

Oracle® SQLcl

User's Guide



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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.

Documentation Accessibility

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Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
<i>italic</i>	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
monospace	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

1

Changes in Release 24.3 for *Oracle SQLcl User's Guide*

This section lists the changes for this release.

New Features

New features in this release are:

- Database Application CI/CD
See [Database Application CI/CD](#)
- Support for MLE
See [MLE](#)
- Support for MDB
See [MDB](#)

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 a batch file. SQLcl provides inline editing, statement completion, command recall, and also supports existing SQL*Plus scripts.

Oracle SQLcl is available for download from Oracle Technology Network.

Note:

- To run SQLcl, you need to install Oracle Java 11, 17 or 21. 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:

- [Alphabetic List of SQLcl Commands](#)
- [List of Unsupported SQL*Plus Commands and Features](#)
- [Starting and Leaving SQLcl](#)
- [Connecting to a Database](#)
- [Managing Stored Connections](#)
- [Starting Up and Shutting Down a Database](#)
- [Entering and Executing Commands](#)
- [Manipulating SQL, SQLcl, and PL/SQL Commands](#)

- [Formatting Query Results](#)
- [Accessing Databases](#)
- [Additional Commands](#)
- [Loading a File](#)
- [Using the OCI Command for Oracle Cloud Infrastructure REST APIs](#)
- [Running Tasks in the Background](#)

2.1 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: version 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 est 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 rservs....
```

2.2 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
- NAME

- 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.
-name, n	Specifies a Name connection type.
-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.
-replace, rp	Specifies that the saved connection details must replace any existing connection with the same name. Requires the <code>-save</code> option.

Option	Description
-rest, rt	Specifies that the connection should be established using REST.
-role, r	Specifies the database role. This is an alternative to providing it in the connection spec parameter.
-save, sa	Specifies a name to save the connection details for a successful connection.
-savepwd, sv	Specifies that passwords must be saved with the connection details. By default, passwords are not saved. Requires the <code>-save</code> option.
-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
<code><connectionspec></code>	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
```

To save a connection after opening it:

```
SQL> CONNECT -SAVE myconn scott@localhost:1521/orcl
```

2.2.1 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/myervice
```

See Also:

[Support for Kerberos](#) for troubleshooting information

2.2.2 NAME Connection Type

Connect to a database using a stored connection definition. Stored connections are identified using a unique connection name. For more information about stored connections, see [Managing Stored Connections](#).

Options

Option	Description
-name, n	Specifies a connection type using a stored connection definition.
-user, u	Specifies the user name. 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.
-password, pw	Specifies the password. 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
<connections-spec>	Provides the connection specification for the target database.

Examples

To connect using a stored connection:

```
SQL> CONNECT -name my_connection
```

To connect using a stored connection as a different user:

```
SQL> CONNECT -name myuser/mypassword@my_connection
```

or

```
SQL> CONNECT -name myuser@my_connection
```

2.2.3 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.databasesconnection.<id>.
```

Options

Option	Description
-oci	Specifies an OCI connection type.
-rest, rt	Specifies that the connection should be established using REST.
-proxy, p	Specifies the network proxy to use.
-verbose, v	Requests output of diagnostic information about the connection.

Parameters

Parameter	Description
<connections-spec>	Provides the connection specification for the target database.

Example

To connect using an OCID:

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

2.2.4 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
<connections-spec>	Provides the connection specification for the target database.

Example

To connect using EZCONNECT:

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

2.2.5 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.
-verbose, v	Requests output of diagnostic information about the connection.

Parameters

Parameter	Description
<connections-spec>	Provides the connection specification for the target database.

Example

To connect using REST:

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

2.2.6 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 authentication:

```
[<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.
-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
<connections-spec>	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

2.2.7 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.
-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
<code><connections-spec></code>	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
```

2.2.8 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
<code>-third, t</code>	Specifies a THIRD connection type.
<code>-user, u</code>	Specifies the user name. This is an alternative to providing it in the connection spec parameter.
<code>-password, pw</code>	Specifies the password. This is an alternative to providing it in the connection spec parameter.
<code>-url</code>	Specifies the URL. This is an alternative to providing it in the connection spec parameter.
<code>-role, r</code>	Specifies the database role. This is an alternative to providing it in the connection spec parameter.
<code>-edition, ed</code>	Specifies the Oracle database edition. This is an alternative to providing it in the connection spec parameter.
<code>-verbose, v</code>	Requests output of diagnostic information about the connection.

Parameters

Parameter	Description
<code><connections-spec></code>	Provides the connection specification for the target database.

Example

To connect to MySQL:

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

2.2.9 WALLET Connection Type

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

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

Options

Option	Description
<code>-wallet, w</code>	Specifies a WALLET connection type.
<code>-cloudconfig, cc</code>	Specifies the wallet to establish the connection.
<code>-proxy, p</code>	Specifies the network proxy to use.
<code>-user, u</code>	Specifies the user name. This is an alternative to providing it in the connection spec parameter.
<code>-password, pw</code>	Specifies the password. This is an alternative to providing it in the connection spec parameter.
<code>-url</code>	Specifies the URL. This is an alternative to providing it in the connection spec parameter.
<code>-role, r</code>	Specifies the database role. This is an alternative to providing it in the connection spec parameter.
<code>-edition, ed</code>	Specifies the Oracle database edition. This is an alternative to providing it in the connection spec parameter.
<code>-verbose, v</code>	Requests output of diagnostic information about the connection.

Parameters

Parameter	Description
<code><connections-spec></code>	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
```

2.3 Managing Stored Connections

Persistent connections can be managed with the `CONNMGR` command. Persistent connections are referenced by a connection name. Connections may store a user name. If a user name is stored, a password may also be stored. Passwords are stored in a secure wallet. If a password is not stored, it is provided when prompted to create the connection. A stored connection may describe a connection in a variety of formats, including basic host name, port and service name values or a TNS name and a cloud configuration.

To add a stored connection, see [NAME Connection Type](#) .

To save a stored connection, see the options `-save`, `-savepwd`, and `-replace` in [Connecting to a Database](#).

Syntax

```
connmgr|cm {SUBCOMMAND}
```

where `SUBCOMMAND` can be any one of the following:

- **LIST**: Lists the available connection names.
- **SHOW**: Shows the details for a connection.
- **TEST**: Tests a connection.
- **IMPORT**: Imports one or more connection definitions from a file exported from SQL Developer.
- **CLONE**: Clones an existing connection.

To see the help information, enter:

```
help connmgr [examples]
```

2.3.1 List Connections

List the names of the connections.

Syntax

```
connmgr|cm list
```

Example

To list the names of connections, enter:

```
SQL> CONNMGR LIST
```


2.3.2 Show Connections

Shows the details for a connection, including the connection URL and the user name (if stored). Additional details are displayed depending on the stored connection description.

Syntax

```
connmgr|cm show {PARAMETERS}
```

Parameters

Parameter	Description
<i><name></i>	The name of the connection. Connection names are case-sensitive.

Example

To show the details for `MyConnection`:

```
SQL> CONNMGR SHOW MyConnection
```

2.3.3 Test Connections

A test connection is opened and then closed. This test connection does not affect the current SQLcl connection. The credentials stored with the connection are used for the test. If no password is stored, the user is prompted for the password. If the `-user` option is used, the provided user is tested instead. A password will need to be provided when prompted.

Syntax

```
connmgr|cm test {OPTIONS} {PARAMETERS}
```

Options

Option	Description
<code>-user, -u</code>	Specify a user name instead of using the one stored with the connection definition. Case-sensitive user names are quoted to preserve case.

Parameters

Parameter	Description
<i><name></i>	The name of the connection. Connection names are case-sensitive.

Example

To test the connection `MyConnection` for user name `SCOTT`:

```
SQL> CONNMGR TEST MyConnection
SQL> CONNMGR TEST -USER SCOTT MyConnection
```

2.3.4 Import Connections

Import one or more connections to the common connection store.

Connect files may contain encrypted passwords and other credentials.

When importing connections with encrypted passwords, the encryption key is required to decrypt the passwords. The encryption key may be provided with the import command by first securing it with a secret. For more information about using a secret, see [SECRET Command](#). If no key is provided with the import command, a prompt is displayed to request the key.

The passwords can be removed from imported connections by specifying the `-strip_passwords` option.

Syntax

```
connmgr|cm import {OPTIONS} {PARAMETERS}
```

Options

Option	Description
<code>-duplicates d dups</code>	<p><code>{ignore rename replace}</code></p> <p>Indicates how to handle imported connections whose names match an existing connection.</p> <ul style="list-style-type: none"> • IGNORE: Skips the duplicate connections. • RENAME: Renames the duplicate connections by appending a unique number to the end of the name. • REPLACE: Replaces the existing connection with the new connection.
<code>-key</code>	The public name of a secret that protects the encryption key used to encrypt passwords in the file.
<code>-strip_passwords s strip</code>	Indicates that encrypted passwords be stripped from imported connections.

Note:

If the encryption key is invalid, the connections are imported with the passwords removed.

Parameters

Parameter	Description
<i>path</i>	A single file or directory containing one or more connections to import. If the path is an archive file, the archive is checked for a single connection definition. If the path is a JSON file, it is checked for legacy connection definitions. If the path is a directory, it is checked for more archives containing connection definitions.

Example

To create a secret for the encryption key and specify the secret name when importing connections from a file:

```
SQL> SECRET SET mySecret <encryption key>
SQL> CONNMGR IMPORT -KEY mySecret myconns.json
```

2.3.4.1 SECRET Command

This command is used to securely store secret values in memory. The Connection Manager (`connmgr`) commands enable the use of the secret name to identify secure values such as passwords and encryption keys. Using the secret name in this way ensures that secure values are not displayed on the command line and do not persist in command history. Secure values cannot be retrieved with the `SECRET` command.

Syntax

```
secret {SUBCOMMAND}
```

where the subcommands are:

- [Set](#)
- [List](#)
- [Unset](#)

Set

Sets a name for a secret value. The secret name can be used with commands that support secure values.

Syntax

```
secret set {PARAMETERS}
```

Parameters

Parameter	Description
<i>secret_name</i>	The public name that can be used to represent a secure value.
<i>secret_value</i>	The protected secret value that is associated with the secret name.

List

Lists the currently stored secret names.

Syntax

```
secret list
```

Unset

Removes the secret value for the secret name.

Syntax

```
secret unset <secret_name>
```

where `secret_name` is the public name used to represent a secret value.

Example

Set a name for a secret value and use it to import connections.

```
SQL> secret set my_name myEncryptionKey
secret my_name stored
SQL> connmgr import -encryption_key my_name conns.json
```

2.3.5 Clone Connections

Clones an existing connection. By default, the credentials stored with the original connection are used for the new connection. To change the user name, the `-user` option can be used. If the user changes, a password prompt is displayed unless the `-nopwd` option is used

Syntax

```
connmgr|cm clone {OPTIONS} {PARAMETERS}
```

Options

Option	Description	Default
-original, -o	The name of the source connection being cloned.	Required
-nopwd	Whether to create the connection without a stored password.	-
-user, -u	The user name to store with the connection. If no user name is specified, you may be prompted to provide one when using the connection, depending on the authentication configuration.	-

Parameters

Parameter	Description
<i><name></i>	The name of the connection. Connection names are case-sensitive.

Example

To clone an existing connection:

```
SQL> CONNMGR CLONE -original original_name newname
SQL> CONNMGR CLONE -original original_name -user newuser newname
```

2.4 Starting Up and Shutting Down a Database

Starting up and shutting down a database requires DBA privileges.

STARTUP db_options | cdb_options | upgrade_options

where *db_options* has the following syntax:

```
[FORCE] [RESTRICT] [PFILE=filename] [QUIET] [ MOUNT [dbname] | [ OPEN
[open_db_options] [dbname] ] | NOMOUNT ]
```

where *open_db_options* has the following syntax:

```
READ {ONLY | WRITE [RECOVER]} | RECOVER
```

where *cdb_options* has the following syntax:

root_connection_options | pdb_connection_options

where *root_connection_options* has the following syntax:

```
PLUGGABLE DATABASE pdbname [FORCE] | [RESTRICT] [ OPEN {open_pdb_options}]
```

where *pdb_connection_options* has the following syntax:

```
[FORCE] | [RESTRICT] [ OPEN {open_pdb_options}]
```

where *open_pdb_options* has the following syntax:

```
READ WRITE | READ ONLY
```

and where *upgrade_options* has the following syntax:

```
[PFILE=filename] {UPGRADE | DOWNGRADE} [QUIET]
```

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.

2.5 Entering and Executing Commands

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

/ (slash)

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

EXEC[UTE] *statement*

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

R[UN]

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

TIMI[NG]

Timing is only available as a switch.

Use the following command to access the help system:

HELP | ? [*topic*]

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

Use the following command to execute operating system commands:

HO[ST] [*command*]

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

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

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

 **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.

2.6 Manipulating SQL, SQLcl, and PL/SQL Commands

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

```
A[PPEND] text
```

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

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

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

2.7 Formatting Query Results

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

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

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

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

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

Where *report_element* has the following syntax:

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

and where *action* has the following syntax:

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

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

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

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

```
CL[EAR] option ...
```

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

Where *option* represents one of the following clauses:

```
BRE[AKS]
BUFF[ER]
COL[UMNS]
COMP[UTES]
CONTEXT
SCR[EEN]
SQL
TIMI[NG]
```

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

Specifies display attributes for a given column, such as:

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

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

Where *option* represents one of the following clauses:

```

ALI[AS] alias
CLE[AR]
ENTMAP {ON | OFF}
FOR[MAT] format
HEA[DING] text
JUS[TIFY] {L[EFT] | C[ENTER] | R[IGHT]}
LIKE {expr | alias}
NEWL[INE]
NEW_V[ALUE] variable
NOPRI[NT] | PRI[NT]
NUL[L] text
OLD_V[ALUE] variable
ON | OFF
WRA[PPED] | WOR[D_WRA[PPED]] | 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).

Element	Examples	Description
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.

`SPOOL[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
```

2.8 Accessing Databases

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

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

where *logon* has the following syntax:

```
username[/password] [@connect_identifier]
```

where *proxy* has the following syntax:

```
proxyuser[username] [/password] [@connect_identifier]
```



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.

2.9 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.

2.9.1 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

```

2.9.1.1 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.

2.9.1.2 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
```

2.10 Using the OCI Command for Oracle Cloud Infrastructure REST APIs

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
```

From SQLcl release 23.3, if you have a DEFAULT OCI profile installed, it is loaded when starting SQLcl.

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 list)

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

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
```

2.11 Running Tasks in the Background

The `BACKGROUND` command runs the SQLcl command as a background task.

Syntax

```
background|bg {OPTIONS} <commandspec>
```

where <commandspec> is the SQLcl command.

Options

Option	Description
-wait4 -w4 <wait4>	List of task names to wait for. See Wait4 Command
-taskname -tn <taskname>	Name of the task. To know the task details, use the Jobs Command .

Examples

```
SQL> background apex list
SQL> background -taskname task3 -wait4 task1,task2 apex list
```

2.11.1 Jobs Command

The `JOBS` command lists the details of jobs that are running in the background.

Syntax

```
jobs|jb {SUBCOMMAND} {OPTIONS}
```

where `SUBCOMMAND` can be any of the following:

- **Cancel:** Cancel a running job.
- **Logs:** Show job logs.
- **Delete:** Remove jobs from the list.

Options

Option	Description
<code>-id -i <id></code>	The id of the task.
<code>-taskname -tn <taskname></code>	Name of the task.

Examples

```
SQL> jobs -id 2
SQL> jobs logs -id 2
SQL> jobs cancel -id 2
```

2.11.1.1 Cancel Jobs

This command cancels a running job.

Syntax

```
jobs|jb cancel|c {OPTIONS}
```

Options

Option	Description
<code>-id -i <id></code>	The id of the task.
<code>-taskname -tn <taskname></code>	Name of the task.

Examples

```
SQL> jobs cancel -id 2
```

2.11.1.2 Log Jobs

This command shows the log files for jobs.

Syntax

```
jobs|job logs|l {SUBCOMMAND} {OPTIONS}
```

where SUBCOMMAND is:

delete|d: Delete logfiles for completed jobs.

Options

Option	Description
-id -i <id>	The id of the task.
-taskname -tn <taskname>	Name of the task.

Examples

```
SQL> jobs logs -id 2
SQL> jobs logs delete
```

2.11.1.3 Delete Jobs

This command removes jobs from the list. This could be either a a specific job, or all jobs, or only if the job is finished.

Syntax

```
jobs|job delete|d {OPTIONS}
```

Options

Option	Description
-id -i <id>	The id of the task.
-taskname -tn <taskname>	Name of the task.
-all -a	Remove all tasks from the list.
-finished -f	Only remove finished tasks from the list.

Examples

```
SQL> jobs delete -id 2
```

2.11.2 Wait4 Command

Wait for one or more tasks to finish before continuing the job.

Syntax

```
wait4|w4 {OPTIONS} {PARAMETERS}
```

Options

Option	Description
-delay -d <delay> (0)	Number of milliseconds to wait before continuing with processing.

Parameters

Option	Description
<tasknames>	List of task names to wait for.

Examples

```
SQL> wait4 task1,task3
```

3

Using Liquibase

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

- [About Liquibase in SQLcl](#)
- [Requirements for Using Liquibase](#)
- [Supported Types](#)
- [Supported Liquibase Commands in SQLcl](#)
- [Using SQLcl Liquibase Functionality with Open-Source Liquibase](#)
- [Dynamic Object Transformation with SQLcl Liquibase and `DBMS_METADATA` Oracle Database Package](#)
- [Liquibase Open-Source Changesets with SQLcl Liquibase](#)
- [DATABASECHANGELOG_DETAILS VIEW](#)
- [ChangeSets in Liquibase](#)
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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_INITIAL_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}
```

To see the help for Liquibase in SQLcl, type :

```
help Liquibase
```

To only view the examples in help, type:

```
help liquibase examples
```

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

Database Diff Commands

New Command	Description
diff	Writes description of differences between two databases to standard out.
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
rollback	Rolls back the database to the state it was in when the tag was applied.
rollback-sql	A helper command that produces the raw SQL Liquibase would run when using the rollbackByTag command.
rollback-to-date	Rolls back the database to the state it was in at the given date/time.
rollback-to-date-sql	A helper command that allows you to inspect the SQL Liquibase will run while using the rollback-to-date command.
rollback-count	Rolls back the last <value> changesets.
rollback-count-sql	Writes SQL to roll back the last <value> changesets to STDOUT.
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
data	Generate changelogs for the data.
generate-apex-object	Generate apex objects from a database
generate-controlfile	Generate an empty control file that you can use to start a new changelog.
generate-db-object	Generate database objects from a database
generate-ords-module, generate-ords-schema	Generate ords objects from a database

New Command	Description
generate-schema	Generate all supported objects in a schema and controller file.
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.

Database Update Commands

New Command	Description
update	Updates the database to the current version.
update-sql	A helper command that enables you to inspect the SQL code that Liquibase will run when using the update command.
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
db-doc	Generates Javadoc-like documentation based on current database and changelog.

Maintenance Commands

New Command	Description
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.
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
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.
drop-all	Drops all database objects owned by the user.
list-locks	Lists who currently has locks on the database changelog.
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.
tag	"Tags" the current database state for future rollback.
tag-exists	Checks whether the given tag already exists.
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.

Status Commands

New Command	Description
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
Required		
<code>-changelog-file -chf</code>	The root changelog file.	-
<code>-changeset-identifier -chi</code>	Changeset ID identifier of form <code>filepath::id::author</code> .	-
Optional		
<code>-database-changelog-table-name -dactn</code>	Name of table to use for tracking change history.	-

Option	Description	Default
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-liquibase-schema-name -lbn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-search-path -sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	True
-output-default-schema -ouds	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False

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
Required		
<code>-changelog-file -chf</code>	The root changelog file.	-
Optional		
<code>-contexts -co</code>	Context string to use for filtering which changes to operate on.	-
<code>-database-changelog-table-name -dactn</code>	Name of table to use for tracking change history.	-
<code>-debug -de</code>	Enable debug output.	-
<code>-default-schema-name -desn</code>	The default schema name to use for the database connection.	-
<code>-defaults-file -def</code> <code><defaults-file> {FILE}</code>	Fully qualified path to the properties file you want to use. Example: <code>-defaults-file/tmp/liquibase.properties</code>	-
<code>-labels -la</code>	Label expression to use for filtering the changes to operate on.	-
<code>-liquibase-schema-name -lbsn</code>	Schema to use for Liquibase objects.	-
<code>-liquibase-tablespace-name -lbtn</code>	Tablespace to use for Liquibase objects.	-
<code>-log -lo</code>	Enable logging. Standard logging is <code>INFO</code> level (no debug flag). Debug logging is <code>FINEST</code> level (both log and debug flag).	-
<code>-search-path -sep</code>	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-
<code>-secure-parsing -scp</code>	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True
<code>-output-default-schema -ouds</code>	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False

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}
```

Options

Option	Description	Default
Required		
-changelog-file -chf	The root changelog file.	-
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.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-labels -la	Label expression to use for filtering the changes to operate on.	-
-liquibase-schema-name -lbn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-output-default-schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False
-output-file -ouf	The name of the file to write the output to.	-

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

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}
```

Options

Option	Description	Default
Required		
-changelog-file -chf	The root changelog file.	-
-tag -ta <tag>	The tag to be used during the execution of command.	-
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.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-

Option	Description	Default
-defaults-file -def <defaults-file> {FILE}	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-labels -la	Label expression to use for filtering the changes to operate on.	-
-liquibase-schema-name -lbn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-search-path -sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	True
-output-default-schema -ouds	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False

