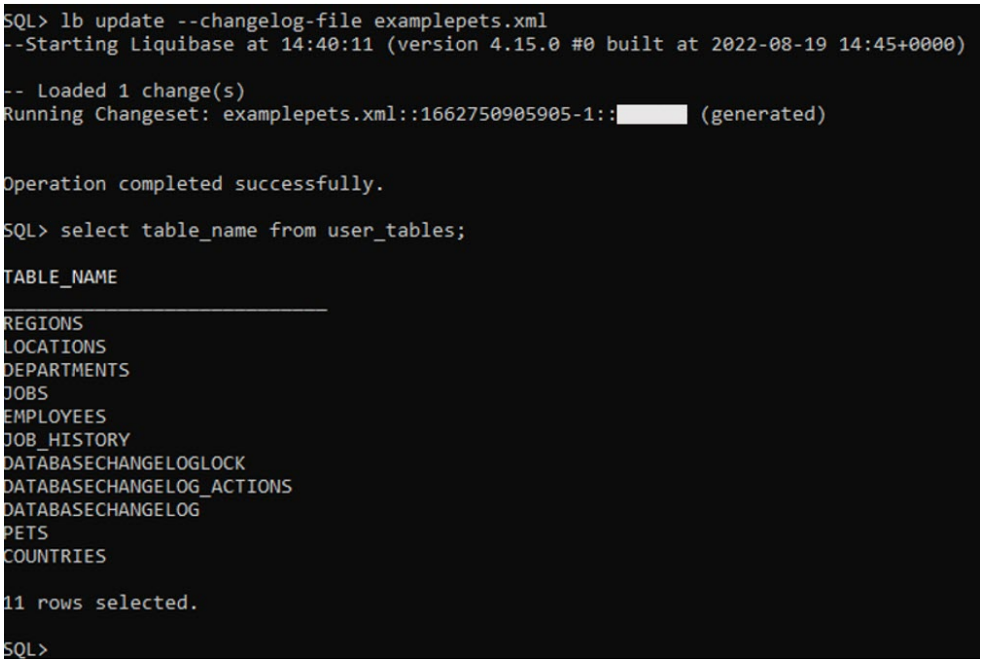
5. Connect to your Oracle Database from the SQLcl 22.3 bin location.

   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;
```



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?         Type
_________________ ___________ _________________
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                       VARCHAR2(255)
LABELS                         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 <lb-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:

1. 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 `DBMS_CLOUD` 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:

> **Note:**
>
> When using `DBMS_CLOUD` credential, you can only list the objects in the bucket.`DBMS_CLOUD` 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

sqldev1

--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:

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

--Put an object from local directory into cloud storage
SQL> cs put C:\\Users\\JDOE\\EMPLOYEES_DATA_TABLE.csv /o/myemployees.csv

Put C:\\Users\\JDOE\\EMPLOYEES_DATA_TABLE.csv copied
        to https://objectstorage.us-ashburn-1.oraclecloud.com/n/test/b/
example/o/myemployees.csv

--List the objects in the bucket
SQL> cs listo

COUNTRIES_DATA_TABLE.csv
DEPARTMENTS_DATA_TABLE.csv
REGIONS_DATA_TABLE.csv
LOCATIONS_DATA_TABLE.csv
myemployees.csv
```

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

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	<*file-name*>[,…] Dump file name(s) when using database directory. 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.	<*jobname*><*n*>.DMP

Table 5-1 (Cont.) Optional Arguments

File Argument	Description	Default
-dumpuri,-u	[<*uri*>[,...] | <*qualified-name*>[,...]] <*uri*>: Complete URI for the Oracle Object Store file if a default is not set on Cloud Storage command. <*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. 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.	Default object name is <*jobname*>.DMP
-logdirectory,-ld	Database directory for log file.	-directory if specified or DATA_PUMP_DIR
-logfile,-lf	Log file name in the database directory.	<*jobname*><*n*>.LOG

Table 5-2 Command Arguments

Command Argument	Description	Default
-noexec,-ne	[TRUE | FALSE] TRUE: Validate and generate the PL/SQL, but do not execute it.	FALSE
-verbose,-ve	[TRUE | FALSE] TRUE: Show additional diagnostic output.	FALSE

Table 5-3 Common Arguments

Common Argument	Description	Default
-copycloud,-cc	`[TRUE | 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.	FALSE
-encryptionpassword,-enp	<*password*> 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.	None
-excludeexpr,-ex	<*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','TRIGGER')"`	None
-excludelist,-el	<*object-type*>[,...] Specify a comma-separated-value list of object types to exclude from the job. Example:`-excludelist GRANT,INDEX,TRIGGER`	None