Example

Mark changes as executed in the 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|chsts {OPTIONS}
```

Options

Option	Description	Default
Required		
<code>-changelog-file -chf</code>	The root changelog file.	-
<code>-tag -ta <tag></code>	The tag to be used during the execution of the command.	-
Optional		
<code>-contexts -co</code>	Context string to use for filtering which changes to operate on.	-
<code>-database-changelog-table-name -dactn</code>	Name of table to use for tracking change history.	-
<code>-debug -de</code>	Enable debug output.	-
<code>-default-schema-name -desn</code>	The default schema name to use for the database connection.	-
<code>-defaults-file -def</code> <code><defaults-file> {FILE}</code>	Fully qualified path to the properties file you want to use. Example: <code>-defaults-file/tmp/liquibase.properties</code>	-
<code>-labels -la</code>	Label expression to use for filtering the changes to operate on.	-
<code>-liquibase-schema-name -lbn</code>	Schema to use for Liquibase objects.	-
<code>-liquibase-tablespace-name -lbtn</code>	Tablespace to use for Liquibase objects.	-
<code>-log -lo</code>	Enable logging. Standard logging is <code>INFO</code> level (no debug flag). Debug logging is <code>FINEST</code> level (both log and debug flag).	-
<code>-output-default-schema -ouds</code>	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
<code>-output-file -ouf</code>	The name of the file to write the output to.	-
<code>-search-path -sep</code>	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-
<code>-secure-parsing -scp</code>	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	True

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
-database-changelog-table-name -dactn	Name of table to use for tracking change history.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn <default-schema-name>	The default schema name to use for the database connection.	-
-defaults-file -def <defaults-file> {FILE}	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-liquibase-schema-name -lbsn <liquibase-schema-name>	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn <liquibase-tablespace-name>	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-secure-parsing -scp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True

Option	Description	Default
-output-default-schema - ouods	Control whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False

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
-data-output-directory - daod <data-output- directory>	Directory to write data to, only applicable when <DIFF_TYPE> includes data.	-
-database-changelog-table- name -dactn <database- changelog-table-name>	Name of table to use for tracking change history.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn <default-schema-name>	The default schema name to use for the database connection.	-
-defaults-file -def <defaults-file> {FILE}	Fully qualified path to the properties file you want to use. Example: -defaults- file/tmp/ liquibase.properties	-
-exclude-objects -exo <exclude-objects>	Objects to exclude from diff.	-
-include-objects -ino <include-objects>	Objects to include in diff.	-
-include-schema -ins <include-schema>	If true, the schema is included in generated changesets.	False
-include-tablespace -int <include-tablespace>	Include the tablespace attribute in the changelog.	False
-liquibase-schema-name - lbsn <liquibase-schema- name>	Schema to use for Liquibase objects.	-

Option	Description	Default
<code>-liquibase-tablespace-name -lbtn <liquibase-tablespace-name></code>	Tablespace to use for Liquibase objects.	
<code>-log -lo</code>	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
<code>-output-default-schema -ouds</code>	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False
<code>-output-file -ouf <output-file></code>	The name of the file to write the output to.	-
<code>-overwrite-files -ovf</code>	Overwrite any existing files in directory. This will not affect other files.	-
<code>-schemas -sc <schemas></code>	Schemas to include operation.	-
<code>-search-path -sep <search-path></code>	Complete list of locations to search for files such as changelog files. Multiple paths can be specified by separating them with commas.	-
<code>-secure-parsing -scp <secure-parsing></code>	Keep functionality from file parsers which could be used insecurely. Examples include (but not limited to) disabling remote XML entity support.	True

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
Required		
<code>-changelog-file -chf <changelog-file></code>	The root changelog file.	-
<code>-output-directory -oud <output-directory></code>	The directory where the documentation is generated.	-
Optional		
<code>-database-changelog-table-name -dactn <database-changelog-table-name></code>	Name of table to use for tracking change history.	-

Option	Description	Default
-debug -de	Enable debug output.	-
-default-schema-name -desn <default-schema-name>	The default schema name to use for the database connection.	-
-defaults-file -def <defaults-file> {FILE}	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-liquibase-schema-name -lbn <liquibase-schema-name>	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn <liquibase-tablespace-name>	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-search-path -sep <search-path>	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-
-secure-parsing -scp <secure-parsing>	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True
-output-default-schema -ouds <output-default-schema>	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False

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
Required		
-reference-password -rep	The reference database password.	-
-reference-url -reurl	The JDBC reference database connection URL.	-
-reference-username -reusername	The reference database username.	-
Optional		
-database-changelog-table-name -dactn	Name of table to use for tracking change history.	-
-debug -de	Enable debug output.	-
-default-schema -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-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}
-exclude-objects -exo <exclude-objects>	Objects to exclude from diff.	-
-include-objects -ino <include-objects>	Objects to include in diff.	-
-include-schema -ins <include-schema>	If true, the schema will be included in generated changesets.	False
-include-tablespace -int <include-tablespace>	Include the tablespace attribute in the changelog.	False
-liquibase-schema-name -lbsn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-

Option	Description	Default
<code>-overwrite-files -ovf</code>	Overwrite any existing files in directory. This will not affect other files.	-
<code>-search-path -sep <search-path></code>	Complete list of locations to search for files such as changelog files. Specify multiple paths by separating them with commas.	-
<code>-secure-parsing -scp</code>	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True
<code>-output-default-schema -oudu</code>	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False
<code>-output-file -ouf</code>	The name of the file to write the output to.	-
<code>-reference-default-schema-name -redsn</code>	The reference default schema name to use for the database connection.	-
<code>-schemas -sc</code>	Schemas to include operation.	-

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
Required		
-reference-password -rep	The reference database password.	-
-reference-url -reur	The JDBC reference database connection URL.	-
-reference-username -reu	The reference database username.	-
Optional		
-database-changelog-table-name -dactn	Name of table to use for tracking change history.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-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}
-exclude-objects -exo	Objects to exclude from diff	-
-include-objects -ino	Objects to include in diff	-
-include-schema -ins	If true, the schema is included in generated changesets.	False
-include-tablespace -int	Include the tablespace attribute in the changelog	False
-liquibase-schema-name -lbn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-

Option	Description	Default
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-overwrite-files -ovf	Overwrite any existing files in the directory. This will not affect other files.	-
-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.	-
-secure-parsing -scp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True
-output-default-schema -ouds	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False
-output-file -ouf	The name of the file to write the output to.	-

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 {OPTIONS}
```

Options

Option	Description	Default
-database-changelog-table-name -dactn	Name of table to use for tracking change history.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-liquibase-schema-name -lbn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-output-default-schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False
-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.	-
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	True
-schemas -sc	Schemas to include operation.	-

Example

To drop all database objects owned by the user, enter:

```
SQL> lb drop-all
```

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
Required		
-changelog-file -chf	The root changelog file.	-
-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.	-
-debug -de	Enable debug output.	False
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: <code>-defaults-file/tmp/liquibase.properties</code>	-
-labels -la	Label expression to use for filtering the changes to operate on.	-
-liquibase-schema-name -lbn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is <code>INFO</code> level (no debug flag). Debug logging is <code>FINEST</code> level (both log and debug flag).	-
-output-default-schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true, they are qualified. If false, only objects outside the default schema are fully qualified.	False
-output-file -ouf	The name of the file to write the output to.	-

Option	Description	Default
-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.	-
-overwrite-files -ovf	Overwrite any existing files in the directory. This will not affect other files.	-
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	True

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
Required		
-changelog-file -chf	The root changelog file.	-
-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.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-labels -la	Label expression to use for filtering the changes to operate on.	-

Option	Description	Default
<code>-liquibase-schema-name -lbsn</code>	Schema to use for Liquibase objects.	-
<code>-liquibase-tablespace-name -lbtn</code>	Tablespace to use for Liquibase objects.	-
<code>-log -lo</code>	Enable logging. Standard logging is <code>INFO</code> level (no debug flag). Debug logging is <code>FINEST</code> level (both log and debug flag).	-
<code>-output-default-schema -ouds</code>	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
<code>-output-file -ouf</code>	The name of the file to write the output to.	-
<code>-overwrite-files -ovf</code>	Overwrite any existing files in the directory. This will not affect other files.	-
<code>-search-path -sep</code>	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-
<code>-secure-parsing -scp</code>	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	True

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
Required		
<code>-changelog-file -chf</code>	The root changelog file.	-
Optional		
<code>-contexts -co</code>	Context string to use for filtering which changes to operate on.	-
<code>-database-changelog-table-name -dactn</code>	Name of table to use for tracking change history.	-
<code>-debug -de</code>	Enable debug output.	-
<code>-default-schema-name -desn</code>	The default schema name to use for the database connection.	-
<code>-defaults-file -def</code>	Fully qualified path to the properties file you want to use. Example: <code>-defaults-file/tmp/liquibase.properties</code>	-
<code>-labels -la</code>	Label expression to use for filtering the changes to operate on.	-
<code>-liquibase-schema-name -lbsn</code>	Schema to use for Liquibase objects.	-
<code>-liquibase-tablespace-name -lbtn</code>	Tablespace to use for Liquibase objects.	-
<code>-log -lo</code>	Enable logging. Standard logging is <code>INFO</code> level (no debug flag). Debug logging is <code>FINEST</code> level (both log and debug flag).	-
<code>-output-default-schema -ouds</code>	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
<code>-output-file -ouf</code>	The name of the file to write the output to.	-
<code>-overwrite-files -ovf</code>	Overwrite any existing files in the directory. This will not affect other files.	-
<code>-search-path -sep</code>	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-
<code>-secure-parsing -scp</code>	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True

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}
```

Options

Option	Description	Default
-applicationid -api	ID for application to be exported.	-
-changesby -chb	Expects string parameter. Limit -list values to changes by the given user.	-
-changessince -chs	Expects date parameter (YYYY-MM-DD). Limit -list values to changes since the given date.	-
-contexts -co	Context string to use for filtering which changes to operate on.	-
-debug -de	{true false} Enable debug output.	-
-deploymentsystem -desy	Deployment system for exported feedback.	-
-dir -di	Save all files in the given directory. Example: -dir some/sub/directory	-
-exporiginalids -dxoi	Export will not emit ids as they were when the application was imported.	-
-runalways -ra	{true false} Set runAlways attribute to true in changelog.	False
-expaclassignments -exacl	Export ACL user role assignments.	-
-expcomments -exco	Export developer comments.	-
-expcomponents -exc	-	-
-expfeedback -exfe	Export team development feedback for all workspaces or identified by -workspaceid.	-
-expfeedbacksince -exfs	Export team development feedback since date in the format YYYYMMDD.	-
-expfiles -exfi	Export all workspace files identified by -workspaceid.	-
-expirnotif -exir	Export all interactive report notifications.	-

Option	Description	Default
-expminimal -exmi	Only export workspace definition, users, and groups.	-
-expnosubscriptions -exns	Do not export references to subscribed components.	-
-exppubreports -exre	Export all user saved public interactive reports.	-
-expsavedreports -exsr	Export all user saved interactive reports.	-
-expsupportingobjects -exso	Pass (Y)es, (N)o or (I)nstall to override the default.	-
-expteamdevdata -exte	Export team development data for all workspaces or identified by workspaceid.	-
-exptranslations -extr	Export the translation mappings and all text from the translation repository	-
-exptype -exty	Comma delimited list of export types to perform: <ul style="list-style-type: none"> APPLICATION_SOURCE: export an APEX application using other parameters passed. EMBEDDED_CODE: Export code such as SQL, PL/SQL and Javascript. APEX ignores all other options when EMBEDDED_CODE is selected. CHECKSUM-SH1: Export a SHA1 checksum that is independent of IDs and can be compared across instances and workspaces. CHECKSUM-SH256: Export an SHA-256 checksum that is independent of IDs and can be compared across instances and workspaces. READABLE_JSON: Export a readable version of the application metadata in JSON format. READABLE_YAML: Export a readable version of the application metadata in YAML format. 	-
-expworkspace -exwo	Export workspace identified by workspaceid or all workspaces if workspaceid not specified.	-
-fail-on-error -foe	{true false} Set failOnError attribute to true in changelog.	False
-instance -in	Export all applications.	-

Option	Description	Default
-skipexportdate -ked	Include export date in application export files.	-
-labels -la	Label expression to use for filtering which changes to operate on.	-
-list -li	Lists applications installed in the database.	-
-log -lo	{true false} Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-nochecksum -noch	Overwrite existing files even if the contents have not changed.	-
-overwrite-files -ovf	Overwrite any existing files in the directory. This will not affect other files.	=
-split -sp	{true false} This makes the export split the files into directories based on the object types.	False
-workspaceid -woi	Workspace ID to export all applications to or the workspace to be exported.	-

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
-data-output-directory -daod	Directory to write data to.	-
-database-changelog-table-name -dactn	Name of table to use for tracking change history.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-

Option	Description	Default
-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}
-exclude-objects -exo	Objects to exclude from diff	-
-include-objects -ino	Objects to include in diff	-
-include-schema -ins	If true, the schema is included in generated changeSets.	False
-include-tablespace -int	Include the tablespace attribute in the changelog	False
-liquibase-schema-name -lbn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-output-default-schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False
-output-file -ouf <output-file>	The name of the file to write the output to.	-
-overwrite-files -ovf	Overwrite any existing files in the directory. This will not affect other files.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-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.	-
-secure-parsing cp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True

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-controlfile

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

Syntax

```
Liquibase|lb generate-controlfile {OPTIONS}
```

Options

Option	Description	Default
Required		
-changelog-file -chf	The root changelog file.	-
Optional		
-debug -de	Enable debug output.	-
-log -lo	Enable logging.	-
	Standard logging is INFO level (no debug flag).	
	Debug logging is FINEST level (both log and debug flag).	

Example

Generate control file:

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

3.4.18 generate-db-object

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

Syntax

```
lb generate-db-object|geo {OPTIONS}
```

Options

Option	Description	Default
-database-changelog-table-name -dactn <database-changelog-table-name>	Name of table to use for tracking change history.	-
-debug -de	Enable debug output	-
-default-schema-name -desn <default-schema-name>	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-fail-on-error -foe	Set failOnError attribute to true in changelog.	False
-liquibase-schema-name -lbsn <liquibase-schema-name>	Schema to use for Liquibase objects.	-
-liquibase-namespace -lbtn <liquibase-namespace-name>	Namespace to use for Liquibase objects.	-
-log -lo	Enable logging	-
-object-name -obn	Name of the object.	-
-object-type -obt	Type of object.	-
-output-default-schema -ouds <output-default-schema>	Control whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	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.	-
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	True
-sql -sq	Generate a sql file along with the changelog showing the DDL for the object. This sql is not intended to be used for anything other than review.	-
-replace -re	Set replaceIfExists attribute to true in changelog.	-
-runalways -ra	Set runAlways attribute to false in changelog	-
-runonchange -rc	Set runOnChange attribute to true in changelog.	-

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}
```

Options

Option	Description	Default
Required		
-module-name -mon	The module name for which to generate code.	-
Optional		
-debug -de	Enable debug output.	-
-exclude-enable-schema -exes	Dictates whether the enable_schema call will be included in the export.	-
-exclude-privs -exp	Dictates whether privileges will be included in the export.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-overwrite-files -ovf	Overwrite any existing files in the directory. This will not affect other files.	-

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}
```

Options

Option	Description	Default
-debug -de	Enable debug output.	-
-exclude-enable-schema -exes	Dictates whether the enable_schema call is included in the export.	-
-exclude-privs -exp	Dictates whether privileges will be included in the export.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-overwrite-files -ovf	Overwrite any existing files in the directory. This will not affect other files.	-

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
-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
-debug -de	Enable debug output.	-
-fail-on-error -foe	{true false} Set failOnError attribute to true in changelog.	False

Option	Description	Default
-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	Export Object, System and Role grants.	-
-labels -la	Label expression to use for filtering which changes to operate on.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-overwrite-files -ovf	Overwrite any existing files in the directory. This will not affect other files.	-
-perform-detail-parse -pdp	Setting this flag will cause all functions, procedures and packages to undergo a complete parse to determine dependencies. This additional processing will cause the generation to take more time. This flag should only be used when there is a sorting issue in functions, procedures or packages.	-
-replace -re	Set replaceIfExists attribute to true in changelog.	-
-runalways -ra	Set runAlways attribute to false in changelog.	-
-runonchange -rc	Set runOnChange attribute to true in changelog.	-
-split -sp	This makes the export split the files into directories based on the object types.	-

Option	Description	Default
-sql -sq	Generate a SQL file along with the changelog showing the DDL for the object. This SQL is not intended for anything other than review.	-
-synonyms -sy	Export public synonyms.	-

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
Required		
-changelog-file -chf	The root changelog file.	-
Optional		
-contexts -co <contexts>	Context string to use for filtering the changes to operate on.	-
-database-changelog-table-name -dactn	Name of table to use for tracking change history.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-labels -la <labels>	Label expression to use for filtering the changes to operate on.	-
-liquibase-schema-name -lbsn	Schema to use for Liquibase objects.	-

Option	Description	Default
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is <code>INFO</code> level (no debug flag). Debug logging is <code>FINEST</code> level (both log and debug flag).	-
-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.	-
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	True
-output-default-schema -ouds	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False

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
-database-changelog-table-name -dactn	Name of table to use for tracking change history.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: <code>-defaults-file/tmp/liquibase.properties</code>	-

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

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|manocr {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
Required		
-changelog-file -chf	The root changelog file.	-
Optional		
-database-changelog-table-name -dactn	Name of table to use for tracking change history.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: <code>-defaults-file/tmp/liquibase.properties</code>	-
-liquibase-schema-name -lbsn	Schema to use for Liquibase objects.	-

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

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
Required		
<code>-changelog-file -chf</code>	The root changelog file.	-
Optional		
<code>-database-changelog-table-name -dactn</code>	Name of table to use for tracking change history.	-
<code>-debug -de</code>	Enable debug output.	-
<code>-default-schema-name -desn</code>	The default schema name to use for the database connection.	-
<code>-defaults-file -def</code>	Fully qualified path to the properties file you want to use. Example: <code>-defaults-file/tmp/liquibase.properties</code>	-
<code>-liquibase-schema-name -lbn</code>	Schema to use for Liquibase objects.	-
<code>-liquibase-tablespace-name -lbtn</code>	Tablespace to use for Liquibase objects.	-

Option	Description	Default
-log -lo	Enable logging. Standard logging is <code>INFO</code> level (no debug flag). Debug logging is <code>FINEST</code> level (both log and debug flag).	-
-output-default-schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true, they are qualified. If false, only objects outside the default schema are fully qualified.	False
-overwrite-files -ovf	Overwrite any existing files in the directory. This will not affect other files.	-
-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.	-
-secure-parsing -scp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	-
-output-file -ouf	The name of the file to write the output to.	-

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
-database-changelog-table-name -dactn	Name of table to use for tracking change history.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: <code>-defaults-file/tmp/liquibase.properties</code>	-
-liquibase-schema-name -lbn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-

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

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
Required		
<code>-changelog-file -chf</code>	The root changelog file.	-
<code>-tag -ta</code>	The tag to use during the execution of the command.	-
Optional		
<code>-contexts -co</code>	Context string to use for filtering which changes to operate on.	-
<code>-database-changelog-table-name -dactn</code>	Name of table to use for tracking change history.	-
<code>-debug -de</code>	Enable debug output.	-
<code>-default-schema-name -desn</code>	The default schema name to use for the database connection.	-
<code>-defaults-file -def</code>	Fully qualified path to the properties file you want to use. Example: <code>-defaults-file/tmp/liquibase.properties</code>	-
<code>-labels -la</code>	Label expression to use for filtering the changes to operate on.	-

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

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
Required		
-changelog-file -chf	The root changelog file.	-
-count -cu	The number of changes to apply.	-
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.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-labels -la	Label expression to use for filtering the changes to operate on.	-
-liquibase-schema-name -lbsn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-rollback-script -ros	Rollback script to execute.	-
-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.	-
-secure-parsing -scp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True
-output-default-schema -ouds	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False

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
Required		
<code>-changelog-file -chf</code>	The root changelog file.	-
<code>-count -cu</code>	The number of changes to apply.	-
Optional		
<code>-contexts -co</code>	Context string to use for filtering which changes to operate on.	-
<code>-database-changelog-table-name -dactn</code>	Name of table to use for tracking change history.	-
<code>-debug -de</code>	Enable debug output.	-
<code>-default-schema-name -desn</code>	The default schema name to use for the database connection.	-
<code>-defaults-file -def</code>	Fully qualified path to the properties file you want to use. Example: <code>-defaults-file/tmp/liquibase.properties</code>	-
<code>-labels -la</code>	Label expression to use for filtering the changes to operate on.	-
<code>-liquibase-schema-name -lbsn</code>	Schema to use for Liquibase objects.	-
<code>-liquibase-tablespace-name -lbtn</code>	Tablespace to use for Liquibase objects.	-
<code>-log -lo</code>	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
<code>-output-default-schema -ouds</code>	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
<code>-output-file -ouf</code>	The name of the file to write the output to.	-
<code>-overwrite-files -ovf</code>	Overwrite any existing files in the directory. This will not affect other files.	-

Option	Description	Default
<code>-rollback-script -ros</code>	Rollback script to execute.	-
<code>-search-path -sep <search-path></code>	Complete list of locations to search for files such as changelog files in. Specify multiple paths by separating them with commas.	-
<code>-secure-parsing -scp</code>	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	-

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
Required		
<code>-changelog-file -chf</code>	The root changelog file.	-
<code>-tag -ta</code>	The tag to use during the execution of the command.	-
Optional		
<code>-contexts -co</code>	Context string to use for filtering which changes to operate on.	-
<code>-database-changelog-table-name -dactn</code>	Name of table to use for tracking change history.	-
<code>-debug -de</code>	Enable debug output.	-
<code>-default-schema-name -desn</code>	The default schema name to use for the database connection.	-

Option	Description	Default
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-labels -la	Label expression to use for filtering the changes to operate on.	-
-liquibase-schema-name -lbn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-output-default-schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False
-output-file -ouf	The name of the file to write the output to.	-
-overwrite-files -ovf	Overwrite any existing files in the directory. This will not affect other files.	-
-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.	-
-secure-parsing -scp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True

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
Required		
-changelog-file -chf	The root changelog file.	-
-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		
-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.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-labels -la	Label expression to use for filtering the changes to operate on.	-
-liquibase-schema-name -lbn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-rollback-script -ros	Rollback script to execute.	-
-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.	-
-secure-parsing -scp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True

Option	Description	Default
-output-default-schema -ouuds	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False

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
Required		
-changelog-file -chf	The root changelog file.	-
-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		
-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.	-
-debug -de	Enable debug output.	-

Option	Description	Default
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-labels -la	Label expression to use for filtering the changes to operate on.	-
-liquibase-schema-name -lbsn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-output-default-schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False
-output-file -ouf	The name of the file to write the output to.	-
-overwrite-files -ovf	Overwrite any existing files in the directory. This will not affect other files.	-
-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.	-
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	True

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
-database-changelog-table-name -dactn	Name of table to use for tracking change history.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: <code>-defaults-file/tmp/liquibase.properties</code>	-
-liquibase-schema-name -lbsn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is <code>INFO</code> level (no debug flag). Debug logging is <code>FINEST</code> level (both log and debug flag).	-
-output-file -ouf	The name of the file to write the output to.	-
-overwrite-files -ovf	Overwrite any existing files in the directory. This will not affect other files.	-
-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.	-
-secure-parsing -scp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True
-snapshot-format -snf	Output format to use (JSON, YAML, or TXT)	-

Option	Description	Default
<code>-output-default-schema -ouuds</code>	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False

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 status

Generate a list of pending changesets.

Syntax

```
Liquibase|lb status|st {OPTIONS}
```

Options

Option	Description	Default
Required		
<code>-changelog-file -chf</code>	The root changelog file.	-
Optional		
<code>-contexts -co</code>	Context string to use for filtering which changes to operate on.	-
<code>-database-changelog-table- name -dactn</code>	Name of table to use for tracking change history.	-
<code>-debug -de</code>	Enable debug output.	-
<code>-default-schema-name -desn</code>	The default schema name to use for the database connection.	-
<code>-defaults-file -def</code>	Fully qualified path to the properties file you want to use. Example: <code>-defaults-file/tmp/liquibase.properties</code>	-
<code>-labels -la</code>	Label expression to use for filtering the changes to operate on.	-
<code>-liquibase-schema-name - lbsn</code>	Schema to use for Liquibase objects.	-
<code>-liquibase-tablespace- name -lbtn</code>	Tablespace to use for Liquibase objects.	-

Option	Description	Default
-log -lo	Enable logging. Standard logging is <code>INFO</code> level (no debug flag). Debug logging is <code>FINEST</code> level (both log and debug flag).	-
-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.	-
-secure-parsing -scp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True
-verbose -ve	Verbose flag	True
-output-default-schema - ouids	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False

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
```

3.4.35 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
Required		
-tag -ta	The tag to use during the execution of the command.	-
Optional		
-database-changelog-table- name -dactn	Name of table to use for tracking change history.	-
-debug -de	Enable debug output.	-

Option	Description	Default
<code>-default-schema-name -desn</code>	The default schema name to use for the database connection.	-
<code>-defaults-file -def</code>	Fully qualified path to the properties file you want to use. Example: <code>-defaults-file/tmp/liquibase.properties</code>	-
<code>-liquibase-schema-name -lbn</code>	Schema to use for Liquibase objects.	-
<code>-liquibase-tablespace-name -lbtn</code>	Tablespace to use for Liquibase objects.	-
<code>-log -lo</code>	Enable logging. Standard logging is <code>INFO</code> level (no debug flag). Debug logging is <code>FINEST</code> level (both log and debug flag).	-
<code>-search-path -sep</code>	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-
<code>-secure-parsing -scp</code>	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True
<code>-output-default-schema -ouds</code>	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False

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
```

3.4.36 tag-exists

Verify the existence of the specified tag.

Syntax

```
Liquibase|lb tag-exists|tae {OPTIONS}
```


Options

Option	Description	Default
Required		
-tag -ta	The tag to use during the execution of the command.	-
Optional		
-database-changelog-table-name -dactn	Name of table to use for tracking change history.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-liquibase-schema-name -lbsn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-search-path -sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-
-secure-parsing -scp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True
-output-default-schema -ouds	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False

3.4.37 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
Required		
-changelog-file -chf	The root changelog file.	-
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.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def <defaults-file> {FILE}	Fully qualified path to the properties file you want to use. For example, defaults-file /tmp/liquibase.properties	-
-labels -la	Label expression to use for filtering the changes to operate on.	-
-liquibase-schema-name -lbsn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-output-default-schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False
-output-file -ouf	The name of the file to write the output to.	-
-overwrite-files -ovf	Overwrite any existing files in the directory. This will not affect other files.	-
-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.	-
-secure-parsing -scp	If true, remove functionality from file parsers, which can be used insecurely. An example is disabling remote XML entity support.	True
-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
```

3.4.38 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
Required		
-changelog-file -chf	The root changelog file.	-
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.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-labels -la	Label expression to use for filtering the changes to operate on.	-
-liquibase-schema-name -lbsn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-

Option	Description	Default
-log -lo	Enable logging. Standard logging is <code>INFO</code> level (no debug flag). Debug logging is <code>FINEST</code> level (both log and debug flag).	-
-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.	-
-secure-parsing -scp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True
-show-summary -shs <show-summary> {OFF SUMMARY VERBOSE}	Produces a summary list of any changesets skipped and why they were skipped. Valid values are OFF, SUMMARY, and VERBOSE.	SUMMARY
-output-default-schema -ouds	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False
-override-app-alias -ovaa	Override value to be used for the APEX application alias.	-
-override-app-id -ovai	Override value to be used for the APEX application id.	-
-override-app-schema -ovas	Override value to be used for the APEX workspace schema.	-
-override-app-workspace -ovaw	Override value to be used for the APEX application workspace.	-

3.4.39 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
Required		
-changelog-file -chf	The root changelog file.	-
-count -cu	The number of changes to apply.	-
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.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-labels l-	Label expression to use for filtering the changes to operate on.	-
-liquibase-schema-name -lbsn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-search-path -sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-
-secure-parsing -scp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True
-show-summary -shs <show-summary> {OFF SUMMARY VERBOSE}	Produces a summary list of any changesets skipped and why they were skipped. Valid values are OFF, SUMMARY, and VERBOSE.	SUMMARY
-output-default-schema -ouds	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False

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
```

3.4.40 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
Required		
-changelog-file -chf	The root changelog file.	-
-count -cu	The number of changes to apply.	-
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.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-labels -la	Label expression to use for filtering the changes to operate on.	-
-liquibase-schema-name -lbsn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-output-default-schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False
-output-file -ouf	The name of the file to write the output to.	-
-overwrite-files -ovf	Overwrite any existing files in the directory. This will not affect other files.	-
-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.	-

Option	Description	Default
<code>-secure-parsing scp</code>	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True

3.4.41 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
Required		
<code>-changelog-file -chf</code>	The root changelog file.	-
Optional		
<code>-contexts -co</code>	Context string to use for filtering which changes to operate on.	-
<code>-database-changelog-table-name -dactn</code>	Name of table to use for tracking change history.	-
<code>-debug -de</code>	Enable debug output.	-
<code>-default-schema-name -desn</code>	The default schema name to use for the database connection.	-
<code>-defaults-file -def</code>	Fully qualified path to the properties file you want to use. Example: <code>-defaults-file/tmp/liquibase.properties</code>	-
<code>-labels -la</code>	Label expression to use for filtering the changes to operate on.	-
<code>-liquibase-schema-name -lbsn</code>	Schema to use for Liquibase objects.	-
<code>-liquibase-tablespace-name -lbtn</code>	Tablespace to use for Liquibase objects.	-
<code>-log -lo</code>	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
<code>-output-default-schema -ouds</code>	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
<code>-output-file -ouf</code>	The name of the file to write the output to.	-

Option	Description	Default
<code>-overwrite-files -ovf</code>	Overwrite any existing files in the directory. This will not affect other files.	-
<code>-search-path -sep</code>	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-
<code>-secure-parsing -scp</code>	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True
<code>-override-app-alias -ovaa</code>	Override value to be used for the APEX application alias.	-
<code>-override-app-id -ovai</code>	Override value to be used for the APEX application id.	-
<code>-override-app-schema -ovas</code>	Override value to be used for the APEX workspace schema.	-
<code>-override-app-workspace -ovaw</code>	Override value to be used for the APEX application workspace.	-

3.4.42 update-testing-rollback

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

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
Required		
<code>-changelog-file -chf</code>	The root changelog file.	-
Optional		
<code>-contexts -co</code>	Context string to use for filtering which changes to operate on.	-
<code>-database-changelog-table-name -dactn</code>	Name of table to use for tracking change history.	-
<code>-debug -de</code>	Enable debug output.	-
<code>-default-schema-name -desn</code>	The default schema name to use for the database connection.	-

Option	Description	Default
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-labels -la	Label expression to use for filtering the changes to operate on.	-
-liquibase-schema-name -lbn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-output-default-schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False
-output-file -ouf	The name of the file to write the output to.	-
-overwrite-files -ovf	Overwrite any existing files in the directory. This will not affect other files.	-
-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.	-
-secure-parsing -scp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	-

3.4.43 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
Required		

Option	Description	Default
-changelog-file -chf	The root changelog file.	-
-tag -ta	The tag to use during the execution of the command.	-
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.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: <code>-defaults-file/tmp/liquibase.properties</code>	-
-labels -la	Label expression to use for filtering the changes to operate on.	-
-liquibase-schema-name -lbsn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is <code>INFO</code> level (no debug flag). Debug logging is <code>FINEST</code> level (both log and debug flag).	-
-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.	-
-secure-parsing -scp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	-
-show-summary -shs <show-summary> {OFF SUMMARY VERBOSE}	Produces a summary list of any changesets skipped and why they were skipped. Valid values are OFF, SUMMARY, and VERBOSE.	SUMMARY
-output-default-schema -ouds	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False

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
```

3.4.44 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
Required		
-changelog-file -chf	The root changelog file.	-
-tag -ta	The tag to use during the execution of the command.	-
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.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-labels -la	Label expression to use for filtering the changes to operate on.	-
-liquibase-schema-name -lbsn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbtn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-output-default-schema -ouds	Control whether names of objects in the default schema are fully qualified or not. If true they are qualified. If false, only objects outside the default schema are fully qualified.	False

Option	Description	Default
-output-file -ouf	The name of the file to write the output to.	-
-overwrite-files -ovf	Overwrite any existing files in the directory. This will not affect other files.	-
-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.	-
-secure-parsing -scp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True

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
```

3.4.45 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
Required		
-changelog-file -chf	The root changelog file.	-
Optional		
-database-changelog-table-name -dactn	Name of table to use for tracking change history.	-
-debug -de	Enable debug output.	-
-default-schema-name -desn	The default schema name to use for the database connection.	-

Option	Description	Default
-defaults-file -def	Fully qualified path to the properties file you want to use. Example: -defaults-file/tmp/liquibase.properties	-
-liquibase-schema-name -lbn	Schema to use for Liquibase objects.	-
-liquibase-tablespace-name -lbn	Tablespace to use for Liquibase objects.	-
-log -lo	Enable logging. Standard logging is INFO level (no debug flag). Debug logging is FINEST level (both log and debug flag).	-
-search-path -sep	Complete list of locations to search for files such as changelog files. You can specify multiple paths by separating them with commas.	-
-secure-parsing -scp	If true, remove functionality from file parsers that could be used insecurely. An example is disabling remote XML entity support.	True
-output-default-schema -ouds	Controls whether names of objects in the default schema are fully qualified or not. If false, only objects outside the default schema are fully qualified.	False

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
```

3.4.46 version

Display version information.

Syntax

```
Liquibase|lb version|ve
```

Options

Option	Description	Default
-debug -de	Enable debug output.	-

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](#).

```
liquibase.properties - Notepad
File Edit Format View Help
changelog-file: example-changelog.xml
driver: oracle.jdbc.OracleDriver
username: 
password: 
url: jdbc:oracle:thin:@

liquibase.hub.mode=off
```

- 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.
- Run the update command.

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

```
C:\Users\[username]>liquibase --changelog-file=fruits_table.xml update
#####
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
#####
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 'createXmlObject'.
Check for spelling or capitalization errors and missing extensions such as liquibase-commercial.

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

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

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.

- 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:

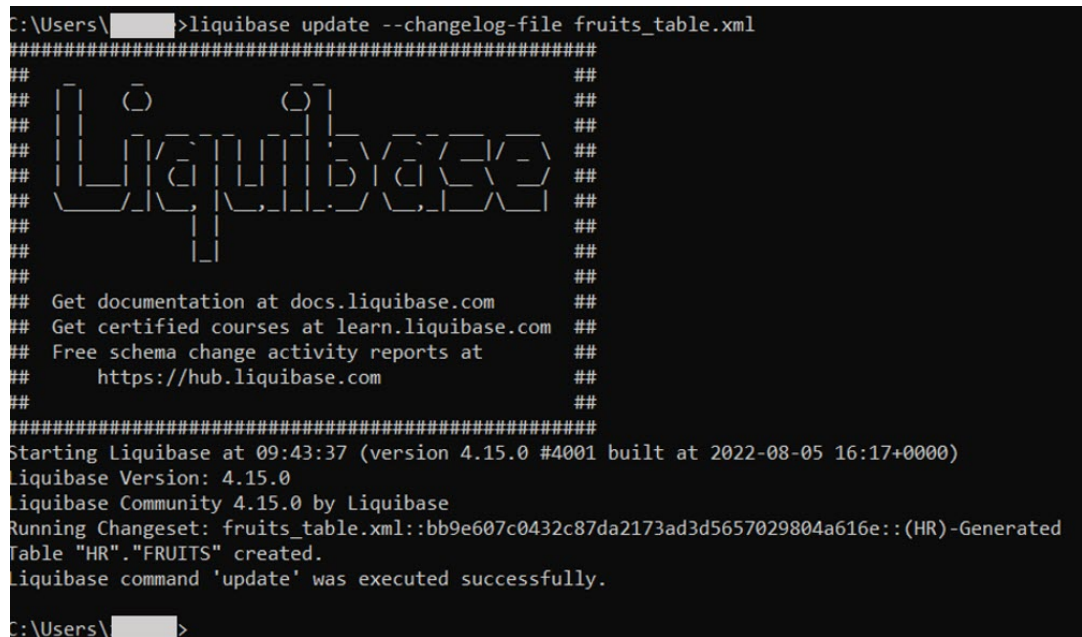
```
change-exec-listener-class:  
liquibase.changelog.visitor.OracleActionChangeListener
```



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.

```

C:\Users\>liquibase update --changelog-file controller.xml
#####
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
#####
Starting Liquibase at 07:27:00 (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: departments_seq_sequence.xml::93020a4f5c3fc570029b0695d52763142b6e44e1::(HR)-Generated
Statement executed successfully
Running Changeset: employees_seq_sequence.xml::42e3db1348e500dade36829bab3b7f5343ad6f09::(HR)-Generated
Statement executed successfully
Running Changeset: locations_seq_sequence.xml::7ec49fad51eb8c0b53fa0128bf6ef2d3fee25d35::(HR)-Generated
Statement executed successfully
Running Changeset: departments_table.xml::62926485197be515dcecdf2174bca09c4331d020::(HR)-Generated
Table "HR"."DEPARTMENTS" altered.
Table "HR"."DEPARTMENTS" altered.
Table "HR"."DEPARTMENTS" altered.
Table "HR"."DEPARTMENTS" altered.
Running Changeset: employees_table.xml::14662f7d19c2e2d74bd735e31b78b79cf20ee0f6::(HR)-Generated
Table "HR"."EMPLOYEES" altered.
Table "HR"."EMPLOYEES" altered.
Table "HR"."EMPLOYEES" altered.
Table "HR"."EMPLOYEES" altered.

```

3.6 Dynamic Object Transformation with SQLcl Liquibase and DBMS_METADATA Oracle Database Package

Oracle supplies many packages, which are automatically installed with Oracle Database, that extend database functionality. One of these packages, 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-existing 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
```


```
SQL> lb generate-schema
--Starting Liquibase at 15:59:29 (version 4.15.0 #0 built at 2022-08-19 14:45+0000)

Export Flags Used:

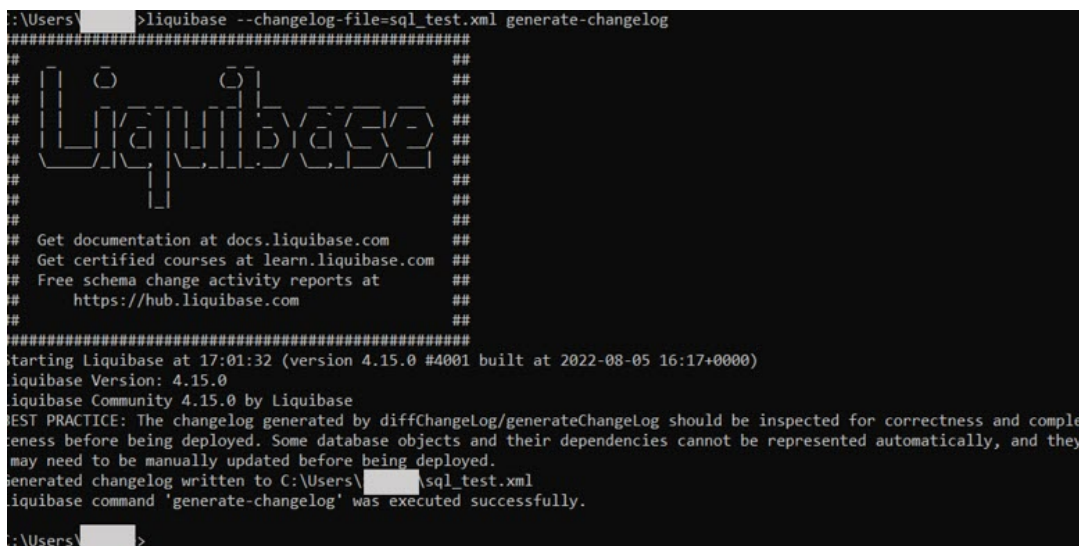
Export Grants          false
Export Synonyms       false

[Method loadCaptureTable]:
  [Type - TYPE_SPEC]:          451 ms
  [Type - TYPE_BODY]:          247 ms
  [Type - SEQUENCE]:           205 ms
  [Type - DIRECTORY]:          112 ms
  [Type - CLUSTER]:            1473 ms
  [Type - TABLE]:             25672 ms
```

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

 **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> 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	PK_MAN	13000		100	20	
202	Rat	Fay	RFAY	603.123.6666	17-AUG-97	PK_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	515.123.8888	07-JUN-94	AC_MGR	12000		101	110	
206	William	Gietz	WGIEZT	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
```

```

C:\Users\ [redacted] > liquibase --changelog-file=sql_test2.xml generate-changelog
#####
##
##
## Liquibase
##
##
##
## Get documentation at docs.liquibase.com
## Get certified courses at learn.liquibase.com
## Free schema change activity reports at
## https://hub.liquibase.com
##
#####
Starting Liquibase at 09:39:06 (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
BEST PRACTICE: The changelog generated by diffChangelog/generateChangelog should be inspected for correctness and completeness before being deployed. Some database objects and their dependencies cannot be represented automatically, and they may need to be manually updated before being deployed.
Generated changelog written to C:\Users\ [redacted] \sql_test2.xml
Liquibase command 'generate-changelog' was executed successfully.
C:\Users\ [redacted] >

```

- 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.

```

- In the open-source Liquibase command-line window, run the update command.

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

```

C:\Users\ [redacted] > liquibase --changelog-file=sql_test2.xml update
#####
##
##
## Liquibase
##
##
##
## Get documentation at docs.liquibase.com
## Get certified courses at learn.liquibase.com
## Free schema change activity reports at
## https://hub.liquibase.com
##
#####
Starting Liquibase at 09:52:16 (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_test2.xml::1663339182389-1: [redacted] (generated)
Unexpected error running Liquibase: Migration failed for changeset sql_test2.xml::1663339182389-1: [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_ID_PK PRIMARY KEY (REGION_ID))]
For more information, please use the --log-level flag
C:\Users\ [redacted] >

```

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: [REDACTED]
-- 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> lb update -changelog-file controller.xml
--Starting Liquibase at 10:05:17 (version 4.15.0 #0 built at 2022-08-19 14:45+0000)
-- Loaded 37 change(s)
Running Changeset: departments_seq_sequence.xml::93020a4f5c3fc570029b0695d52763142b6e44e1::(HR)-Generated
Statement executed successfully
Running Changeset: employees_seq_sequence.xml::42e3db1348e500dade36829bab3b7f5343ad6f09::(HR)-Generated
Statement executed successfully
Running Changeset: locations_seq_sequence.xml::7ec49fad51eb8c0b53fa0128bf6ef2d3fee25d35::(HR)-Generated
Statement executed successfully
Running Changeset: departments_table.xml::62926485197be515dcecdf2174bca09c4331d020::(HR)-Generated
Table "HR"."DEPARTMENTS" altered.
Table "HR"."DEPARTMENTS" altered.
Table "HR"."DEPARTMENTS" altered.
Table "HR"."DEPARTMENTS" altered.
Running Changeset: employees_table.xml::14662f7d19c2e2d74bd735e31b78b79cf20ee0f6::(HR)-Generated
Table "HR"."EMPLOYEES" altered.
Table "HR"."EMPLOYEES" altered.
Table "HR"."EMPLOYEES" altered.
Table "HR"."EMPLOYEES" altered.
Running Changeset: regions_table.xml::52334f421d935229140b0468d06157dd45c20f96::(HR)-Generated
Statement executed successfully
Running Changeset: jobs_table.xml::84d6c14a5af0d22812c689a42e58e6c0cf300c1e::(HR)-Generated
Statement executed successfully
Running Changeset: activities_table.xml::a7941c2352f1cad12cd6e4eadfbd4fc9d1d438d6::(HR)-Generated
Table "HR"."ACTIVITIES" created.
Running Changeset: countries_table.xml::43c08b308b52ef60fc8e8f42f33ebda679f18323::(HR)-Generated
Statement executed successfully

```

```
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.
```


2. Start your H2 database:

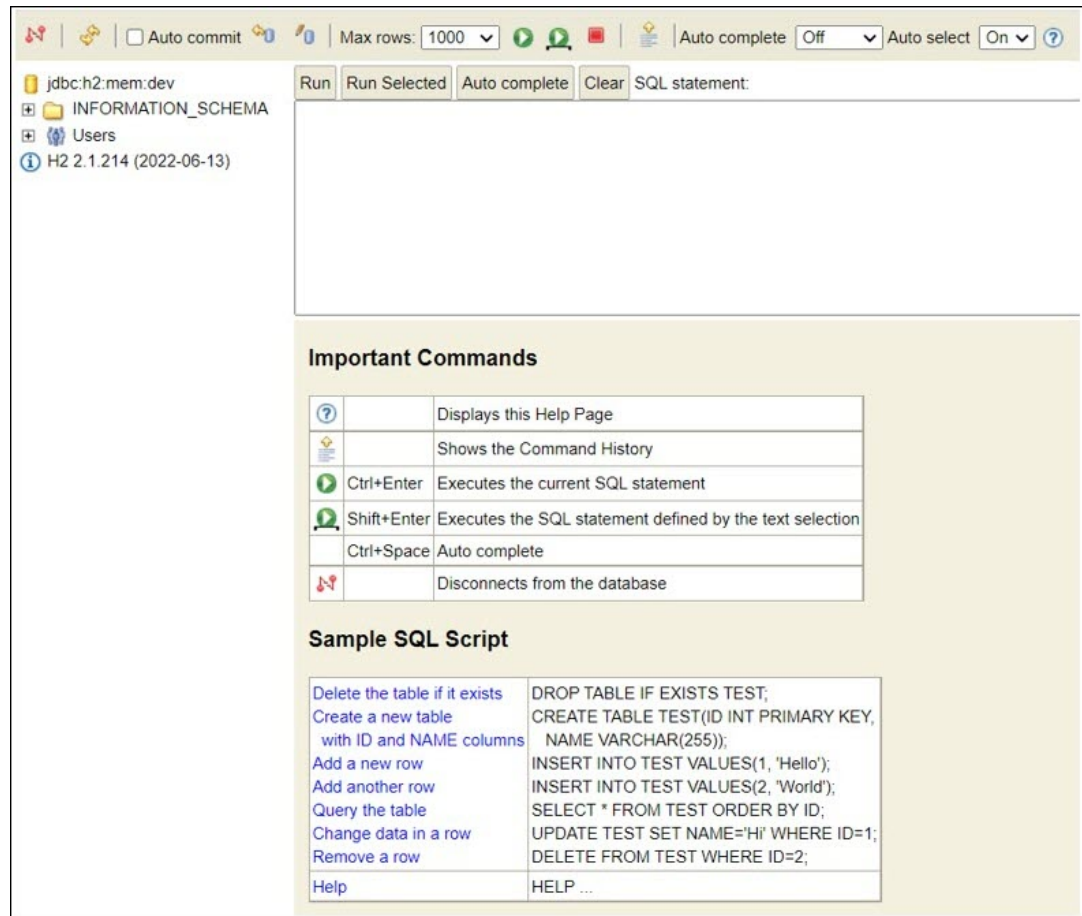
```
>liquibase init start-h2
```

```
C:\Users\>liquibase init start-h2
#####
##                               ##
##  LIQUIBASE                     ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##  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 13:50:44 (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
Starting Example H2 Database...
NOTE: The database does not persist data, so stopping and restarting this process will reset it back to a blank database

Connection Information:
Dev database:
  JDBC URL: jdbc:h2:tcp://localhost:9090/mem:dev
  Username: dbuser
  Password: letmein
Integration database:
  JDBC URL: jdbc:h2:tcp://localhost:9090/mem:integration
  Username: dbuser
  Password: letmein

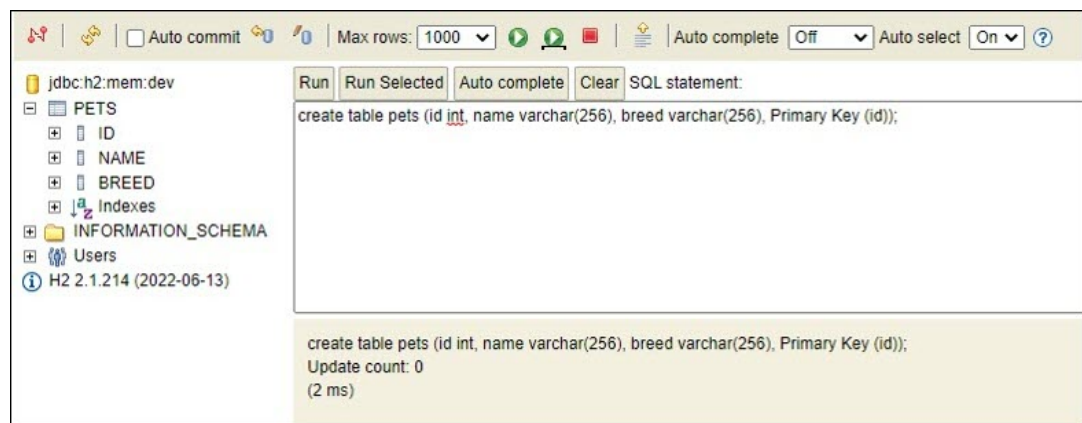
Opening Database Console in Browser...
Dev Web URL: http://localhost:8080/frame.jsp?jsessionId=8321df5bcfa92fc43c05b576e86ad283
Integration Web URL: http://localhost:8080/frame.jsp?jsessionId=eccffa1c93a406ac30b50493f105c0db
```

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`.


```

C:\Users\>liquibase --changelog-file-examplepets.xml generate-changelog
#####
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
##                               ##
#####
## 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 14:15:05 (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
BEST PRACTICE: The changelog generated by diffChangelog/generateChangelog should be inspected for correctness and completeness before being deployed.
Some database objects and their dependencies cannot be represented automatically, and they may need to be manually updated before being deployed.
Generated changelog written to C:\Users\>\examplepets.xml
Liquibase command 'generate-changelog' was executed successfully.
C:\Users\>

```

The output shows where the file is saved.

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

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

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

```
TABLE_NAME
```

```

-----
REGIONS
LOCATIONS
DEPARTMENTS
JOBS
EMPLOYEES
JOB_HISTORY
COUNTRIES

```

7 rows selected.

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

```

SQL> lb update --changelog-file examplepets.xml
SQL> select table_name from user_tables;

```

```

SQL> lb update --changelog-file examplepets.xml
--Starting Liquibase at 14:40:11 (version 4.15.0 #0 built at 2022-08-19 14:45+0000)
-- Loaded 1 change(s)
Running Changeset: examplepets.xml::1662750905905-1:: (generated)

Operation completed successfully.

SQL> select table_name from user_tables;

TABLE_NAME
-----
REGIONS
LOCATIONS
DEPARTMENTS
JOBS
EMPLOYEES
JOB_HISTORY
DATABASECHANGELOGLOCK
DATABASECHANGELOG_ACTIONS
DATABASECHANGELOG
PETS
COUNTRIES

11 rows selected.