Table 5-3 (Cont.) Common Arguments

Common Argument	Description	Default
-includeexpr,-ix	<*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')"`	None
-includelist,-il	<*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`	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.	`ESQL_<n>` | `ISQL_<n>` where *n* is a data pump generated number.
-nameexpr,-nx	{<*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')";PROCEDURE="IN ('ADD_JOB_HISTORY','SECURE_DML')"`	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,departments;PROCEDURE=add_job_history,secure_dml`	None
-parallel,-p	<*degree_integer*> 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.	1
-schemas,-s	<*schema*>*[,...]* - The schema or list of schemas to process. For example: `-schemas schema1,schema2`	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*>: A specific database version, for example, 11.0.0. 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.	COMPATIBLE

Table 5-3 (Cont.) Common Arguments

Common Argument	Description	Default
-wait,-w	[TRUE | FALSE] 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.	TRUE

Table 5-4 Export Only Arguments

Export-Only Arguments	Description	Default
-compression,-cm	{ALL | DATA_ONLY | METADATA_ONLY | NONE} 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.	METADATA_ONLY
-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} Specifying any encryption option will turn on encryption if you do not specify -encryption NONE.	NONE, or ALL if any other encryption option is specified.
-encryptionalgorithm,-ena	{AES128 | AES192 | AES256} Identifies the cryptographic algorithm to use.	AES128

Table 5-4 (Cont.) Export Only Arguments

Export-Only Arguments	Description	Default
-encryptionmode,-enm	{DUAL | PASSWORD | TRANSPARENT} Identifies the types of security used for encryption and decryption. 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.	TRANSPARENT, or PASSWORD if -encryptionpassword is specified.
-filesize,-fs	{*<n>*{B | KB | MB | GB | TB}} Limit for the size of files.	500 MB
-flashbackscn,-fb	[TRUE | FALSE] TRUE: Use consistent database content based on system change number (SCN) at the start time of execution.	FALSE
-reusefile,-r	[TRUE | FALSE] TRUE: Replace existing dump file(s) with a new file.	TRUE

Table 5-5 Import Only Arguments

Import-Only Arguments	Description	Default
-columnencryption,-ce	[TRUE | FALSE] TRUE: Include column encryption clause on table metadata. FALSE Omit column encryption clause.	TRUE if supported by database
-objectid,-oid	[TRUE | FALSE] TRUE: Assign the exported OID. FALSE: Assign a new OID	TRUE

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,oldschema2=newschema2.	Not Applicable
-remaptablespaces,-rt	*{<oldTablespace>=<newTablespace>[,…]}* <oldTablespace> storage segment in the job is relocated to <newTablespace>. Example: oldtablespace1=newtablespace1,oldtablespace2=newtablespace2	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`: Include storage clauses.	TRUE
-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: The table compression clause is included if supported. FALSE: The table has the default compression for the tablespace.	TRUE

5.3 Use Cases

The following use cases illustrate how to use the 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

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.
Remap the tablespace.
```

```
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
  Log
  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
  Connected to:
  Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - 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.

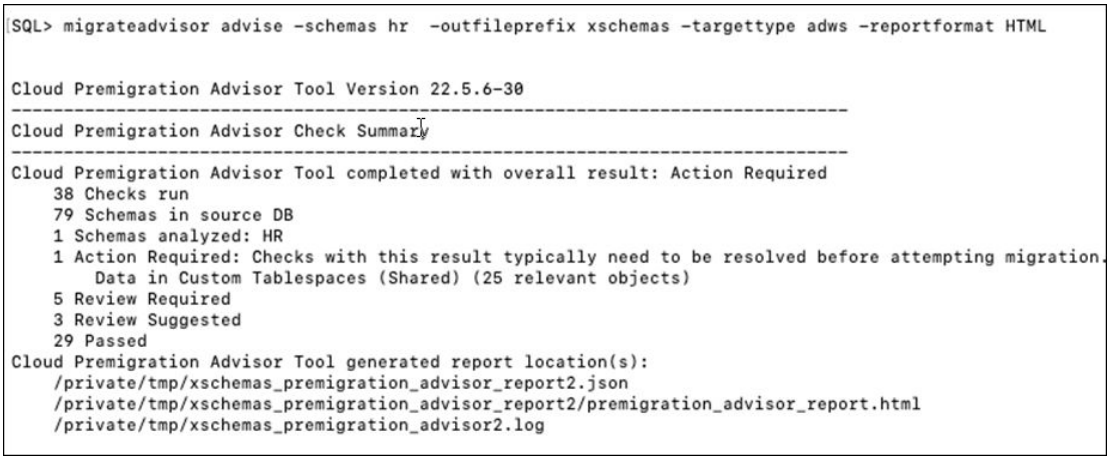
Topics:

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.