SQL>
  
```

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 Tips for Liquibase Settings

This section covers the following:

- [How to Exclude Table Properties When Deploying Changelogs to a New Environment](#)
- [Create Database Objects in a Schema Different From the Connected Schema](#)

3.10.1 How to Exclude Table Properties When Deploying Changelogs to a New Environment

When capturing tables from one environment and deploying to another, there are certain table properties you may want to exclude from the deployment while creating the table. This may be due to these properties being unavailable or undesired in your target environment, such as:

- [Partitioning](#)
- [Compression](#)
- [Tablespace](#)

SQLcl uses the Data Definition Language (DDL) session settings in the target environment, where the database objects are created or altered in (and not the environment the changelog was generated from), to generate the DDL for the objects. By turning off the DDL settings, you can prevent the corresponding table properties from being included in the table creation.

1. Generate your Liquibase changelog file for the table you want to capture and deploy.

```
liquibase generate-object -object-name [table name] -object-type table
```

As an example, consider the following table:

```
CREATE TABLE "PARTITION_COMPRESSION_TABLESPACE_TEST"
  (
    "A" VARCHAR2(20) NOT NULL ENABLE,
    "B" VARCHAR2(20),
    "C" VARCHAR2(20) NOT NULL ENABLE,
    CONSTRAINT "PARTITION_COMPRESSION_TABLESPACE_TEST_PK" PRIMARY KEY
("A")
  USING INDEX
  PCTFREE 10 INITRANS 2 MAXTRANS 255 LOGGING
  TABLESPACE "USERS" ENABLE
  ) PCTFREE 0 PCTUSED 40 INITRANS 1 COMPRESS BASIC
  STORAGE( BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE
DEFAULT)
  TABLESPACE "USERS"
  PARTITION BY HASH ("C")
(PARTITION "SYS_P803" SEGMENT CREATION DEFERRED
  COMPRESS BASIC
  TABLESPACE "USERS");
```

The following is an excerpt from the resulting changelog (the partition, compression and tablespace attributes are highlighted):

```
<?xml version="1.0" encoding="UTF-8"?>
<databaseChangeLog
xmlns="http://www.liquibase.org/xml/ns/dbchangelog"
...
  <TABLE_PROPERTIES>
    <HASH_PARTITIONING>
```

```

<COL_LIST>
  <COL_LIST_ITEM>
    <NAME>C</NAME>
  </COL_LIST_ITEM>
</COL_LIST>
<DEFAULT_PHYSICAL_PROPERTIES>
  <HEAP_TABLE>
    <SEGMENT_ATTRIBUTES>
      <PCTFREE>0</PCTFREE>
      <PCTUSED>40</PCTUSED>
      <INITRANS>1</INITRANS>
      <MAXTRANS>255</MAXTRANS>
      <STORAGE>
        <BUFFER_POOL>DEFAULT</BUFFER_POOL>
        <FLASH_CACHE>DEFAULT</FLASH_CACHE>
        <CELL_FLASH_CACHE>DEFAULT</CELL_FLASH_CACHE>
      </STORAGE>
      <TABLESPACE>USERS</TABLESPACE>
    </SEGMENT_ATTRIBUTES>
    <COMPRESS>BASIC</COMPRESS>
  </HEAP_TABLE>
</DEFAULT_PHYSICAL_PROPERTIES>
<PARTITION_LIST>
  <PARTITION_LIST_ITEM>
    <NAME>SYS_P803</NAME>
    <SEGMENT_ATTRIBUTES>
      <SEGMENT_CREATION_DEFERRED></
SEGMENT_CREATION_DEFERRED>
      <TABLESPACE>USERS</TABLESPACE>
    </SEGMENT_ATTRIBUTES>
    <COMPRESS>BASIC</COMPRESS>
  </PARTITION_LIST_ITEM>
</PARTITION_LIST>
</HASH_PARTITIONING>
</TABLE_PROPERTIES>
</RELATIONAL_TABLE>
</TABLE>]]></n0:source>
</n0:createSxmlObject>
</changeSet>
</databaseChangeLog>

```

2. In the environment where you apply the update and generate the table, turn off the following DDL settings:

```

set ddl partitioning off
set ddl segment_attributes off
set ddl tablespace off

```

Partitioning turns off the partitioning property, segment_attributes turns off the compression property, and tablespace turns off the tablespace property.

```

SQL> show ddl
Parameters
-----
BODY                               : ON

```

```

COLLATION_CLAUSE           : NEVER
CONSTRAINTS                : ON
CONSTRAINTS_AS_ALTER      : ON
EMIT_SCHEMA                : ON
FORCE                      : ON
INHERIT                    : ON
INSERT                     : ON
OID                        : ON
PARTITIONING               : OFF
PRETTY                     : ON
REF_CONSTRAINTS           : ON
SEGMENT_ATTRIBUTES        : OFF
SIZE_BYTE_KEYWORD         : ON
SPECIFICATION              : ON
SQLTERMINATOR              : ON
STORAGE                    : ON
TABLESPACE                 : OFF

```

```
-----
End Parameters
```

3. To confirm that these settings are not included in the table generation, use the `liquibase update-sql` command. This command shows you the exact SQL and PL/SQL code that will be run by the `update` command before you execute it.

```
liquibase update-sql -changelog-file
partition_compression_tablespace_test_table.xml
```

When partitioning, compression, and tablespace settings are turned off, the SQL code looks like the following snippet:

```

-- Changeset
partition_compression_tablespace_test_table.xml::fb1d77405bcd3cf7d60e555337
b80ec9555134d7::(HR)-Generated
CREATE TABLE "PARTITION_COMPRESSION_TABLESPACE_TEST"
  (    "A" VARCHAR2(20) NOT NULL ENABLE,
    "B" VARCHAR2(20),
    "C" VARCHAR2(20) NOT NULL ENABLE,
    CONSTRAINT "PARTITION_COMPRESSION_TABLESPACE_TEST_PK" PRIMARY KEY
("A")
  USING INDEX ENABLE
  );

```

The following is an example of the SQL code if partitioning, compression, and tablespace settings were turned on:

```

-- Changeset
partition_compression_tablespace_test_table.xml::fb1d77405bcd3cf7d60e555337
b80ec9555134d7::(HR)-Generated
CREATE TABLE "PARTITION_COMPRESSION_TABLESPACE_TEST"
  (    "A" VARCHAR2(20) NOT NULL ENABLE,
    "B" VARCHAR2(20),
    "C" VARCHAR2(20) NOT NULL ENABLE,
    CONSTRAINT "PARTITION_COMPRESSION_TABLESPACE_TEST_PK" PRIMARY KEY
("A")

```

```

USING INDEX
PCTFREE 10 INITRANS 2 MAXTRANS 255 LOGGING
TABLESPACE "USERS" ENABLE
) PCTFREE 0 PCTUSED 40 INITRANS 1 COMPRESS BASIC
STORAGE (
BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)
TABLESPACE "USERS"
PARTITION BY HASH ("C")
(PARTITION "SYS_P803" SEGMENT CREATION DEFERRED
COMPRESS BASIC
TABLESPACE "USERS");

```

4. You can apply the update and create the table by running the `update` command in your target environment. This creates the table as unpartitioned, uncompressed, and uses the tablespace of the target environment (rather than attempting to use the tablespace of the environment the changelog was generated from).

```

liquibase update -changelog-file
partition_compression_tablespace_test_table.xml

```

3.10.2 Create Database Objects in a Schema Different From the Connected Schema

With SQLcl Liquibase, you can make deployments to a different database user schema than the one you are connected to. However, you must have the required permissions for the target user schema.

There are three important parameters related to this for the `liquibase update` command:

- `-output-default-schema|-ouds`
Controls if the schema is output or not when running the data definition language (DDL) SQL to create or alter your database object.

- If `-output-default-schema true` is set, the schema is included.

```
create table storefront.merchandise ...
```

- If `-output-default-schema false` is set or `-output-default-schema` is not set at all, the schema is not included.

```
create table merchandise ...
```

To deploy database objects to a different schema than the connected schema, you must set `-output-default-schema true` so that you can specify the schema you want to create the objects in using `-default-schema-name`.

- `-default-schema-name|-desn`
If `-output-default-schema true` is set, the `-desn` parameter controls which schema is output.

Use this parameter to specify the schema in which to create your database objects. For example, if you are connected to `test_user` and you want to create your table in `storefront`, your command would be:

```
liquibase update -changelog-file merchandise_table.xml -output-default-schema true -default-schema-name storefront
```

If `-output-default-schema true` is set and `-default-schema-name` is not set, the schema output is based on the `ownerName` attribute for your changeset in your changelog file.

```
<n0:createSxmlObject objectName="Merchandise" objectType="TABLE"
ownerName="LBUSER" replaceIfExists="false" >
```

If `ownerName` is not set, the schema you are connected to is used.

- `-liquibase-schema-name|-lbsn`

One of the big advantages of the Liquibase functionality in SQLcl is the ability to track and manage your changes. This is mainly done with the `databasechangelog` tracking tables automatically created and updated in your schema when you run Liquibase.

`-liquibase-schema-name` allows you to control in which schema you update Liquibase tracking information through the `databasechangelog` tables.

This allows you to have use cases such as having a control schema or user that tracks all your Liquibase change information, while applying the database objects themselves to other schemas.

For example, you are connected to the user or schema `storefront` and want to create your merchandise table using your `merchandise_table.xml` changelog file. However, you do not want Liquibase to create your `databasechangelog` tables in this schema. You want the tracking information to be stored in the pre-existing `databasechangelog` tables in your schema `control_user`.

The following command accomplishes this:

```
liquibase update -changelog-file merchandise_table.xml -liquibase-schema-name control_user
```

Note:

Storefront needs to have the permission to write on the `databasechangelog`, `databasechangeloglock`, and `databasechangelog_actions` tables in `control_user`.

```
GRANT SELECT, INSERT, UPDATE, DELETE ON
CONTROL_USER.DATABASECHANGELOG TO STOREFRONT;
GRANT SELECT, INSERT, UPDATE, DELETE ON
CONTROL_USER.DATABASECHANGELOGLOCK TO STOREFRONT;
GRANT SELECT, INSERT, UPDATE, DELETE ON
CONTROL_USER.DATABASECHANGELOG_ACTIONS TO STOREFRONT;
```

3.11 Important 23.4 Update with Liquibase Changelog Files

For cross-schema use, changelog files generated before SQLcl release 23.4 may require regeneration or manual updates. These alterations are necessary only if you are changing schema names between your export and import with pre-23.4 changelogs.

If you do not regenerate your changelogs or make the manual adjustments, then:

- Changelogs containing schema names are applied only to the schema named in them, regardless of provided parameters.
- Changelogs not containing schema names are applied only to the schema you are currently connected to with SQLcl, regardless of provided parameters.

SQLcl release 23.4 introduced a `%USER_NAME%` replacement for the schema name stored in changesets.

There are two types of changes for manually updating your changelogs with the proper `%USER_NAME%` substitution:

- Changelogs with `<SCHEMA></SCHEMA>` XML element
- Changelogs that use SQL within a CDATA field

For changelogs with the `<SCHEMA></SCHEMA>` XML element, replace the content inside with `%USER_NAME%`.

In the following code block, the two `<SCHEMA>` XML elements that appear in this code are highlighted using bold font. These are replaced with `%USER_NAME%`

```
<?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-latest.xsd">
  <changeSet id="5b3935a6b05750a24ac6ebc1c646bc6fe4cb4b40" author="(HR) -
Generated" failOnError="false" runOnChange="true" runAlways="false" >
    <n0:createXmlObject objectName="MERCHANDISE" objectType="TABLE"
ownerName="HR" replaceIfExists="true" >
      0:source<<![CDATA[
<TABLE xmlns="http://xmlns.oracle.com/ku" version="1.0">
<SCHEMA>HR</SCHEMA>
<NAME>MERCHANDISE</NAME>
<RELATIONAL_TABLE>
  <COL_LIST>
    <COL_LIST_ITEM>
      <NAME>ID</NAME>
      <DATATYPE>NUMBER</DATATYPE>
      <IDENTITY_COLUMN>
<SCHEMA>HR</SCHEMA>
      <GENERATION>ALWAYS</GENERATION>
      <START_WITH>1</START_WITH>
      <INCREMENT>1</INCREMENT>
      <MINVALUE>1</MINVALUE>
      <MAXVALUE>99999999999999999999999999999999</MAXVALUE>
```

```

    <CACHE>20</CACHE>
  </IDENTITY_COLUMN>
...

```

After you do the manual adjustment, this section changes to:

```

<?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-latest.xsd">
  <changeSet id="5b3935a6b05750a24ac6ebc1c646bc6fe4cb4b40" author="(HR) -
Generated" failOnError="false" runOnChange="true" runAlways="false" >
    <n0:createXmlObject objectName="MERCHANDISE" objectType="TABLE"
ownerName="HR" replaceIfExists="true" >
      <n0:source><![CDATA[
<TABLE xmlns="http://xmlns.oracle.com/ku" version="1.0">
<SCHEMA>%USER_NAME%</SCHEMA>
<NAME>MERCHANDISE</NAME>
<RELATIONAL_TABLE>
  <COL_LIST>
    <COL_LIST_ITEM>
      <NAME>ID</NAME>
      <DATATYPE>NUMBER</DATATYPE>
      <IDENTITY_COLUMN>
<CHEMA>%USER_NAME%</SCHEMA>
      <GENERATION>ALWAYS</GENERATION>
      <START_WITH>1</START_WITH>
      <INCREMENT>1</INCREMENT>
      <MINVALUE>1</MINVALUE>
      <MAXVALUE>99999999999999999999999999999999</MAXVALUE>
      <CACHE>20</CACHE>
      </IDENTITY_COLUMN>
...

```

For changelogs that use SQL within the CDATA field, attach "%USER_NAME%". to the front of all database object references. If a schema name is in these locations, replace it with "%USER_NAME%". Note that there is a period after "%USER_NAME%".

Two examples are shown below, each showing a changelog file before and after the manual adjustment, with the area of adjustment highlighted in bold font in the code block for emphasis.

Example 1

```

<?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-latest.xsd">
  <changeSet id="f1b1bf677cf990caa0147f863ea18486cdf23815" author="(LBUSER) -
Generated" failOnError="false" runOnChange="false" runAlways="false" >

```

```

<n0:createOracleRefConstraint objectName="EMP_JOB_FK"
objectType="REF_CONSTRAINT" ownerName="LBUSER" replaceIfExists="false" >
<n0:source><![CDATA[ALTER TABLE "LBUSER"."EMPLOYEES" ADD CONSTRAINT
"EMP_JOB_FK" FOREIGN KEY ("JOB_ID") REFERENCES "LBUSER"."JOBS" ("JOB_ID")
ENABLE;]]></n0:source>
</n0:createOracleRefConstraint>
</changeSet>
</databaseChangeLog>

```

After you do the manual adjustment, this section changes to:

```

<?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-latest.xsd">
<changeSet id="f1b1bf677cf990caa0147f863ea18486cdf23815" author="(LBUSER)-
Generated" failOnError="false" runOnChange="false" runAlways="false" >
<n0:createOracleRefConstraint objectName="EMP_JOB_FK"
objectType="REF_CONSTRAINT" ownerName="LBUSER" replaceIfExists="false" >
<n0:source><![CDATA[ALTER TABLE "%USER_NAME%"."EMPLOYEES" ADD CONSTRAINT
"EMP_JOB_FK" FOREIGN KEY ("JOB_ID") REFERENCES "%USER_NAME%"."JOBS"
("JOB_ID") ENABLE;]]></n0:source>
</n0:createOracleRefConstraint>
</changeSet>
</databaseChangeLog>

```

Example 2

```

<?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-latest.xsd">
<changeSet id="2b1ce58fc2f1781ce70d5bb99bf23b6ae8741ff3" author="(TEST9)-
Generated" failOnError="false" runOnChange="false" runAlways="false" >
<n0:createOracleProcedure objectName="P_SQLCLERROR_PROCEDURE"
objectType="PROCEDURE" ownerName="TEST9" replaceIfExists="false" >
<n0:source><![CDATA[CREATE OR REPLACE EDITIONABLE PROCEDURE
"TEST9"."P_SQLCLERROR_PROCEDURE" is
begin
null;
end p_sqlclerror_procedure;
/]]></n0:source>
</n0:createOracleProcedure>
</changeSet>
</databaseChangeLog>

```


After you do the manual adjustment, this section appears as follows:

```
<?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-latest.xsd">
  <changeSet id="2b1ce58fc2f1781ce70d5bb99bf23b6ae8741ff3" author="(TEST9)-
Generated" failOnError="false" runOnChange="false" runAlways="false" >
    <n0:createOracleProcedure objectName="P_SQLCLERROR_PROCEDURE"
objectType="PROCEDURE" ownerName="TEST9" replaceIfExists="false" >
      <n0:source><![CDATA[CREATE OR REPLACE EDITIONABLE PROCEDURE
"%USER_NAME%". "P_SQLCLERROR_PROCEDURE" is
begin
null;
end p_sqlclerror_procedure;
/]]></n0:source>
    </n0:createOracleProcedure>
  </changeSet>
</databaseChangeLog>
```

3.12 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](#)

3.12.1 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
```

3.12.2 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
```

3.12.3 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
```

3.12.4 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

Database Application CI/CD

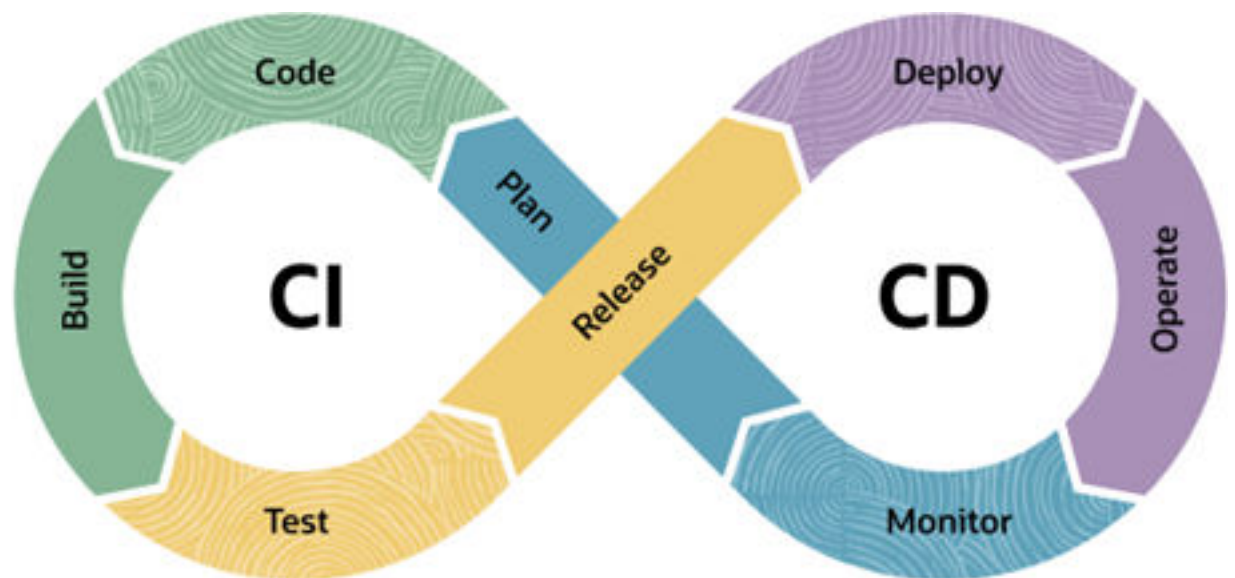
The Oracle SQLcl Projects feature allows users to manage the creation and administration of a database application. It is targeted towards enterprise-level applications that require structured release processes.

This chapter contains the following topics:

- [Introduction](#)
- [About the Project Command](#)
- [Quick Start](#)
- [Examples](#)

4.1 Introduction

Database Application Continuous Integration and Continuous Delivery (CI/CD) represents a transformative approach in modern database management and application development. This methodology seamlessly integrates database changes into the development pipeline while ensuring swift and secure deployment to production environments. By combining the rapid feedback mechanisms of Continuous Integration with the streamlined deployment processes of Continuous Delivery, Database CI/CD addresses the critical need for agility and reliability in today's fast-paced software development landscape.



At its core, Database CI/CD aims to:

- Accelerate time-to-market for new features and updates.

- Maintain a consistently high quality of code and database schema.
- Facilitate immediate issue detection and resolution.
- Ensure that both application and database components are always in a deployable state.

This approach not only enhances development efficiency but also significantly improves the end-user experience through frequent, reliable releases.

The `project` command in Oracle SQLcl is a powerful tool designed to standardize database software versioning and create releasable artifacts, including APEX elements. This command supports a consistent model of development and operations, enabling repeatable builds that can be applied in a specific order.

The key features of SQLcl Projects include:

- **Versioned Feature Management:** Allows database developers to identify individual changes and create versioned features or issues.
- **Release Artifact Creation:** Facilitates rolling multiple changes into a single release artifact that can be published for use.
- **Ordered Installation:** Ensures that artifacts are installable in the correct sequence, taking into account previously installed components in the environment.
- **Source Control Integration:** Supports creating branches in source control and exporting objects to these branches. Changes are realised using branch diffs and formatted consistently, allowing for easy identification through file checksums.
- **Automated Release Packaging:** When multiple branches or changes are created, SQLcl Projects can wrap them into a release, automatically setting up the execution of all changesets in the correct order on a target system.

The SQLcl Projects feature represents a significant step towards streamlining database development workflows, enhancing version control, and improving the overall efficiency of database application development and deployment processes.

4.1.1 Supported Objects

The supported database object types have been tested to work with the `project export` and `project stage` commands. All types not included in the following list can be added using the `project stage add-custom` command with any custom SQL. For more information about the `add-custom` sub-command, enter `help project stage add-custom` in the SQLcl command-line help.

The database object types that are supported are:

- APEX_APP
- CONSTRAINT
- CONTEXT
- FUNCTION
- INDEX
- OBJECT_GRANT
- PACKAGE_BODY
- PACKAGE_SPEC
- PROCEDURE

- REF_CONSTRAINT
- ROLE_GRANT
- SEQUENCE
- SYNONYM
- SYSTEM_GRANT
- TABLE
- TRIGGER
- TYPE_BODY
- TYPE_SPEC
- USER
- VIEW

4.1.2 Database CI/CD Concepts

This section covers the concepts relevant to understanding SQLcl Projects.

- [Database Continuous Integration \(CI\) and Database Continuous Delivery \(CD\)](#)
- [Database Project Scaffolding](#)
- [Advanced Database Object Explorer](#)
- [Automated Database Migration Script Generation](#)
- [Building Releasable Artifacts](#)

Database Continuous Integration (CI) and Database Continuous Delivery (CD)

Database continuous integration (CI) is the process of frequently integrating database schema and logic changes into application development, aiming to provide immediate feedback on any issues. Database continuous delivery (CD) focuses on quickly and safely deploying those changes to production, ensuring that both application and database code are always in a deployable state. Together, database CI/CD reduces time-to-market and delivers consistent end-user value through frequent, high-quality releases.

Database Project Scaffolding

When initializing SQLcl Projects (using the `project init` command), SQLcl creates a set of files that are used to manage the creation of files and changelogs.

There are three folders in the initial setup:

- `.dbtools`: This folder contains the following:
 - Project filters that are used by `project export` to filter out objects that will be exported.
 - Project format rules that are used to format the code when it is exported.
 - Project configuration settings.
- `src`: This folder is where the exported objects from the database get placed. This is broken down by schema and objects types.

- `dist`: The release artifacts are created in this folder. This folder gets populated by the `project stage` command and the `project release` command compresses its contents to create a release artifact.

```

├── .dbtools
│   ├── filters
│   │   └── project.filters
│   ├── project.config.json
│   └── project.sqlformat.xml
├── dist
│   ├── README.md
│   └── install.sql
├── src
│   ├── README.md
│   └── database
│       ├── README.md
│       └── hr

```

Advanced Database Object Explorer

One of the main features of SQLcl Projects is exporting database objects to the source control repository. The export includes the SQL needed to create the object and a "snapshot" of the object's metadata. The snapshot is stored as a comment and is prefixed with `sqlcl_snapshot`. It contains the following information:

- Checksum calculated on the exported code
- Object type
- Object name
- Schema name
- SXML representation of the object as exported (see `DBMS_METADATA SXML`)

The following path is used for exported objects:

```
src/database/<SCHEMA>/<OBJECT_TYPE>/<OBJECT_NAME>[.sql|.pks|.pkb]
```

For example, a table called `doc` in the `HR` schema, the file path is `src/database/hr/tables/doc.sql`.

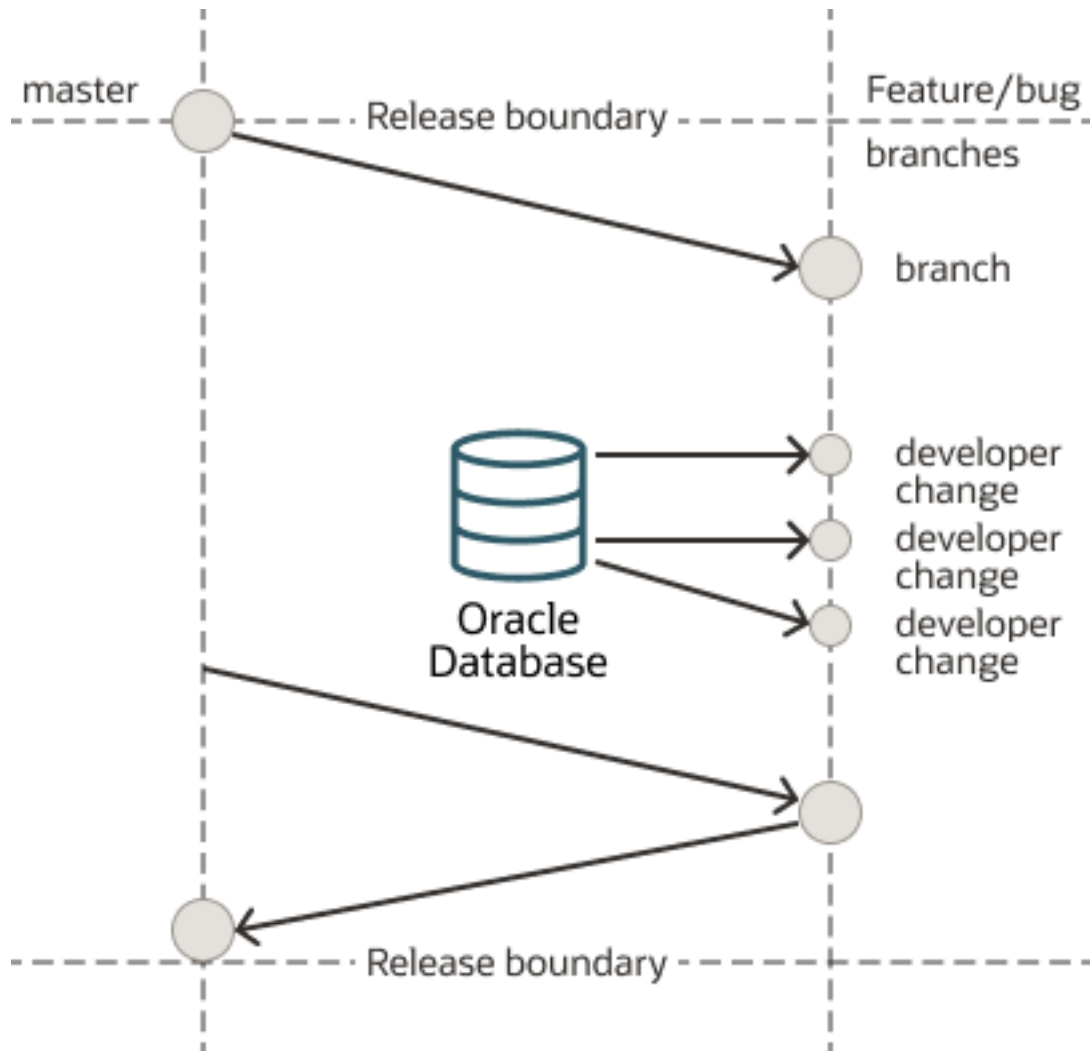
```

create table hr.doc (
    id number
);
-- sqlcl_snapshot
{"hash":"d992dceaa87a936e8242bdc81201f93030084ab5","type":"TABLE","name":"DOC",
"schemaName":"HR","sxml":"<TABLE xmlns=\"http://xmlns.abc.com/ku\"
version=\"1.0\"> <SCHEMA>HR</SCHEMA> <NAME>DOC</NAME>
<RELATIONAL_TABLE><COL_LIST> <COL_LIST_ITEM><NAME>ID</NAME><DATATYPE>NUMBER</
DATATYPE> </COL_LIST_ITEM></COL_LIST><DEFAULT_COLLATION>USING_NLS_COMP</
DEFAULT_COLLATION><PHYSICAL_PROPERTIES> <HEAP_TABLE></HEAP_TABLE></
PHYSICAL_PROPERTIES> </RELATIONAL_TABLE></TABLE>"}

```

Automated Database Migration Script Generation

As developers add changes to the database, they are exported to the branch. Git branches are used to identify changes between units of work. Using the diffs between the branches, the changed files are identified.



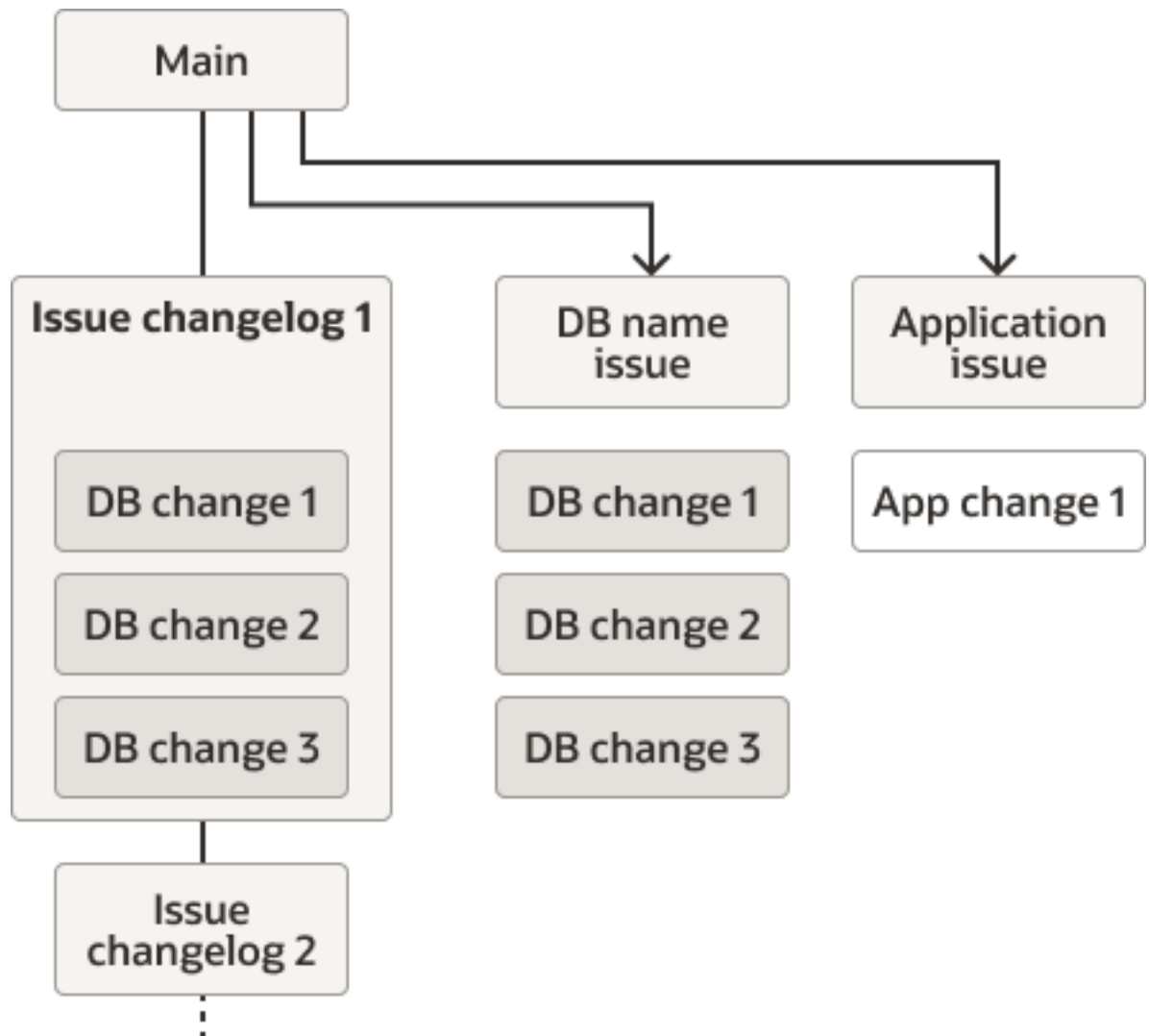
Each object file has a specific checksum and, in some cases, specific SXML for the specification of the object. Using Oracle DBMS_METADATA_DIFF, the SXML files are compared and the DDL to make both objects the same is generated and added to the repository.

Building Releasable Artifacts

To ensure deployment consistency, statements need to run in a particular order. Once a statement is executed, it will never be run again (immutable). Liquibase support, which was introduced in SQLcl to allow users to create changesets for schemas or objects, can be run to install the objects into a database. SQLcl Projects builds on that support to generate changesets for each block of changes on a branch and build those together into a release.

This is achieved by taking the comparison set between branches and generating a hierarchy scaffolding of changelogs that represent the list of comparisons. Then, the comparison set is

used to generate the SXML differences, which is then used to generate the DDL for the changes.



After an export of the changes, the `project stage` command generates the changesets for the differences from the current branch and the main branch.

```
--Example
next
├─ release.changelog.xml
├─ changes
│   └─ initial-export
│       ├── hr
│       │   └─ table
│       │       └─ doc.sql
│       └─ stage.changelog.xml
```

In this example, there is one table that is exported into `doc.sql`. This example has been simplified to explain the concept. The `project stage` command compares the contents of the current branch and by default compares it against the base branch of the project. The `project`

configuration that controls the base branch is `git.defaultBranch`. This can be shown by using the following command:

```
project config -list -name git.defaultBranch
```

To change it, use the same `config` command with the `-set` option.

```
SQL> project config -list -name git.defaultBranch
+=====+
| SETTING NAME      | VALUE |
+=====+
| git.defaultBranch | master |
+-----+
```

The `project stage` command also has a prescribed format. When the command is run, it creates the following structure:

```
next/changes/<branch_name>
```

In the example, the branch created for the initial export of the `hr.doc` table is called `initial-export`. Each time a new branch is created and the `stage` command is run, there is a new folder underneath `next/changes/<branch_name>`.

In this example, the `doc.sql` file is automatically prefixed with Liquibase-formatted SQL formats and is defined as an individual changeset. `doc.sql` will be referenced in a changelog file.

```
-- Liquibase-formatted sql
-- changeset HR:d992dceaa87a936e8242bdc81201f93030084ab5 stripComments:false
logicalFilePath:initial-export/hr/table/doc.sql
-- sqlcl_snapshot src/database/hr/tables/
doc.sql:null:d992dceaa87a936e8242bdc81201f93030084ab5:create

create table hr.doc (
    id number
);
```

In this example, the `stage.changelog.xml` references the Liquibase-formatted SQL changeset.

```
--stage.changelog.xml

<?xml version="1.0" encoding="UTF-8"?>
<databaseChangeLog xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns="http://www.liquibase.org/xml/ns/dbchangelog"
    xsi:schemaLocation="http://www.liquibase.org/xml/ns/
dbchangelog
    http://www.liquibase.org/xml/ns/dbchangelog/
dbchangelog-4.3.xsd">
<!--BEGIN-->
<include file="hr/table/doc.sql" relativeToChangelogFile="true"/>
<!--END-->
<!--BEGIN CUSTOM-->
```

```
<!--END CUSTOM-->
</databaseChangeLog>
```

The next folder has a `release.changelog.xml` right at the top. This file is referenced again in the `project release` command.

```
--release.changelog.xml

<?xml version="1.0" encoding="UTF-8"?>
<databaseChangeLog xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns="http://www.liquibase.org/xml/ns/dbchangelog"
  xsi:schemaLocation="http://www.liquibase.org/xml/ns/
dbchangelog
  http://www.liquibase.org/xml/ns/dbchangelog/
dbchangelog-4.3.xsd">
<!--BEGIN CHANGE-->
<include file="changes/initial-export/stage.changelog.xml"
  relativeToChangelogFile="true"/>
<!--END CHANGE-->
<!--BEGIN CODE-->
<!--END CODE-->
</databaseChangeLog>
```

When all the changes are created for a release, run the `project release` command to take all files under the `next` folder and move them to a "numbered release" folder.

The final structure is:

```
releases
├── 1.0
│   ├── code
│   │   └── code.changelog.xml
│   ├── release.changelog.xml
│   └── changes
│       └── initial-export
│           ├── code
│           │   ├── _custom
│           │   └── hr
│           │       └── table
│           │           └── doc.sql
│           └── stage.changelog.xml
├── main.changelog.xml
├── next
│   └── release.changelog.xml
└── util
    ├── prechecks.sql
    └── recompile.sql
```

To generate a re-runnable artifact, run the `project gen-artifact` command. This creates a file in `artifacts/<projectname>-<version>.zip`. By default, artifacts are not included in the Git repository (To change this, modify the `.gitignore` file).

The contents of this artifact include:

```
releases/next/release.changelog.xml
releases/1.0/changes/initial-export/stage.changelog.xml
releases/1.0/changes/initial-export/hr/table/doc.sql
releases/1.0/release.changelog.xml
releases/1.0/code/code.changelog.xml
releases/util/recompile.sql
releases/util/prechecks.sql
releases/main.changelog.xml
README.md
install.sql
```

The last part is deploying the artifacts into a production database. The command `project deploy` takes the generated artifact and runs it with SQLcl.

```
SQL> project deploy -file demo-1.0.zip
Starting the migration...
Running Changeset: initial-export/hr/table/
doc.sql::d992dceaa87a936e8242bdc81201f93030084ab5::HR
Table HR.DOC created.
Liquibase: Update has been successful. Rows affected: 1
Installing/updating schemas
--Starting Liquibase at 2024-09-19T09:09:02.326601 (version [local build] #0
built at 2024-08-14 18:40+0000)
Table HR.DOC created.

UPDATE SUMMARY
Run:                               1
Previously run:                     0
Filtered out:                       0
-----
Total change sets:                  1

Produced logfile: sqlcl-lb-1726733337322.log
Operation completed successfully.
Migration has been completed.
```

4.2 About the Project Command

The command in SQLcl for Database CI/CD extension is `project`. It contains several sub-commands that are used as part of the process to help developers manage database changes and create serialized transactions.

All `project` sub-commands support `-verbose` and `-debug` options, which provide detailed processing information.

Each of the sub-commands are described below. For information about syntax and options for each sub-command, refer the SQLcl command line help.

- `init|jin`

Initializes a new project. This command can be run in a new Git repository or in an existing repository.

```
project init -name demo -makeroot -schemas cicd
```

This command creates a project in the current working directory called `demo` under a new folder called `demo`. Several folders are created under the project directory including a configuration directory under `.dbtools`.

This folder and the files under it should be added and committed to the Git repository.

- **config|cfg**

Enables you to view and manage your project configuration properties.

This command allows you to look at the current configuration that is used by each of the `project` commands. The files for the configuration are stored under the `.dbtools` folder. In the configuration, there are a number of settings that can be configured.

```
project config -list
```

This command lists all the configured options. Most of these options have defaults, which are used in the absence of the parameter. You can see the defaults by using the `-verbose` option with `project config -list`.

You can set configuration items by using the following command:

```
project config set -name <configitem> -value <value> -type <value-type>
```

Any invalid configurations are flagged at runtime when a `project` command is used.

- **export|ex**

Exports database objects into your repository.

As a rule, when exporting from the database, a new branch is created. This branch is used when using the `stage` command to compare with previous branches to generate the DDL statements. You can run the following command in the project to export the objects owned by the schemas identified in the `project init` command.

```
project export
```

You can also choose to export a specific schema, or even an object.

In the configuration files, there is a specific file for filtering objects that can be modified to clearly identify the correct objects to export.

Export supports normal database objects supported by `DBMS_METADATA` and also APEX applications. See the `DBMS_METADATA: Object Types` table in [Oracle Database PL/SQL Packages and Types Reference](#).

- **stage|st**

Creates Liquibase changelogs or changesets for all source files and custom SQL files.

The `stage` command is used along with the `export` command. This command takes the current branch and compares it to the base branch and generates the changelogs that will

apply those changes to a database. The command creates a folder in a specific format with a `dist` folder.

```
src
dist -
  -releases
  -next
  - <stage files>
```

The `stage` command can also be used to add other custom changesets as part of the change. This generates a file to add SQL and SQLcl commands with a Liquibase SQL changeset header. This file will be added to the changelog hierarchy automatically.

- **release|re**

Moves the current set of work into a release state and starts a new body of work.

The `release` command takes the contents of the `dist/next` folder and renames it to a given version number.

```
project release -version 1.0
```

And then creates a new `next` folder under `dist`.

Once code has been moved into a release it should never be modified. As such, it is recommended that the `release` command should only be run once the following criteria have been met:

- `project verify` has successfully ran.
- Test the release against various systems:
 - * Build system: This confirms that all DDL and code compiles correctly.
 - * Test system (with data): Confirms that no data integrity issues (For example: Making a column `not null` only to find out it has `null` values).

To test a pre-release build, run `project gen-artifact` and use a version name such as -version `1.0.0-test`. This also includes everything in the `next` folder.

- **gen-artifact|ga**

Generates an artifact representing the current state of your project.

- **deploy|dp**

Deploys the artifact on a target database.

- **verify|v**

Provides the means to test various aspects of your project (snapshots, changes, overall project).

4.3 Quick Start

This section introduces the SQLcl Projects feature using a simple setup and list of tasks. The quick start covers:

- How to initialize a new project (for an application with a single schema called `demo`).
- Work to be done as part of a sprint:
 - Ticket-1

- * Create the standard sample `dept` and `emp` tables
- * Load the tables with sample data
- Ticket-2
 - * Add a new column named `email` to the `emp` table
 - * Add a new function named `get_display_name`
- How to complete a release, and then generate and deploy an artifact.

Topics

- [Prerequisites](#)
- [Assumptions](#)
- [Project Setup](#)
- [Ticket-1](#)
- [Ticket-2](#)
- [Final Steps](#)

4.3.1 Prerequisites

This Quick Start has the following prerequisites:

- You must create two databases, `DEV` and `PROD`, with the `demo` schema pre-created. You need to connect as the `demo` user from SQLcl.

```
create user demo identified by demo;
grant resource to demo;
grant connect to demo;
grant create view to demo;
alter user demo quota unlimited on system;
```

- You require two named connections in SQLcl: `demo-dev` and `demo-prod`. The following examples show how to add and manage named connections in SQLcl.

```
-Add a new named connection
-Note: -savepwd is an optional parameter to save the password.
SQL> conn -savepwd -save demo-dev demo/demo@//myserver.com:1521/mypdb
```

```
-List current connections
SQL> connmgr list
```

```
-To connect to a named connection
SQL> conn -name demo-dev
```

4.3.2 Assumptions

This quick start assumes the following:

- A Git project named `demo-project` is used. All work in the repository is "local" only, a remote server (such as, Github or Gitlab) is not needed for this demo.

- The term ticket (or issue) refers to a unit of work, typically tracked in a system such as Jira.
- SQLcl can run operating system level commands using the `host` command.
 - For example, `host date` prints the system date.
 - A shortcut for the `host` command is `!<cmd>`. For example, `!date` is the equivalent of `host date`.
 - This demo uses a lot of `host` commands. To avoid exiting and entering SQLcl each time, the `!` shortcut is used to execute them directly within SQLcl.

4.3.3 Project Setup

Create a Git repository.

Note:

This demo uses a local Git repository. In most cases, a clone from a remote Git repository is used as a starting point.

```
-Create and go into new folder
mkdir demo-project
cd demo-project

-Start SQLcl
sql /nolog

-Initialize git repo
SQL> !git init --initial-branch=main
```

Initialize the repository for SQLcl Projects.

-The schema that is used for this demo is called "demo".

```
SQL> project init -name demo_project -schemas demo
```

```
-----
PROJECT DETAILS
-----
Project name:    demo_project
Schema(s):      DEMO
Directory:       /private/tmp/demo-project
Connection name:
Project root:    demo-project
Your project has been successfully created
```

-Root folder now looks like:

```
- .
- |
- | .dbtools
- |   |
- |   | filters
- |   |   |
- |   |   | project.filters
- |   |   |
- |   |   | project.config.json
```



```

- |   └─ project.sqlformat.xml
- └─ README.md
- └─ dist
-   └─ README.md
-   └─ install.sql
- └─ src
-   └─ README.md
-   └─ database
-       └─ README.md
-       └─ demo

```

-Add and commit the initial files to the repository

```

SQL> !git add --all
SQL> !git commit -m "initial"

```

```

[main (root-commit) 5fa6ebd] initial
9 files changed, 188 insertions(+)
create mode 100644 .dbtools/filters/project.filters
create mode 100644 .dbtools/project.config.json
create mode 100644 .dbtools/project.sqlformat.xml
create mode 100644 .gitignore
create mode 100644 README.md
create mode 100644 dist/README.md
create mode 100644 dist/install.sql
create mode 100644 src/README.md
create mode 100644 src/database/README.md

```

4.3.4 Ticket-1

In practice, most development is done as part of a ticket in a project management system, such as Jira or GitHub. In this section, `ticket-1` is created and has the following requirements:

1. Create `emp` and `dept` tables.
2. Add the initial data.

In the following steps, you will:

1. Create and check out a Git branch named `ticket-1`.
2. Create the tables in the database schema.
3. Export the objects from the schema to the project's `src` folder.
4. Register the changes in the project's `dist` folder.
 - Changes are detected automatically by comparing the feature branch to the main branch.
 - Changes are created in the next release as part of `ticket-1`.
 - Changes are captured as Liquibase changelogs/sets.
5. Add a custom script to load the initial data for the `emp` and `dept` tables.
6. Commit and merge changes to complete the ticket.

Steps

1. Connect to the the demo-dev server.

```
SQL> conn -name demo-dev
Connected.
```

2. Create a new branch called ticket-1.

```
SQL> !git checkout -b ticket-1
Switched to a new branch 'ticket-1'
```

3. Create database objects.

```
SQL> create table dept(
  deptno      number(2,0),
  dname       varchar2(14),
  loc         varchar2(13),
  constraint pk_dept primary key (deptno)
);
```

Table DEPT created.

```
SQL> create table emp(
  empno       number(4,0),
  ename       varchar2(10),
  job         varchar2(9),
  mgr         number(4,0),
  hiredate    date,
  sal         number(7,2),
  comm        number(7,2),
  deptno      number(2,0),
  constraint pk_emp primary key (empno),
  constraint fk_deptno foreign key (deptno) references dept (deptno)
);
```

Table EMP created.

```
SQL> create index idx_emp_deptno on emp(deptno);
Index IDX_EMP_DEPTNO created.
```

4. Export all the objects to the src folder.

```
SQL> project export
```

The current connection //myserver.com:1521/mypdb DEMO will be used for all operations

```
*** INDEXES ***
*** TABLES ***
*** REF_CONSTRAINTS ***
```

```
-----
TABLE                               2
REF_CONSTRAINT                       1
INDEX                                 1
-----
```

```
Exported 4 objects
Elapsed 20 sec
```

The `src` folder now contains all the scripts required to recreate the objects in the `demo` schema.

The changes in the `src` folder are used to detect changes that need to be added to the `dist` folder for each release.

The folder structure looks as follows:

```
└─
src

  └─
    README.md

  └─
    database

  └─
    README.md

  └─
    demo

  └─
    indexes

  └─
    | └─
    |   idx_emp_deptno.sql
    |   └─
    |     ref_constraints
    |     └─
    |       fk_deptno.sql
    |       └─
    |         tables
    |         └─
    |           dept.sql
```

```
└─ emp.sql
```

Add and commit the newly created `src` files.