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`

> **Note:**
>
> 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
```

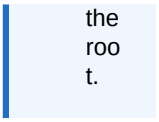
The following table lists the required and optional arguments for `advise`.

Argument	Description	Default
Required		
-targettype,-t	`(ATPS|ATPD|ADWS|ADWD|DEFAULT}` The type of target database to analyze for migration.	None
Optional		

Argument	Description	Default
-analysisprops,-a	*<propertyFile>* The path and name of a properties file.	None

Note:

The full path is optional. If the full path is not specified, `cd <path>` is used as the root. If `cd <path>` is not specified, then the launch path is used as

Argument	Description	Default
	 A properties file that was created using the properties sub-command while connected to the target database.	
-excludeschemas,-x	<*schema*>[,...] The schema or comma-separated-value list of schemas to exclude from analysis.	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.	Include all objects
-maxtextdatarows,-n	<*maxTextDataRows*> Relevant object rows to be included in text reports (does not apply to JSON reports).	-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	<*directory*> Identifies location for log and report files.	Current SQLcl directory
-outfileprefix,-p	<*outFilePrefix*> A prefix to the standard base file name of "premigration_advisor_report".	No prefix
-reportformat,-r	`{HTML|JSON|TEXT}[,...]` Specify one or more <reportFormats> where <reportFormat> is HTML, JSON, or TEXT.	HTML

Argument	Description	Default
-schemas,-s	<*schema*>[,...] The schema or comma separated value list of schemas to analyze. Example: schema1, schema2	All schemas
-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]` TRUE shows additional diagnostic output.	FALSE

The following table lists the optional arguments for `properties`.

Argument	Description	Default
-outdir,-o	<*directory*> Identifies location for log and report files.	Current SQLcl directory
-outfileprefix,-p	<*outFilePrefix*> A prefix to the standard base file name of "premigration_advisor_report".	No prefix

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
```

```
SQL> migrateadvisor advise -schemas hr -outfileprefix hr -targettype adws -
analysisprops <propertyFile>
```

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 `SELECT ANY DICTIONARY` 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
support.
**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.

> **See Also:**
>
> 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:

```
pgql 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:

```
pgql 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
  2    VERTEX TABLES (
  3      emp KEY(empno) LABEL Employee
  4        PROPERTIES ARE ALL COLUMNS EXCEPT ( deptno ),
  5      dept KEY(deptno) LABEL Department
  6        PROPERTIES ( deptno, dname )
  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.

```
PGQL> pgql auto on graph scott_hr;

PGQL Auto enabled for graph=[SCOTT_HR], execute=[true], translate=[false]

PGQL> column department format a20;
PGQL> column employees format a10;
PGQL> SELECT d.dname AS department, COUNT(e) AS employees
  2  FROM MATCH (e:Employee) -[:works_for]-> (d:Department)
  3  GROUP BY d
  4  ORDER BY employees
  5* LIMIT 3;

DEPARTMENT           EMPLOYEES
-------------------- ----------
ACCOUNTING           3
```

```
RESEARCH             5
SALES                6
```

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

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 l
WHERE
  b.language = l.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:

```
(SELECT ...
   FROM T1,
        (SELECT ...
           FROM T2 ...
          WHERE (DSP predicate1) OR (DSP predicate2)
         )
  WHERE ...
```

In this example, table `T2` 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:

```
(SELECT ...
   FROM T1,
        T2, ...
  WHERE (DSP predicate1) OR (DSP predicate2))
        ...
```

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     |
-------------------------------------------------------------------------------
----------------------------
|   0 | SELECT STATEMENT                    |                   |     1 |
215 |     4   (0)| 00:00:01 |
|   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:

```
SELECT * FROM XLA_AE_HEADERS WHERE TO_CHAR(AE_HEADER_ID) = '1511989';
-------------------------------------------------------------------------
-------------
| Id  | Operation         | Name           | Rows  | Bytes | Cost
(%CPU)| Time     |
-------------------------------------------------------------------------
-------------
|   0 | SELECT STATEMENT  |                |     1 |   215 |  5788
(1)| 00:00:01 |
|*  1 |  TABLE ACCESS FULL| xla_ae_headers |     1 |   215 |  5788
(1)| 00:00:01 |
-------------------------------------------------------------------------
-------------

Predicate Information (identified by operation id):
---------------------------------------------------
   1 - filter(TO_CHAR("AE_HEADER_ID")='1511989')
```

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
      WHEN ... THEN
```

```
      ELSE ...
 END)
```

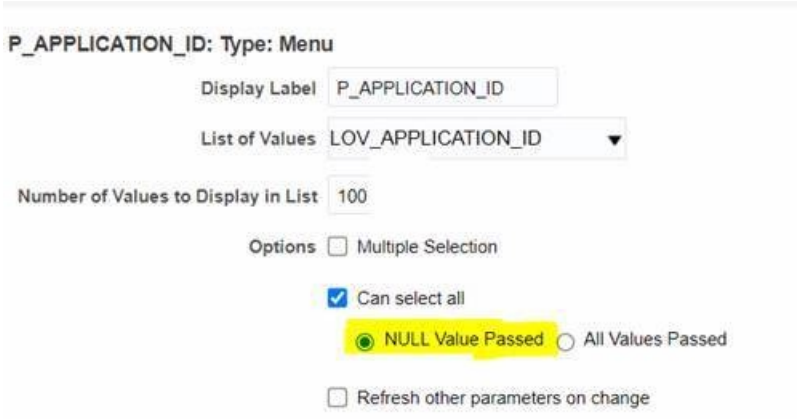
Long in IN-LISTs in SQL Clauses

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.