 **Note:**

It is very important to commit all `src` changes because only committed changes are used to determine changes for `dist/release`.

```
SQL> !git add --all
SQL> !git commit -m "TICKET-1: Added dept emp tables, and get_display_name
function"
```

```
[ticket-1 812db72] TICKET-1: Added dept emp tables, and get_display_name
function
 4 files changed, 44 insertions(+)
 create mode 100644 src/database/demo/indexes/idx_emp_deptno.sql
 create mode 100644 src/database/demo/ref_constraints/fk_deptno.sql
 create mode 100644 src/database/demo/tables/dept.sql
 create mode 100644 src/database/demo/tables/emp.sql
```

5. Generate the scripts and Liquibase changelogs for the current ticket.

This happens in the background where the changes in `branches/ticket-1/src` are compared against `branches/main/src`.

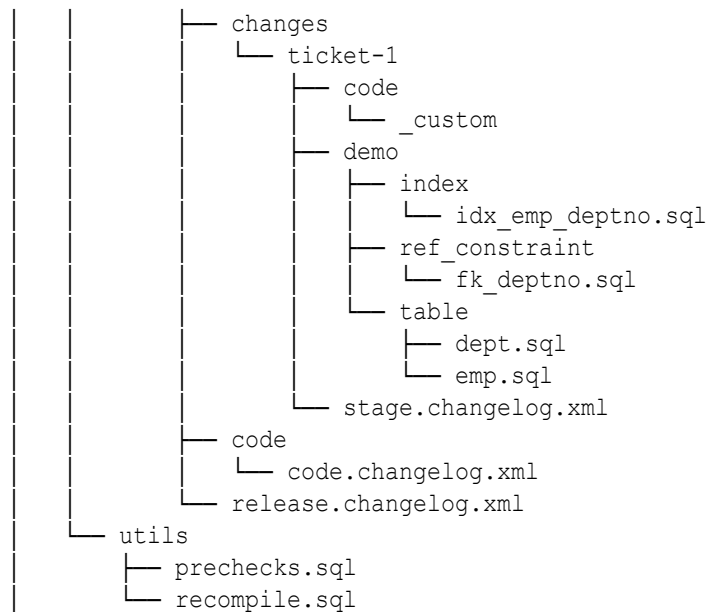
```
SQL> project stage
Stage successfully created, please review and commit your changes to
repository
```

The `dist` folder now becomes as follows:

 **Note:**

- All current work is stored in the `releases/next` folder. After a release is ready, this folder is converted to a release number and a new or empty `next` folder is created.
- Changelogs work as follows: `main.changelog.xml` references `next/release.changelog.xml`, which references `ticket-1/stage.changelog.xml`, which references all the files that are part of `ticket-1`.

```
└─ dist
   └─ README.md
   └─ install.sql
   └─ releases
      └─ main.changelog.xml
      └─ next
```



6. Add and commit the files.

It is recommended to review all generated files before adding to the repository.

```
SQL> !git add --all
SQL> !git status
```

On branch ticket-1

Changes to be committed:

```
(use "git restore --staged <file>..." to unstage)
new file:   dist/releases/main.changelog.xml
new file:   dist/releases/next/changes/ticket-1/demo/index/
idx_emp_deptno.sql
new file:   dist/releases/next/changes/ticket-1/demo/
ref_constraint/fk_deptno.sql
new file:   dist/releases/next/changes/ticket-1/demo/table/dept.sql
new file:   dist/releases/next/changes/ticket-1/demo/table/emp.sql
new file:   dist/releases/next/changes/ticket-1/stage.changelog.xml
new file:   dist/releases/next/code/code.changelog.xml
new file:   dist/releases/next/release.changelog.xml
new file:   dist/utils/prechecks.sql
new file:   dist/utils/recompile.sql
```

```
SQL> !git commit -m "TICKET-1: Added dept emp tables"
```

```
[ticket-1 261cceb] TICKET-1: Added dept emp tables
10 files changed, 396 insertions(+)
create mode 100644 dist/releases/main.changelog.xml
create mode 100644 dist/releases/next/changes/ticket-1/demo/index/
idx_emp_deptno.sql
create mode 100644 dist/releases/next/changes/ticket-1/demo/
ref_constraint/fk_deptno.sql
create mode 100644 dist/releases/next/changes/ticket-1/demo/table/dept.sql
create mode 100644 dist/releases/next/changes/ticket-1/demo/table/emp.sql
create mode 100644 dist/releases/next/changes/ticket-1/stage.changelog.xml
create mode 100644 dist/releases/next/code/code.changelog.xml
```

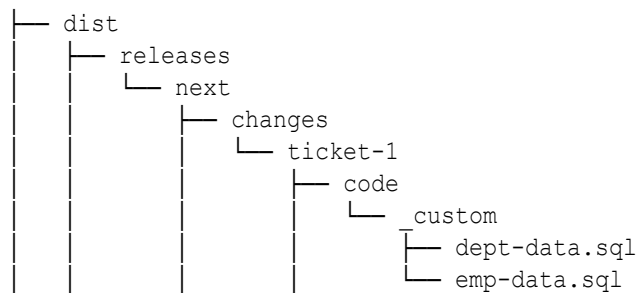
```
create mode 100644 dist/releases/next/release.changelog.xml
create mode 100644 dist/utils/prechecks.sql
create mode 100644 dist/utils/recompile.sql
```

7. Add sample data for each table using a custom .sql file.

Use the `project stage add-custom` command to generate custom files, as it auto-generates all the Liquibase-header information.

```
SQL> project stage add-custom -file-name dept-data.sql
SQL> project stage add-custom -file-name emp-data.sql
```

The custom files now appear in `dist` under the `_custom` folder.



The following command displays the contents of `dept-data.sql`.

```
SQL> !cat dist/releases/next/changes/ticket-1/code/_custom/dept-data.sql
(For Windows, use !
type .\dist\releases\next\changes\ticket-1\code\_custom\dept-data.sql)

-- liquibase formatted sql
-- changeset SqlCl:f56fcfec11f7d7cb99d74403a0c2727a765ddb99
stripComments:false logicalFilePath:ticket-1/code/_custom/dept-data.sql
-- sqlcl_snapshot dist/releases/next/changes/ticket-1/code/_custom/dept-
data.sql:null:null:custom
```

8. Add the sample data for each file.

In `dist/releases/next/changes/ticket-1/code/_custom/dept-data.sql`, copy and paste the following statements to the end of the file and then save the file.

```
insert into demo.dept values(10, 'ACCOUNTING', 'NEW YORK');
insert into demo.dept values(20, 'RESEARCH', 'DALLAS');
insert into demo.dept values(30, 'SALES', 'CHICAGO');
insert into demo.dept values(40, 'OPERATIONS', 'BOSTON');
```

In `dist/releases/next/changes/ticket-1/code/_custom/emp-data.sql`, copy and paste the following statements to the end of the file and then save the file.

```
insert into demo.emp values( 7839, 'KING', 'PRESIDENT', null,
to_date('17-11-1981','dd-mm-yyyy'), 5000, null, 10);
insert into demo.emp values( 7698, 'BLAKE', 'MANAGER', 7839,
to_date('1-5-1981','dd-mm-yyyy'), 2850, null, 30);
insert into demo.emp values( 7782, 'CLARK', 'MANAGER', 7839,
```

```

to_date('9-6-1981','dd-mm-yyyy'), 2450, null, 10);
insert into demo.emp values( 7566, 'JONES', 'MANAGER', 7839,
to_date('2-4-1981','dd-mm-yyyy'), 2975, null, 20);
insert into demo.emp values( 7788, 'SCOTT', 'ANALYST', 7566, to_date('13-
JUL-87','dd-mm-rr') - 85, 3000, null, 20);
insert into demo.emp values( 7902, 'FORD', 'ANALYST', 7566,
to_date('3-12-1981','dd-mm-yyyy'), 3000, null, 20);
insert into demo.emp values( 7369, 'SMITH', 'CLERK', 7902,
to_date('17-12-1980','dd-mm-yyyy'), 800, null, 20);
insert into demo.emp values( 7499, 'ALLEN', 'SALESMAN', 7698,
to_date('20-2-1981','dd-mm-yyyy'), 1600, 300, 30);
insert into demo.emp values( 7521, 'WARD', 'SALESMAN', 7698,
to_date('22-2-1981','dd-mm-yyyy'), 1250, 500, 30);
insert into demo.emp values( 7654, 'MARTIN', 'SALESMAN', 7698,
to_date('28-9-1981','dd-mm-yyyy'), 1250, 1400, 30);
insert into demo.emp values( 7844, 'TURNER', 'SALESMAN', 7698,
to_date('8-9-1981','dd-mm-yyyy'), 1500, 0, 30);
insert into demo.emp values( 7876, 'ADAMS', 'CLERK', 7788, to_date('13-
JUL-87', 'dd-mm-rr') - 51, 1100, null, 20);
insert into demo.emp values( 7900, 'JAMES', 'CLERK', 7698,
to_date('3-12-1981','dd-mm-yyyy'), 950, null, 30);
insert into demo.emp values( 7934, 'MILLER', 'CLERK', 7782,
to_date('23-1-1982','dd-mm-yyyy'), 1300, null, 10);

```

9. Run each file to ensure that the data is loaded into the table.

```

SQL> @dist/releases/next/changes/ticket-1/code/_custom/dept-data.sql
SQL> @dist/releases/next/changes/ticket-1/code/_custom/emp-data.sql
SQL> commit;

```

Commit complete.

10. Add and commit the new custom files.

```

SQL> !git add --all
SQL> !git commit -m "TICKET-1: data files"

[ticket-1 ac2488d] TICKET-1: data files
 3 files changed, 33 insertions(+)
 create mode 100644 dist/releases/next/changes/ticket-1/code/_custom/dept-
data.sql
 create mode 100644 dist/releases/next/changes/ticket-1/code/_custom/emp-
data.sql

```

11. To highlight the order of operations that have automatically been managed, enter the following command:

```

SQL> !cat dist/releases/next/changes/ticket-1/stage.changelog.xml

<?xml version="1.0" encoding="UTF-8"?>
<databaseChangeLog xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
                    xmlns="http://www.liquibase.org/xml/ns/dbchangelog"
                    xsi:schemaLocation="http://www.liquibase.org/xml/ns/
dbchangelog
                                http://www.liquibase.org/xml/ns/dbchangelog/
dbchangelog-4.3.xsd">

```

```

<!--BEGIN-->
<include file="demo/table/dept.sql" relativeToChangelogFile="true"/>
<include file="demo/table/emp.sql" relativeToChangelogFile="true"/>
<include file="demo/ref_constraint/fk_deptno.sql"
relativeToChangelogFile="true"/>
<include file="demo/index/idx_emp_deptno.sql"
relativeToChangelogFile="true"/>
<!--END-->
<!--BEGIN CUSTOM-->
<include file="code/_custom/dept-data.sql" relativeToChangelogFile="true"/>
<include file="code/_custom/emp-data.sql" relativeToChangelogFile="true"/>
<!--END CUSTOM-->

```

Ticket-1 is now complete.

12. Merge the changes into the main branch.

This is done through a Merge Request or a Pull Request (depending on your Git provider). Since this is a local repository, you can only merge directly into main.

```
SQL> !git checkout main
```

```
Switched to branch 'main'
```

```
SQL> !git merge "ticket-1"
```

```
Updating f9660ae..ac2488d
```

```
Fast-forward
```

```

dist/releases/main.changelog.xml |
9 ++++++
dist/releases/next/changes/ticket-1/code/_custom/dept-data.sql |
11 ++++++
dist/releases/next/changes/ticket-1/code/_custom/emp-data.sql |
20 ++++++
dist/releases/next/changes/ticket-1/demo/index/idx_emp_deptno.sql |
8 ++++++
dist/releases/next/changes/ticket-1/demo/ref_constraint/fk_deptno.sql |
9 ++++++
dist/releases/next/changes/ticket-1/demo/table/dept.sql |
13 ++++++
dist/releases/next/changes/ticket-1/demo/table/emp.sql |
18 ++++++
dist/releases/next/changes/ticket-1/stage.changelog.xml |
16 ++++++
dist/releases/next/code/code.changelog.xml |
8 ++++++
dist/releases/next/release.changelog.xml |
11 ++++++
dist/utils/prechecks.sql |
81 ++++++
dist/utils/recompile.sql |
225 ++++++
+++++
+++++
src/database/demo/indexes/idx_emp_deptno.sql |
7 ++++++

```



```

src/database/demo/ref_constraints/fk_deptno.sql |
8 ++++++
src/database/demo/tables/dept.sql |
12 ++++++++
src/database/demo/tables/emp.sql |
17 ++++++++
16 files changed, 473 insertions(+)
create mode 100644 dist/releases/main.changelog.xml
create mode 100644 dist/releases/next/changes/ticket-1/code/_custom/dept-
data.sql
create mode 100644 dist/releases/next/changes/ticket-1/code/_custom/emp-
data.sql
create mode 100644 dist/releases/next/changes/ticket-1/demo/index/
idx_emp_deptno.sql
create mode 100644 dist/releases/next/changes/ticket-1/demo/
ref_constraint/fk_deptno.sql
create mode 100644 dist/releases/next/changes/ticket-1/demo/table/dept.sql
create mode 100644 dist/releases/next/changes/ticket-1/demo/table/emp.sql
create mode 100644 dist/releases/next/changes/ticket-1/stage.changelog.xml
create mode 100644 dist/releases/next/code/code.changelog.xml
create mode 100644 dist/releases/next/release.changelog.xml
create mode 100644 dist/utills/prechecks.sql
create mode 100644 dist/utills/recompile.sql
create mode 100644 src/database/demo/indexes/idx_emp_deptno.sql
create mode 100644 src/database/demo/ref_constraints/fk_deptno.sql
create mode 100644 src/database/demo/tables/dept.sql
create mode 100644 src/database/demo/tables/emp.sql

```

4.3.5 Ticket-2

Now that the first ticket is complete, work can start on `TICKET-2`. The purpose of this ticket is to highlight the automated DDL management along with soft objects (that is, re-runnable objects such as packages, views, and so on) creation.

`TICKET-2` has the following requirements:

1. Add a new column `emp.email`.
2. Add a new function `get_display_name`.

The steps are:

1. Create and check out a Git branch called `ticket-2`.
2. Alter the `emp` table and add the new column in the database.
3. Export the `emp` table. This will show the new table structure in the `src/.../tables/emp.sql` file.
4. Run the `project stage` command to register the alter table statements.
5. Create a new function, `get_display_name`, in the database and run `project export`.
6. Rerun the `project stage` command to include the `get_display_name` function.
7. Commit and merge changes to complete the ticket.

Steps

1. Create the `ticket-2` branch.

```
SQL> !git checkout -b ticket-2
Switched to a new branch 'ticket-2'
```

2. Make the table changes to the development database.

```
SQL> alter table emp add email varchar2(255);
Table EMP altered.
```

3. Run the `project export` command to get the latest version of the table.

 **Note:**

Use the `-o` argument to only export the `demo.emp` table.

```
SQL> project export -o emp
```

```
The current connection //myserver.com:1521/mypdb DEMO will be used for all
operations
```

```
*** INDEXES ***
*** TABLES ***
*** REF_CONSTRAINTS ***
```

```
-----
TABLE                1
REF_CONSTRAINT      1
INDEX                1
-----
```

```
Exported 3 objects
Elapsed 13 sec
```

4. Run the `git diff` command to show what was changed in the `src/database/demo/tables/emp.sql` file.

 **Note:**

Because the column name is changed, the whole file is marked as changed to add additional spacing.

Only the logical changes are listed below to show the real differences. The diff highlights that the new column (email) is added.

```
!git --no-pager diff src/database/demo/tables/emp.sql
```

```
- deptno  number(2, 0)
+ deptno  number(2, 0),
+ email   varchar2(255 byte)
```

5. Add and commit changes, which is required before running the `project stage` command.

This happens in the background where the changes in `branches/ticket-1/src` are compared against `branches/main/src`.

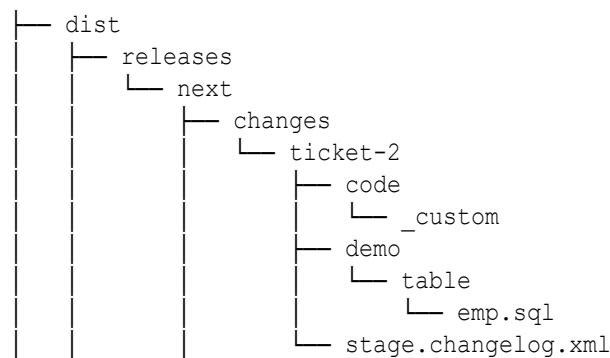
```
SQL> !git add --all
SQL> !git commit -m "TICKET-2: Added emp.email"

[ticket-2 a3e7508] TICKET-2: Added emp.email
 1 file changed, 3 insertions(+), 2 deletions(-)
```

- Run project stage to automatically generate the alter table statement required to add the email column.

```
SQL> project stage
Stage successfully created, please review and commit your changes to
repository
```

The following files have been added:



- The output of `dist/releases/next/changes/ticket-2/demo/table/emp.sql` is shown below.

It automatically detected the modification in the emp table and generated the correct alter statement.

```
SQL> !cat dist/releases/next/changes/ticket-2/demo/table/emp.sql

-- liquibase formatted sql
-- changeset DEMO:cffad61078f4afb0680bfacbe818e5f089ce535
stripComments:false logicalFilePath:ticket-2/demo/table/emp.sql
-- sqlcl_snapshot src/database/demo/tables/
emp.sql:1d12b2ddb0fe34a061ad35dc1990fc3d84d5a676:9c26d3ba57756671939cf399cb
7e96ae0d3ac84e:alter

alter table demo.emp add (
    email varchar2(255)
)
/
```

- Add and commit changes.

```
SQL> !git add --all
SQL> !git commit -m "TICKET-2: emp.email alter commands"
```

```
[ticket-2 582cd63] TICKET-2: emp.email alter commands
3 files changed, 20 insertions(+)
create mode 100644 dist/releases/next/changes/ticket-2/demo/table/emp.sql
create mode 100644 dist/releases/next/changes/ticket-2/stage.changelog.xml
```

9. Create a new function called `get_display_name`. This highlights how the source code can automatically be managed with SQLcl Projects.

```
SQL> create or replace function get_display_name(p_ename in emp.ename%type)
return varchar2
as
begin
    return initcap(p_ename);
end get_display_name;
/
```

Function GET_DISPLAY_NAME compiled

10. Similar to table changes, running a `project export` command detects supported object changes.

```
SQL> project export

*** FUNCTIONS ***
*** INDEXES ***
*** TABLES ***
*** REF_CONSTRAINTS ***
-----
TABLE                                2
REF_CONSTRAINT                       1
INDEX                                  1
FUNCTION                               1
-----
Exported 5 objects
Elapsed 14 sec
```

11. Add and commit followed by `project stage` to add to the release.

```
SQL> !git add --all
SQL> !git commit -m "TICKET-2: added get_display_name"

[ticket-2 7cf60a4] TICKET-2: added get_display_name
1 file changed, 10 insertions(+)
create mode 100644 src/database/demo/functions/get_display_name.sql

SQL> project stage
Stage successfully created, please review and commit your changes to
repository
```

The function was added to the `dist/next` folder under a common `code` folder and not `ticket-2`.

This is done because re-runnable code (packages, functions, and so on) may be modified multiple times within a sprint. In most cases, it only needs to be compiled once.

```
SQL> !git status
On branch ticket-2
Changes not staged for commit:
  (use "git add <file>..." to update what will be committed)
  (use "git restore <file>..." to discard changes in working directory)
    modified:   dist/releases/next/code/code.changelog.xml
    modified:   dist/releases/next/release.changelog.xml

Untracked files:
  (use "git add <file>..." to include in what will be committed)
  dist/releases/next/code/demo/
```

12. Add and commit the dist changes.

```
SQL> !git add --all
SQL> !git commit -m "TICKET-2: dist changes for get_display_name"

[ticket-2 706fdb9] TICKET-2: dist changes for get_display_name
 3 files changed, 13 insertions(+)
 create mode 100644 dist/releases/next/code/demo/function/
 get_display_name.sql
```

13. Now that all work on ticket-2 is complete, merge back to main.

```
SQL> !git checkout main
Switched to branch 'main'

SQL> !git merge "ticket-2"

Updating d6abe9d..706fdb9
Fast-forward
 dist/releases/next/changes/ticket-2/demo/table/emp.sql      | 8 ++++++++
 dist/releases/next/changes/ticket-2/stage.changelog.xml    | 11 ++++++++
+
 dist/releases/next/code/code.changelog.xml                 | 1 +
 dist/releases/next/code/demo/function/get_display_name.sql | 11 ++++++++
+
 dist/releases/next/release.changelog.xml                   | 2 ++
 src/database/demo/functions/get_display_name.sql           | 10 ++++++++
 src/database/demo/tables/emp.sql                           | 5 +----
7 files changed, 46 insertions(+), 2 deletions(-)
 create mode 100644 dist/releases/next/changes/ticket-2/demo/table/emp.sql
 create mode 100644 dist/releases/next/changes/ticket-2/stage.changelog.xml
 create mode 100644 dist/releases/next/code/demo/function/
 get_display_name.sql
 create mode 100644 src/database/demo/functions/get_display_name.sql
```

4.3.6 Final Steps

After the sprint is complete, the following needs to be done:

- Generate a release (`project release`)
 - The `release` command renames the `dist/next` folder to the release name (in the following example, `1.0.0`) and then generates a new (empty) `dist/next` folder ready for the next sprint's changes.
- Generate an artifact (`project gen-artifact`)
 - `gen-artifact` creates a zip file that contains a single `install.sql` file, which points to all the different sub-folders in the `dist` folder. In this example, it only contains one folder (`1.0.0`). Over time, the artifact will contain additional releases, as this is what allows Liquibase to upgrade from any point in time.
- Deploy the artifact (`project deploy`).
 - The `deploy` command takes an artifact and upgrades an environment to the latest version. For example, if the artifact includes versions 1-10 and the current environment is on version 8, the installer auto-detects the current state and only runs the changes related to version 9 and version 10.

4.3.6.1 Generate Release 1.0.0

Generating a release:

- Moves the contents of `dist/next` to the name of the release. For example, if generating release `1.0.0`, then `dist/next > dist/1.0.0`.
- Create a new `dist/next` folder that is open for the next set of work for the next release.

1. Generate release 1.0.0

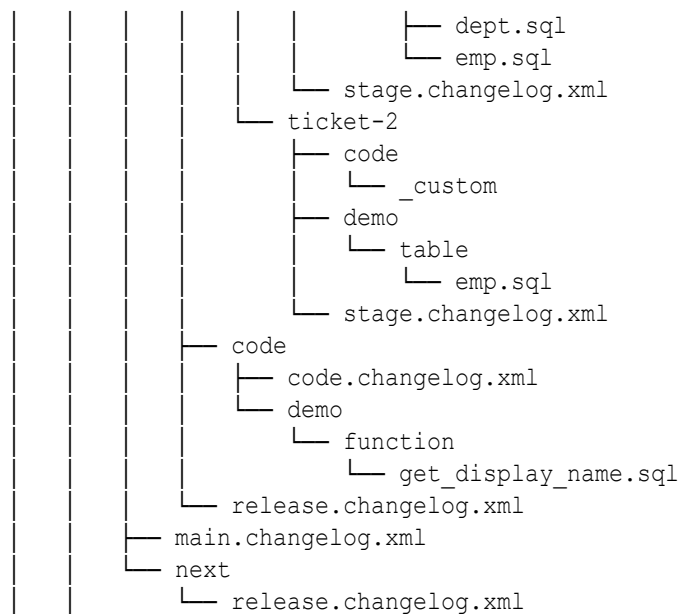
```
SQL> project release -version 1.0.0
Process completed successfully
```

The `dist` folder now looks like below. Note the `dist/next` folder has been emptied and there is a new "fresh" `release.changelog.xml`.

```

├── dist
│   ├── README.md
│   ├── install.sql
│   ├── releases
│   └── 1.0.0
│       ├── changes
│       │   ├── main
│       │   │   ├── code
│       │   │   │   └── _custom
│       │   │   └── stage.changelog.xml
│       │   └── ticket-1
│       │       ├── code
│       │       │   └── _custom
│       │       │       ├── dept-data.sql
│       │       │       └── emp-data.sql
│       │       └── demo
│       │           ├── index
│       │           │   └── idx_emp_deptno.sql
│       │           ├── ref_constraint
│       │           │   └── fk_deptno.sql
│       │           └── table

```



2. Add the changed files and commit.

```
SQL> !git add --all
SQL> !git add .
SQL> !git commit -m "release 1.0.0"
```

```
[main 5e1ac12] release 1.0.0
16 files changed, 25 insertions(+), 4 deletions(-)
create mode 100644 dist/releases/1.0/changes/main/stage.changelog.xml
rename dist/releases/{next => 1.0}/changes/ticket-1/code/_custom/dept-
data.sql (100%)
rename dist/releases/{next => 1.0}/changes/ticket-1/code/_custom/emp-
data.sql (100%)
rename dist/releases/{next => 1.0}/changes/ticket-1/demo/index/
idx_emp_deptno.sql (100%)
rename dist/releases/{next => 1.0}/changes/ticket-1/demo/ref_constraint/
fk_deptno.sql (100%)
rename dist/releases/{next => 1.0}/changes/ticket-1/demo/table/dept.sql
(100%)
rename dist/releases/{next => 1.0}/changes/ticket-1/demo/table/emp.sql
(100%)
rename dist/releases/{next => 1.0}/changes/ticket-1/stage.changelog.xml
(100%)
rename dist/releases/{next => 1.0}/changes/ticket-2/demo/table/emp.sql
(100%)
rename dist/releases/{next => 1.0}/changes/ticket-2/stage.changelog.xml
(100%)
rename dist/releases/{next => 1.0}/code/code.changelog.xml (100%)
rename dist/releases/{next => 1.0}/code/demo/function/
get_display_name.sql (100%)
create mode 100644 dist/releases/1.0/release.changelog.xml
```

3. (Optional) Git tag the release.

```
!git tag release-1.0.0
```

At this point, the `dist/release/next` folder is ready for the next set of work for the new release.

4.3.6.2 Generate an Artifact

An artifact contains all the releases that enable the deployment to automatically detect the instance's current version and the required releases to run through to update to the latest. SQLcl generates the artifact as a zipped file. By default, this file is not included in the Git repository because it is a binary file that can become large over time.



Note:

Artifacts must be stored in an artifact repository such as JFrog's Artifactory.

Generate the artifact as follows:

```
SQL> project gen-artifact -version 1.0.0
Your artifact has been generated demo_project-1.0.0.zip
```

The artifact directory now contains the following artifact:

```
├─ artifact
│  └─ demo_project-1.0.0.zip
```

By default, the artifact directory is included in the `.gitignore` file and not added to the repository. It is best practice to move these to an artifact repository (for example, JFrog).

4.3.6.3 Deploy to PROD

Use the artifact that was generated in the previous step and run the `deploy` command on a different database. The following steps deploy the artifact on the `demo-prod` connection.

1. Connect to the production server.

```
SQL> connect -name demo-prod
```

2. Deploy on the Prod server.

```
SQL> project deploy -file artifact/demo_project-1.0.0.zip
```

```
Starting the migration...
Running Changeset: ticket-1/demo/table/
dept.sql::1e18b33eb500d4ccf3880f65c0d06846c793c509::DEMO
Running Changeset: ticket-1/demo/table/
emp.sql::1d12b2ddb0fe34a061ad35dc1990fc3d84d5a676::DEMO
Running Changeset: ticket-1/demo/ref_constraint/
fk_deptno.sql::55dee6178861d12324b4e858b5465b7f4c1a4fcd::DEMO
Running Changeset: ticket-1/demo/index/
idx_emp_deptno.sql::ab1f05f1b3b979156e8b2c8e1608231ae86a14c5::DEMO
Running Changeset: ticket-1/code/_custom/dept-
data.sql::f56fcfec11f7d7cb99d74403a0c2727a765ddb99::SqlCl
```



```

Running Changeset: ticket-1/code/_custom/emp-
data.sql::113b7d3b31e5ae089898777aaa7f556ff6f8dbf7::SqlCl
Running Changeset: ticket-2/demo/table/
emp.sql::cffad61078f4afbd0680bfacbe818e5f089ce535::DEMO
Running Changeset: ../demo/function/
get_display_name.sql::4c4e98c47aeddbc5ca84a31d8ab7e1c066296976::DEMO
Liquibase: Update has been successful. Rows affected: 26
Installing/updating schemas
--Starting Liquibase at 2024-11-05T17:00:18.968636 (version [local build]
#0 built at 2024-08-14 18:40+0000)

```

```

UPDATE SUMMARY
Run:                               8
Previously run:                     0
Filtered out:                       0
-----
Total change sets:                  8

```

Produced logfile: sqlcl-lb-1730851216381.log

Operation completed successfully.

Migration has been completed

4.4 Examples

This section provides examples that make some assumptions around connections and source schemas, and depend on having connections created.

4.4.1 Single Schema

This example consists of a single development schema and a single production schema. After it is created, the production schema includes objects from the development schema and the Liquibase changelog objects.

Overview

1. Create a SQLCl database project.
2. Initialize a git repository in the database project and commit initial files to the main branch.
3. Create a new branch called `base-release`, run `project export` to export the objects from the connection `hr-dev` and commit the files to the branch.
4. Run `project stage` to compare the branch `base-release` to the `main` branch and generate the changelogs for installing the base release.
5. Run `project release` to move the development code to a versioned release called 1.0.
6. Run `project gen-artifact` to create a deployable zip file of the release called `<projectname>-<version>.zip`.
7. Connect to the production schema and deploy the artifact with `project deploy` command.

Connection Definitions

hr-dev: This is the connection to use as a development schema.

hr-prod: This is the connection to use as the production schema.

Development Connection and Objects

In the development schema, install the objects for the HR sample schema. These objects are available on [Github](#). Clone the `oracle-samples/db-samples-schemas` repository.

In this example, an `hr` user is set up with the password `oracle`.

```
$> git clone git@github.com:oracle-samples/db-sample-schemas.git
$> cd db-sample-schemas/human_resources
$> sql <SYSTEM_USER>/<SYSTEMPASSWORD>@<DATABASE_URL>
```

```
SQL> @hr_install
```

```
Thank you for installing the Oracle Human Resources Sample Schema.
This installation script will automatically exit your database session
at the end of the installation or if any error is encountered.
The entire installation will be logged into the 'hr_install.log' log file.
```

```
Enter a password for the user HR: *****
Enter a tablespace for HR [USERS]:
Do you want to overwrite the schema, if it already exists? [YES|no]: YES
Old HR schema has been dropped.
***** Creating REGIONS table ....
***** Creating COUNTRIES table ....
***** Creating LOCATIONS table ....
***** Creating DEPARTMENTS table .....
***** Creating JOBS table ....
***** Creating EMPLOYEES table ....
***** Creating JOB_HISTORY table ....
***** Creating EMP_DETAILS_VIEW view ...
***** Creating indexes ...
***** Adding table column comments ...

***** Populating REGIONS table ....
***** Populating COUNTRIES table ....
***** Populating LOCATIONS table ....
***** Populating DEPARTMENTS table ....
***** Populating JOBS table ....
***** Populating EMPLOYEES table ....
***** Populating JOB_HISTORY table ....
```

Installation verification

Verification:

Table	provided	actual
regions	5	5
countries	25	25
departments	27	27
locations	23	23

employees	107	107
jobs	19	19
job_history	10	10

Create the connection in Oracle SQL Developer extension for VSCode or Oracle SQLcl.

```
SQL> connect -save hr-dev -savepwd hr/oracle@localhost/freepdb1
Name: hr-dev
Connect String: localhost/freepdb1
User: hr
Password: *****
Connected.
SQL> connect -name hr-dev
Connected.
```

Use a `login.sql` file to customise the login experience. Set up the user, database, project, git status, and current working directory.

```
--login.sql
set sqlformat ansiconsole
set sqlprompt "@|red _USER|@@|green _O_RELEASE|@@|blue  >|@"
set statusbar default editmode linecol git project cwd
set statusbar on
```

Steps

1. Create a SQLcl database project.

Choose a directory to create the project and run the `project init` command.

```
SQL> project init -name demo -schemas hr -makeroot
-----
PROJECT DETAILS
-----
Project name:      demo
Schema(s):        HR
Directory:         /Users/abc/sandbox/projects/demo
Connection name:  hr-dev
Config Only:      false
Project root      demo
Your project has been successfully created.
```

This command creates the project and the `makeroot` option creates a project folder.

2. Initialize the Git repository.

In the project directory, initialize a Git repository and commit the initial files to the main branch. The main branch is called `main`. On commit, it is important to use the Conventional Commits standard for commit messages so that it is useful on release to identify features, bugs, chores and other types. The code block shows Git running in SQLcl using the host

command denoted by the ! character preceding the Git command. This character allows the user to run any command available on the host shell.

```
SQL>cd demo
SQL>pwd
/Users/abc/sandbox/projects/demo
SQL> !git init --initial-branch=main
Initialized empty Git repository in /Users/abc/sandbox/projects/demo/.git/
SQL> !git add .
SQL> !git commit -m "chore: initializing repository with default project
files"
[main (root-commit) 6cc2434] chore: initializing repository with default
project files
 8 files changed, 145 insertions(+)
 create mode 100644 .dbtools/filters/project.filters
 create mode 100644 .dbtools/project.config.json
 create mode 100644 .dbtools/project.sqlformat.xml
 create mode 100644 .gitignore
 create mode 100644 dist/README.md
 create mode 100644 dist/install.sql
 create mode 100644 src/README.md
 create mode 100644 src/database/README.md
```

In the `demo` folder, there are several folders and files:

- `.dbtools`: Contains the configuration files for the project.
- `src`: Contains the source files exported from the schema.
- `dist`: Contains the generated install files and releases.
- `artifact`: Contains the zip files generated for a release.

3. Create the `base-release` branch and commit exported files.

Create a branch in Git called `base-release` and check it out. Run `project export` to export the objects from the `hr-dev` connection.

```
SQL> !git checkout -b base-release
Switched to a new branch 'base-release'
SQL> project export
The current connection localhost/freepdb1 HR will be used for all
operations.
*** INDEXES ***
*** PROCEDURES ***
*** SEQUENCES ***
*** TABLES ***
*** TRIGGERS ***
*** VIEWS ***
*** COMMENTS ***
*** REF_CONSTRAINTS ***
-----
TABLE                                6
PROCEDURE                            2
REF_CONSTRAINT                       10
CREATE_USER                           1
TRIGGER                               2
SEQUENCE                              3
```

```
INDEX                                11
VIEW                                  1
COMMENT                               7
-----
Exported 43 objects.
Elapsed 13 sec.
SQL>!git status
On branch base-release
Untracked files:
  (use "git add <file>..." to include in what will be committed)
  src/database/hr/
SQL>!git add src
SQL>!git status
On branch base-release
Changes to be committed:
  (use "git restore --staged <file>..." to unstage)
  new file:   src/database/hr/comments/countries.sql
  ...
  new file:   src/database/hr/comments/regions.sql
  new file:   src/database/hr/create_users/create_user.sql
  new file:   src/database/hr/indexes/dept_location_ix.sql
  ...
  new file:   src/database/hr/indexes/loc_state_province_ix.sql
  new file:   src/database/hr/procedures/add_job_history.sql
  new file:   src/database/hr/procedures/secure_dml.sql
  new file:   src/database/hr/ref_constraints/countr_reg_fk.sql
  ...
  new file:   src/database/hr/ref_constraints/loc_c_id_fk.sql
  new file:   src/database/hr/sequences/departments_seq.sql
  new file:   src/database/hr/sequences/employees_seq.sql
  new file:   src/database/hr/sequences/locations_seq.sql
  new file:   src/database/hr/tables/countries.sql
  ...
  new file:   src/database/hr/tables/regions.sql
  new file:   src/database/hr/triggers/secure_employees.sql
  new file:   src/database/hr/triggers/update_job_history.sql
  new file:   src/database/hr/views/emp_details_view.sql

!git commit -m "chore: base export of hr schema"
[base-release b481c41] chore: base export of hr schema
44 files changed, 609 insertions(+)
create mode 100644 src/database/hr/comments/countries.sql
...
create mode 100644 src/database/hr/comments/regions.sql
create mode 100644 src/database/hr/create_users/create_user.sql
create mode 100644 src/database/hr/indexes/dept_location_ix.sql
...
create mode 100644 src/database/hr/indexes/loc_state_province_ix.sql
create mode 100644 src/database/hr/procedures/add_job_history.sql
create mode 100644 src/database/hr/procedures/secure_dml.sql
create mode 100644 src/database/hr/ref_constraints/countr_reg_fk.sql
...
create mode 100644 src/database/hr/ref_constraints/loc_c_id_fk.sql
create mode 100644 src/database/hr/sequences/departments_seq.sql
...
create mode 100644 src/database/hr/sequences/locations_seq.sql
```

```

create mode 100644 src/database/hr/tables/countries.sql
...
create mode 100644 src/database/hr/tables/regions.sql
create mode 100644 src/database/hr/triggers/secure_employees.sql
create mode 100644 src/database/hr/triggers/update_job_history.sql
create mode 100644 src/database/hr/views/emp_details_view.sql

```

4. Use project stage to create changelogs for installing the base release.

Run the `project stage` command to compare the `base-release` branch to the main branch and generate the changelogs for installing the base release.

```

SQL> project stage
Stage successfully created, please review and commit your changes to
repository.
SQL> !git status
On branch base-release
Untracked files:
  (use "git add <file>..." to include in what will be committed)
    dist/releases/
SQL> !find dist/releases/next
dist/releases/next
dist/releases/next/changes
dist/releases/next/changes/base-release
dist/releases/next/changes/base-release/code
dist/releases/next/changes/base-release/code/_custom
dist/releases/next/changes/base-release/stage.changelog.xml
dist/releases/next/changes/base-release/hr
dist/releases/next/changes/base-release/hr/ref_constraint
dist/releases/next/changes/base-release/hr/ref_constraint/dept_loc_fk.sql
dist/releases/next/changes/base-release/hr/ref_constraint/emp_job_fk.sql
dist/releases/next/changes/base-release/hr/ref_constraint/jhist_job_fk.sql
dist/releases/next/changes/base-release/hr/ref_constraint/jhist_dept_fk.sql
dist/releases/next/changes/base-release/hr/ref_constraint/loc_c_id_fk.sql
dist/releases/next/changes/base-release/hr/ref_constraint/countr_reg_fk.sql
dist/releases/next/changes/base-release/hr/ref_constraint/emp_dept_fk.sql
dist/releases/next/changes/base-release/hr/ref_constraint/jhist_emp_fk.sql
dist/releases/next/changes/base-release/hr/ref_constraint/dept_mgr_fk.sql
dist/releases/next/changes/base-release/hr/ref_constraint/
emp_manager_fk.sql
dist/releases/next/changes/base-release/hr/table
dist/releases/next/changes/base-release/hr/table/jobs.sql
dist/releases/next/changes/base-release/hr/table/departments.sql
dist/releases/next/changes/base-release/hr/table/regions.sql
dist/releases/next/changes/base-release/hr/table/countries.sql
dist/releases/next/changes/base-release/hr/table/employees.sql
dist/releases/next/changes/base-release/hr/table/job_history.sql
dist/releases/next/changes/base-release/hr/table/locations.sql
dist/releases/next/changes/base-release/hr/index
dist/releases/next/changes/base-release/hr/index/emp_name_ix.sql
dist/releases/next/changes/base-release/hr/index/jhist_department_ix.sql
dist/releases/next/changes/base-release/hr/index/emp_manager_ix.sql
dist/releases/next/changes/base-release/hr/index/emp_department_ix.sql
dist/releases/next/changes/base-release/hr/index/loc_country_ix.sql
dist/releases/next/changes/base-release/hr/index/jhist_employee_ix.sql
dist/releases/next/changes/base-release/hr/index/jhist_job_ix.sql

```

```

dist/releases/next/changes/base-release/hr/index/loc_city_ix.sql
dist/releases/next/changes/base-release/hr/index/dept_location_ix.sql
dist/releases/next/changes/base-release/hr/index/emp_job_ix.sql
dist/releases/next/changes/base-release/hr/index/loc_state_province_ix.sql
dist/releases/next/changes/base-release/hr/sequence
dist/releases/next/changes/base-release/hr/sequence/departments_seq.sql
dist/releases/next/changes/base-release/hr/sequence/locations_seq.sql
dist/releases/next/changes/base-release/hr/sequence/employees_seq.sql
dist/releases/next/release.changelog.xml
dist/releases/next/code
dist/releases/next/code/code.changelog.xml
dist/releases/next/code/hr
dist/releases/next/code/hr/trigger
dist/releases/next/code/hr/trigger/update_job_history.sql
dist/releases/next/code/hr/trigger/secure_employees.sql
dist/releases/next/code/hr/comment
dist/releases/next/code/hr/comment/jobs.sql
dist/releases/next/code/hr/comment/departments.sql
dist/releases/next/code/hr/comment/regions.sql
dist/releases/next/code/hr/comment/countries.sql
dist/releases/next/code/hr/comment/employees.sql
dist/releases/next/code/hr/comment/job_history.sql
dist/releases/next/code/hr/comment/locations.sql
dist/releases/next/code/hr/procedure
dist/releases/next/code/hr/procedure/secure_dml.sql
dist/releases/next/code/hr/procedure/add_job_history.sql
dist/releases/next/code/hr/view
dist/releases/next/code/hr/view/emp_details_view.sql

```

5. Run project release to complete the release.

Run the `project release` command to move the development code to a versioned release called 1.0.

```

SQL> project release -version 1.0 -verbose
Creating a release version 1.0 for the current body of work

Updated change:dist/releases/main.changelog.xml
Moved folder "dist/releases/next" to "dist/releases/1.0"
Created file: dist/releases/next
Created change:dist/releases/next/release.changelog.xml
Created change:dist/releases/next/release.changelog.xml
Process completed successfully

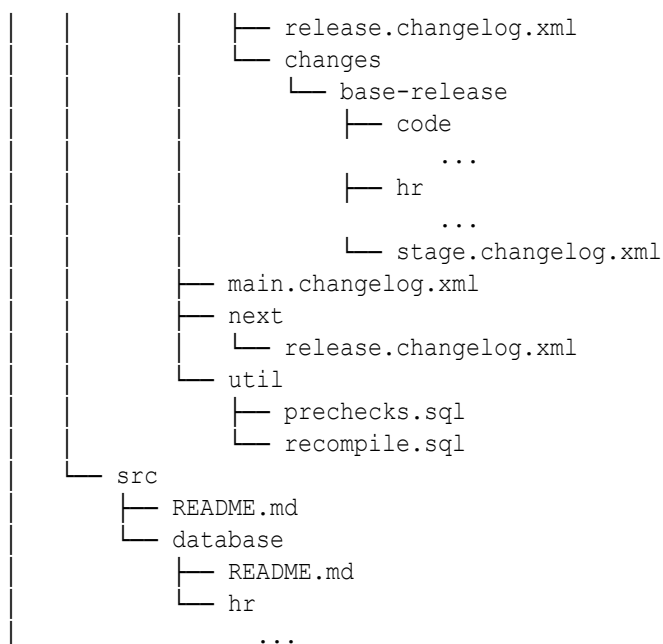
```

This moves all changes in the `next` folder to the 1.0 folder under releases.

```

--Cropped Tree Structure
SQL> !tree
.
├── demo
│   ├── README.md
│   ├── dist
│   │   ├── install.sql
│   │   └── releases
│   │       ├── 1.0
│   │       └── code

```



6. Run `project deploy` to install the artifact into a database.

Connect to the production schema and deploy the artifact with the `project deploy` command.

```

connect -name production-connection
SQL> project deploy -file artifact/demo-1.0.zip -verbose
Check database connection...
Extract the file name: demo-1.0
Artifact decompression in progress...
Artifact decompressed: /var/folders/35/v7k4b96d1d9b61mm93bgjjnr0000gn/T/
e6b3d0f0-92d5-4fde-b82c-37ea9ec419c58326209255710673404
Starting the installation...

```

7. Check the installed schema to check the installed objects.

```

SQL> connect hr/<password>
Connected.
SQL> tables

```

TABLES

```

-----
COUNTRIES
DATABASECHANGELOG_ACTIONS
DATABASECHANGELOG
DATABASECHANGELOGLOCK
DEPARTMENTS
DOC
EMPLOYEES
JOB_HISTORY
JOBS
LOCATIONS
REGIONS

```

The migrated tables are listed along with the management tables for Liquibase.

4.4.2 Administrator Exports HR to Production Schema

In this example, the steps are the same as in [Single Schema](#), except for the deploy (step 7), which is done in this case as an administrator. All objects that are created need to be prefaced with the schema name. This can be added on export by setting the following configuration item:

```
project config set -name export.setTransform.emitSchema -value true -type
BOOLEAN
```

Run the project deploy command.

```
SQL> connect adminuser/oracle@database
SQL> drop user hr cascade;
SQL> grant connect,resource, dba to hr identified by oracle;
SQL> project deploy -file artifact/demo-1.0.zip -verbose
Check database connection...
Extract the file name: demo-1.0
Artifact decompression in progress...
Artifact decompressed: /var/folders/35/v7k4b96d1d9b61mm93bgjjnr0000gn/T/
e6b3d0f0-92d5-4fde-b82c-37ea9ec419c58326209255710673404
Starting the installation...
```

After the installation, the main difference in objects is where the Liquibase tables exist.

```
SQL> show user
USER is "ABC"
SQL> tables
```

TABLES

```
DATABASECHANGELOG_ACTIONS
DATABASECHANGELOG
DATABASECHANGELOGLOCK
```

```
SQL> connect hr/oracle
Connected.
SQL> tables
```

TABLES

```
COUNTRIES
DEPARTMENTS
DOC
EMPLOYEES
JOB_HISTORY
JOBS
LOCATIONS
REGIONS
```

5

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 5-1 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](#)
- [Using the OCI Command for Oracle Cloud Infrastructure REST APIs](#)

5.1 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_ociid <user-  
id> tenancy_ociid <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_ociid] [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
Transfer 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_oxid ocid1.user.oc1.....**g4xoca
      tenancy_oxid 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 CREDENTIAL 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.

5.2 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
```

5.3 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.

5.4 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"
da"<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|"Illinoi
s"
```

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
```

6

Using Data Pump

You can import and export data and metadata using Data Pump. Data Pump is made available in SQLcl using the PL/SQL package, `DBMS_DATAPUMP`.

You can do the following:

- Export one or more schemas.
- Import one or more schemas with the `remap schema` option.
- Use `DATAPUMP` export and import for Oracle Database and Oracle Autonomous Database Cloud Services.
- Use database directory or Oracle Object Store for dump files, which can be optionally encrypted.
- Perform parallel processing of dump files.
- Filter objects by object types or names.
- Use the `SET DATAPUMP` command to set defaults and save them with the `STORE` command.
- Use the Cloud Storage feature to put or get from the database directory.

Topics

- [Getting Started](#)
- [Data Pump Command Syntax and Arguments](#)
- [Use Cases](#)
- [Tips and Troubleshooting](#)

6.1 Getting Started

The following sections provide information needed to get started with the `DATAPUMP` command in SQLcl.

6.1.1 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.

6.1.2 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`.

6.2 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 6-1 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	<i><file-name></i> [,...] 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.	<i><jobname></i> <i><n></i> .DMP

Table 6-1 (Cont.) Optional Arguments

File Argument	Description	Default
-dumpuri,-u	<p>[<uri>[,...] <qualified-name>[,...]]</p> <p><uri>: Complete URI for the Oracle Object Store file if a default is not set on Cloud Storage command.</p> <p><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.</p> <p>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.</p> <p>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.</p>	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 6-2 Command Arguments

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

Table 6-3 Common Arguments

Common Argument	Description	Default
-copycloud,-cc	<p>[TRUE FALSE]</p> <p>TRUE: Copy the dump file between database directory and Oracle Object Store.</p> <p>For export, copy the dump file from the database directory to Oracle Object Store after the data pump job completes.</p> <p>For import, copy the dump file from Oracle Object Store to the database directory before the data pump job starts.</p> <p>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.</p>	FALSE
-encryptionpassword,-enp	<p><password></p> <p>If password is not specified, a prompt for the password is given.</p> <p>For export, the dump files are encrypted using the password.</p> <p>For import, the same password used for export is provided.</p>	None
-excludeexpr,-ex	<p><object_type_expression></p> <p>Specify an expression identifying an object type or set of object types to exclude from the job.</p> <p>Example:-excludeexpr "IN ('GRANT', 'INDEX', 'TRIGGER')"</p>	None
-excludelist,-el	<p><object-type>[,...]</p> <p>Specify a comma-separated-value list of object types to exclude from the job.</p> <p>Example:-excludelist GRANT, INDEX, TRIGGER</p>	None
-includeexpr,-ix	<p><object_type_expression></p> <p>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')"</p>	None

Table 6-3 (Cont.) Common Arguments

Common Argument	Description	Default
-includelist,-il	<p><object_type>[,...]</p> <p>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</p>	None
-includemetadata,-im	<p>[TRUE FALSE]</p> <p>TRUE: Include metadata in the job.</p>	TRUE
-includerows,-ir	<p>[TRUE FALSE]</p> <p>TRUE: Include data in the job.</p>	TRUE
-jobname,-j	<p>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.</p>	ESQL_<n> ISQL_<n> where n is a data pump generated number.
-nameexpr,-nx	<p>{<object-type>=<name-expression>}[...]</p> <p>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')"</p>	None
-namelist,nl	<p>{<object-type>=<name>[,...]}[...]</p> <p>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</p>	None
-parallel,-p	<p><degree_integer></p> <p>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.</p>	1

Table 6-3 (Cont.) Common Arguments

Common Argument	Description	Default
-schemas,-s	<p><schema>[,...] - The schema or list of schemas to process.</p> <p>For example:</p> <pre>-schemas schema1,schema2</pre>	For export, schema for the current connection. For import, the default is FULL and all objects in the dump file are imported.
-version,-v	<p>{<nn.n> COMPATIBLE LATEST}</p> <p><nn.n>: A specific database version, for example, 11.0.0.</p> <p>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.</p> <p>COMPATIBLE: Uses the metadata version from the database compatibility level and the compatibility release level for the feature.</p> <p>LATEST: The version of the metadata corresponds to the database version.</p>	COMPATIBLE
-wait,-w	<p>[TRUE FALSE]</p> <p>TRUE: Wait for the data pump job to finish and show summary results.</p> <p>FALSE: Submit the data pump job without waiting and without showing results.</p>	TRUE

Table 6-4 Export Only Arguments

Export-Only Arguments	Description	Default
-compression,-cm	<p>{ALL DATA_ONLY METADATA_ONLY NONE}</p> <p>Indicates if compression is needed for user data and metadata.</p> <p>ALL: Compress user data and metadata.</p> <p>DATA_ONLY: Compress only user data.</p> <p>METADATA_ONLY: Compress only metadata.</p> <p>NONE: Do not compress user data or metadata.</p>	METADATA_ONLY
-estimate,-e	<p>{BLOCKS STATISTICS}</p> <p>Specifies the estimate method for the size of the tables. It should be performed before starting the job.</p> <p>BLOCKS: Estimate is calculated using the count of blocks allocated to the user tables.</p> <p>STATISTICS: Estimate is calculated using the statistics for each table. If no statistics are available for a table, BLOCKS is used.</p>	
-encryption,-en	<p>{ALL DATA_ONLY ENCRYPTED_COLUMNS_ONLY METADATA_ONLY NONE}</p> <p>Specifying any encryption option will turn on encryption if you do not specify -encryption NONE.</p>	NONE, or ALL if any other encryption option is specified.
-encryptionalgorithm,-ena	<p>{AES128 AES192 AES256}</p> <p>Identifies the cryptographic algorithm to use.</p>	AES128
-encryptionmode,-enm	<p>{DUAL PASSWORD TRANSPARENT}</p> <p>Identifies the types of security used for encryption and decryption.</p> <p>PASSWORD encrypts the dump files using the provided password.</p> <p>TRANSPARENT enables encryption if the Oracle Encryption Wallet is available.</p> <p>DUAL enables import using the Oracle Encryption Wallet or the password. When using DUAL, -encryptionpassword must be specified.</p>	TRANSPARENT, or PASSWORD if -encryptionpassword is specified.

Table 6-4 (Cont.) Export Only Arguments

Export-Only Arguments	Description	Default
-filesize,-fs	{<n>{B KB MB GB TB}}	500 MB
	Limit for the size of files.	
-flashbackscn,-fb	[TRUE FALSE]	FALSE
	TRUE: Use consistent database content based on system change number (SCN) at the start time of execution.	
-reusefile,-r	[TRUE FALSE]	TRUE
	TRUE: Replace existing dump file(s) with a new file.	

Table 6-5 Import Only Arguments

Import-Only Arguments	Description	Default
-columnencryption,-ce	[TRUE FALSE]	TRUE if supported by database
	TRUE: Include column encryption clause on table metadata. FALSE: Omit column encryption clause.	
-objectid,-oid	[TRUE FALSE]	TRUE
	TRUE: Assign the exported OID. FALSE: Assign a new OID	
-remapschemas,-rs	{<oldSchema>=<newSchema>[, ...]}	Not Applicable
	<oldSchema> objects in the job are moved to <newSchema>. Example: oldschema1=newschema1,oldschema2=newschema2.	
-remappingspaces,-rt	{<oldTablespace>=<newTablespace>[, ...]}	Not Applicable
	<oldTablespace> storage segment in the job is relocated to <newTablespace>. Example: oldtablespace1=newtablespace1, oldtablespace2=newtablespace2	
-segmentattributes,-sa	[TRUE FALSE]	TRUE
	TRUE: Include segment attributes clauses (physical attributes, storage attributes, tablespace, logging).	
-skipunusableindexes,-sui	[TRUE FALSE]	TRUE
	TRUE : Rows are inserted into tables having unusable indexes.	

Table 6-5 (Cont.) Import Only Arguments

Import-Only Arguments	Description	Default
-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 <code>-includemetadata true</code> , otherwise APPEND action is taken if table exists during import.
-tablecompression,-tc	[TRUE FALSE] TRUE: The table compression clause is included if supported. FALSE: The table has the default compression for the tablespace.	TRUE

6.3 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 dpumpstest1,dpumpstest11 -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
dpumpstest1=dpumpstest2,dpumpstest11=dpumpstest21
```

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
```

6.4 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
```

7

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, see [Cloud Premigration Advisor Tool](#) in *Oracle Database Utilities*.

Also, see CPAT Analyzes Databases for Suitability of Cloud Migration (Doc ID 2758371.1) in My Oracle Support.

You can use SQLcl to run CPAT by using the `MIGRATEADVISOR` command.

Topics:

- [Overview](#)
- [Prerequisites](#)
- [About the MIGRATEADVISOR Command](#)
- [Examples](#)
- [Tips and Troubleshooting](#)

7.1 Overview

Using the `MIGRATEADVISOR` command in SQLcl, you can:

- Analyze an Oracle database to a generic autonomous type or specific instance, and create reports identifying actions recommended for successful migration to Oracle Cloud. A report can be generated in HTML, text or JSON format.
- Optionally, generate a target properties file that will provide more details specific to an autonomous instance.

The following image shows a CPAT report in HTML format.

```
[SQL> migrateadvisor advise -schemas hr -outfileprefix xschemas -targettype adws -reportformat HTML

Cloud Premigration Advisor Tool Version 22.5.6-30
-----
Cloud Premigration Advisor Check Summary
-----
Cloud Premigration Advisor Tool completed with overall result: Action Required
 38 Checks run
 79 Schemas in source DB
 1 Schemas analyzed: HR
 1 Action Required: Checks with this result typically need to be resolved before attempting migration.
    Data in Custom Tablespaces (Shared) (25 relevant objects)
 5 Review Required
 3 Review Suggested
 29 Passed
Cloud Premigration Advisor Tool generated report location(s):
/private/tmp/xschemas_premigration_advisor_report2.json
/private/tmp/xschemas_premigration_advisor_report2/premigration_advisor_report.html
/private/tmp/xschemas_premigration_advisor2.log
```

CPAT Concepts

The source analysis in CPAT is done generically for different cloud types:

- ATPS (Autonomous Transaction Processing on Shared Infrastructure)
- ATPD (Autonomous Transaction Processing on Dedicated Infrastructure)
- ADWS (Autonomous Data Warehouse on Shared Infrastructure)
- ADWD (Autonomous Data Warehouse on Dedicated Infrastructure)
- Default (Oracle Database)

The source analysis consists of a series of tests that are executed as SQL Statements. The scope of the tests fall into three categories:

- **SCHEMA:** Checks that are only applicable to data within schemas. For example, tables are checked for usage of deprecated and desupported features.
- **INSTANCE:** Checks that are only applicable to the database instance as a whole. For example, certain parameters and values in the `V$PARAMETER` table are checked.
- **UNIVERSAL:** Checks that are always run.

The source analysis can run in FULL mode, SCHEMA MODE or FULL SCHEMA mode.

- **FULL:** (Default) Executes all applicable checks in all appropriate schemas. SCHEMA, INSTANCE, and UNIVERSAL scope checks are executed.
- **SCHEMA:** Executes all applicable checks for schemas specified on the command line and UNIVERSAL checks. INSTANCE scope checks are not executed.
- **SCHEMA FULL:** Executes all applicable checks for schemas specified on the command line and UNIVERSAL and INSTANCE checks.

7.2 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.

7.3 About the MIGRATEADVISOR Command

You can run the CPAT command in SQLcl using `ma` or `migrateadvisor`.

This command includes 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	<p><i><propertyFile></i></p> <p>The path and name of a properties file.</p>	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 the root.

A properties file that was created using the properties sub-

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

7.4 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>
```

7.5 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
```

8

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](#)

8.1 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.

8.2 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:

- `schema <schema_name>`: Make queries run against graphs owned by the specified schema.

- `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 `schema` and `graph` values are 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.

8.3 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         KEY(empno)
11         SOURCE KEY ( empno ) REFERENCES emp
12         DESTINATION KEY ( deptno ) REFERENCES dept
13         NO PROPERTIES
14     )
15     OPTIONS(PG_PGQL);

```

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>
```

9

SQLcl Command Reference

This chapter covers the following sections:

- [Alphabetic List of SQLcl Commands](#)
- [Additional Commands](#)
- [AQ \(Advanced Queuing\)](#)
- [AWR](#)
- [BLOCKCHAIN_TABLE](#)
- [DG \(Data Guard\)](#)
- [DIRS, PUSHHD and POPD](#)
- [MDB](#)
- [MLE](#)
- [MODELER](#)
- [REST](#)
- [SET *system_variable value*](#)
- [SHOW *option*](#)
- [SODA](#)
- [List of Unsupported SQL*Plus Commands and Features](#)

9.1 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
```

```
AQ
```

```
ARBORI
```

```
ARCHIVE LOG LIST
```

```
ARG[UMENT] OPTIONS
```

```
AWR
```

BACKGROUND

BLOCKCHAIN_TABLE

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

BRIDGE

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

CD [<directory>]

CERTIFICATE

C[HANGE] *sepchar old* [*sepchar* [*new* [*sepchar*]]]

CL[EAR] *option* ...

CLOUDSTORAGE

CODESCAN

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*]]

CONNMGR

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*

CTAS *table new_table*

CS

DATAPUMP

DBCCRED

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

DIRS

DISC[ONNECT]

ED[IT] [*file_name*[.ext]]

EXEC[UTE] *statement*

{EXIT | QUIT} [SUCCESS | FAILURE | WARNING | *n* | *variable* | :*BindVariable*]
[COMMIT | ROLLBACK]

FILES

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*]
 IMMUTABLE_TABLE
 INFO[RMATION] {[*schema.*]object[@*connect_identifier*]}
 I[NPUT] [*text*]
 JOBS
 LIQUIBASE
 L[IST] [*n* | *n m* | *n ** | *n LAST* | * | * *n* | * LAST | LAST]
 LOAD [*schema.*]*table_name*[@*db_link*] *file_name*
 MIGRATEADVISOR
 MODELER
 NET
 OCI
 OCIDBMETRICS
 OERR <*facility*> <*error*>
 ORAPKI
 PASSW[ORD] [*username*]
 PAU[SE] [*text*]
 POPD
 PRINT [*variable ...*]
 PROJECT
 PRO[MPT] [*text*]
 PUSHD
 {QUIT | EXIT} [SUCCESS | FAILURE | WARNING | *n* | *variable* | :*BindVariable*]
 [COMMIT | ROLLBACK]
 REM[ARK]
 REPEAT <*iterations*> <*sleep*>
 RESERVED_WORDS
 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>

SECRET

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]]

TIMING

TNSPING <address>

TOSUB

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

UNDEF[INE] variable ...

UNLOAD

VARIABLE

VAULT

WAIT4

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
```

9.1.1 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	
<code>arg_num</code>	The position of the parameter relative to 1.
<code>action {default prompt}</code>	The argument action to take when a parameter is not already defined. <ul style="list-style-type: none"> • <code>prompt</code>: Prompts the user for the parameter value and sets it. • <code>default</code>: Sets the default value.
<code>action_value</code>	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	
<code>comment {comment}</code>	Associate a comment with the parameter. {comment} - Associate the comment value specified with the parameter.
<code>comment_value</code>	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)
```

9.1.2 CODESCAN Command

This command identifies issues with the code using the Trivadis Coding Guidelines, which is available on [GitHub](#).

Syntax

```
codescan { -path dir | -format {json|text} | -ignore ruleNo | -output file | -
settings file }
```

where

- `-path` checks SQL, PLS and PLB files in the directory for SQL Best Practice violations and generates a report of the issues found.
- `-format` formats the output as structured JSON. For example:


```
[ {"file": "/private/tmp/tst.sql", "warnings": [
  {line:35, pos:15, ruleNo:"G-1050",
   msg:"Avoid using literals in your code" },...]} ]
```
- `-output` saves the report in a new file.
- `-ignore` skips specified rule checks.
- `-settings` imports CODESCAN settings from the JSON file. Currently, only the `ignore` attribute is supported, example, `{"ignored":["G-1050", "G-4010"]}`.

Set Codescan

Controls warning messages that are triggered for SQLcl command line code quality issues.

Syntax

```
set codescan {ON | OFF}
```

where `ON` turns on warnings for SQL and PL/SQL best practice violations. The default is `OFF`.

Example

```
SQL>set codescan on
SQL>BEGIN
  BEGIN
    null;
  END;
END;
/
```

SQL best practice warning (1,7): G-1010: Try to label your sub blocks

PL/SQL procedure successfully completed.

9.2 Additional 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.

9.3 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;
```

9.3.1 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
-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

9.3.2 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

9.3.3 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

9.3.4 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

9.3.5 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

9.3.6 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.	-

9.3.7 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

Parameter	Description	Default
-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: <ul style="list-style-type: none"> [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

9.3.8 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.

Parameter	Description	Default
-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: <ul style="list-style-type: none"> [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

9.3.9 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.	-

Parameter	Description	Default
-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

9.3.10 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

9.3.11 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/CREATEETEQ -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.	-
-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, INITTRANS, 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: <ul style="list-style-type: none"> [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

9.3.12 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.	-
-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

Parameter	Description	Default
<code>-retry_delay, -retry</code>	<code><retry_delay number></code> Delay time, in seconds, before this message is scheduled for processing again after an application rollback.	0
<code>-retention_time, -rtime</code>	<code><retention_time number></code> [-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
<code>-sort_list, -sort</code>	<code><sort_list></code> 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
<code>-cache_hint, -cache</code>	[1:AUTO 2:CACHED 3:UNCACHED] Specifies a hint to sharded queue whether to cache messages or not. User can specify following: <ul style="list-style-type: none"> [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
<code>-retention_type, -rtype</code>	[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
<code>-replication_mode, -repl</code>	[0:NONE 1:REPLICATION_MODE]	0:NONE

9.3.13 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

9.3.14 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

9.3.15 Start a Queue

Syntax

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

Parameters

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

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

9.3.17 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.	-

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

9.3.18 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.	-

Parameter	Description	Default
-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

9.3.19 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.	""

Parameter	Description	Default
-subscriber_protocol, -sp	<subscriber_protocol> Protocol to interpret the address and propagate the message.	0

9.3.20 Enqueue

Syntax

```
AQ ENQ[UEUE] -n[name] 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[ception_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: <ul style="list-style-type: none"> [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 enqueueing to a non-persistent queue. 	2:ON_COMMIT

Parameter	Description	Default
-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.	-
-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)	-

9.3.21 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[emption_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.	-
-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: <ul style="list-style-type: none"> [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. 	-

Parameter	Description	Default
-navigation, -nav	Specifies the position of the message that will be retrieved. Possible settings are: <ul style="list-style-type: none"> [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. 	-
-visibility, -vis	Specifies the transactional behavior of the enqueue request. Possible settings are: <ul style="list-style-type: none"> [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 enqueueing 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: <ul style="list-style-type: none"> [-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	<i><transformation></i> 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

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)	-
-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)	-
-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)	-

Parameter	Description	Default
-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)	-

9.4 AWR

The `awr` command creates and retrieves automatic workload repository (AWR) reports for the currently connected instance. These reports provide metrics on the database's workload, performance, and resource usage.

Syntax

```
awr <create_snapshot> | <create_report> | <list_snapshots>
<create_snapshot> := create snapshot (bestfit | lite | typical | all)?
<create_report> := create (html | text) <begin-snapshot-id>
<end-snapshot-id>
<list_snapshots> := list snap[shots]
```

where

<create_snapshot>: Creates a new snapshot and prints its id. The optional parameter flush-level of the snapshot are (BESTFIT, LITE, TYPICAL, ALL).

<create_report>: Creates a new AWR report and writes it to a file called "AWR-<DB_Name>-<PDB_Name>-<Current Timestamp>.[html|txt]" in the current working directory.

<begin-snapshot-id>: Provides the beginning snapshot id for the AWR report. By default, the second last snapshot id is taken if no id has been provided.

<end-snapshot-id>: Provides the ending snapshot id for the AWR report. By default, the last snapshot id is taken if no id has been provided.

<list_snapshots>: Lists the available snapshots in the database.

9.5 BLOCKCHAIN_TABLE

This command uses an extension of the `DBMS_BLOCKCHAIN_TABLE` PL/SQL package. A blockchain table is an append-only table designed for centralized blockchain applications. V2 blockchain tables support schema evolution, delegate signatures, and countersignatures in addition to the functionality found in V1 blockchain tables. Blockchain tables support only DER encoding for X.509 certificates, not PEM encoding.

Syntax

```
blockchain_table|bl [add_interval_partitioning|addintpartition] |
[countersign_row|countersign] | desc | [delete_expired_rows|del] |
get_bytes_for_row_hash | get_bytes_for_row_signature | get_digest |
get_signed_digest | [sign_row|sign] |
[sign_row_with_countersignature|signandcountersign] | verify_rows |
verify_table | verify_user_chains
```

The following table provides a description of each sub-command.

Sub-Command	Description
add_interval_partitioning addintpartition	Adds interval partitioning to an existing, non-partitioned, V1 or V2 blockchain table.
countersign_row countersign	This command procures a countersignature on a specified row in a blockchain table. The countersignature will be produced by signing the row data content using the table owner's private key stored in the database wallet.
desc	Use this command to describe the details of the Blockchain table.
delete_expired_rows del	Delete some or all expired rows in the blockchain table.
get_bytes_for_row_hash	This command returns in row_data the bytes for the particular row identified (a series of meta-data-value, column-data-value pairs in column position order) followed by the hash for the previous row in the chain in the data format specified.
get_bytes_for_row_signature	This command returns the bytes used to compute a user signature, a delegate signature, or a countersignature. For a user signature or a delegate signature, the command returns in row_data the bytes in the hash in the row without any metadata.
get_digest	This command generates and returns a cryptographic hash of the digest for user-specified rows or for a specified blockchain table.
get_signed_digest	This command generates and returns the signed digest for user-specified rows (if specified) in a blockchain table using the table owner's private key stored in the database wallet. The particular rows in the digest are specified by the selector parameter. The default value of this field is null. The signed_bytes, signed_row_indexes, and schema_certificate_guid are also returned.
sign_row sign	This command can be used by the current user to provide a signature on the row content of a previously inserted row.
sign_row_with_countersignature signandcountersign	It is an extension of SIGN_ROW command that enables the user to request a countersignature from the database. The countersignature is produced by signing the row data content using the table owner's private key stored in the database wallet.

Sub-Command	Description
verify_rows	This command verifies all rows on all applicable system chains for the integrity of HASH column value for rows created in the range of low_timestamp to high_timestamp. Row signatures can be verified as an option.
verify_table	This command verifies all rows whose creation-time falls between the minimum value for the row-creation time from begin_bytes_file and the maximum value for row-creation time from end_bytes_file, and returns the number of successfully verified rows.
verify_user_chains	This command verifies rows of one or more user chains when the user chains feature is enabled on the blockchain table.

For more information such as syntax and examples for each sub-command, enter `help blockchain_table` in the SQLcl command-line help.

9.6 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.

9.7 DIRS, PUSHD and POPD

With these commands, you can view and work with the directory stack (a list of recently-visited directories) and change the current working directory in Linux and other Unix type operating systems.

- `dirs`: Displays the list of currently saved directories.
- `pushd`: Adds directories to the stack.
- `popd`: Removes directories from the stack.

Refer to the SQLcl command-line help for more information about these commands.

9.8 MDB

The MDB command enables the import of tables and data from MDB (Microsoft Access Database) files into an Oracle database schema.

You can run the MDB command in SQLcl using `mdb`.

To view the help information for MDB, enter `help mdb`.

The following two sub-commands are supported, enabling listing or copying data from a Microsoft Access database file.

List Data

Lists tables or saved queries (views) that exist in the specified MDB file and outputs the list.

Syntax

```
mdb list {OPTIONS}
```

Options

Option	Description
Required	
-file -fi <file>	Path of the Microsoft Access database file.
Optional	
-tables -tabs	Only the tables that exist in the specified Microsoft Access file.
-views -vw	Only the views or saved queries that are saved in the Microsoft Access database.

Examples

List all tables and saved queries in an MDB file.

```
mdb list -file mdb_file.mdb
```

Copy Data

Copy tables or views from the Microsoft Access database to the Oracle Database.

Syntax

```
mdb copy {OPTIONS}
```

Options

Option	Description
Required	
-file -fi <file>	Path of the Microsoft Access database file.
Optional	
-tables -tabs	Only the tables that exist in the specified Microsoft Access file.
-views -vw	Only the views or saved queries that are saved in the Microsoft Access database.
-prefix -pr <prefix>	Name to add before the table or view table names.
-table -tab <table>	Copy a specific table from MDB file into Oracle Database.

Option	Description
<code>-mode -mo <mode> {APPEND REPLACE SKIP TRUNCATE} (REPLACE)</code>	<p>Specify the mode of operation for handling existing data in the destination table. The available options are:</p> <ul style="list-style-type: none"> • <code>replace</code>: If the target table exists, drop it, then recreate it and add the new data. • <code>append</code>: Add the new data to the existing data in the target table, if any. • <code>truncate</code>: Clear all existing data in the target table before adding the new data. • <code>skip</code>: If the target table already exists, do nothing. Otherwise, create the table and add the new data.

Examples

Copy all from MDB file to Oracle Database.

```
SQL> mdb copy -file mdb_file.mdb
```

Replace the existing target table by dropping it if it exists, then recreate it and add the data.

```
SQL> mdb copy -table employees -file mdb_file.mdb -mode replace
```

9.9 MLE

Use the MLE command to load JavaScript libraries to the database as MLE modules.

The sub-commands are:

- `create-module`: To create an MLE module.
- `alter-module`: To change an existing MLE module.

You can run the MLE commands in SQLcl using `mle`.

To view the help information for MLE, enter `help mle`.

Prerequisites

This command requires:

- Oracle Database Release 23ai.
- The `CREATE TABLE` privilege is required for the `create-module` sub-command. If creating a module in another schema, then the `CREATE ANY TABLE` privilege is required.
- System privileges documented in the [Oracle Database JavaScript Developer's Guide](#).

Create Module

Creates an MLE module.

Syntax

```
mle create-module {OPTIONS}
```

Options

Option	Description
Required	
-filename <filename>	The path to a valid JavaScript file.
-module-name <module>	The name of the module to create in the current schema.
Optional	
-if-not-exists	Create the module only if it does not exist.
-language <language>	The name of a supported programming language. The default value is JavaScript.
-metadata <metadata>	Any valid JSON text that describes the module. This option is mutually exclusive with -metafile.
-metafile <metafile>	The path to a valid JSON file that describes the module. This option is mutually exclusive with -metadata.
-replace	Replace the module if it exists or create one if it does not exist.
-schema <schema>	The name of an alternate schema to own the module.
-verbose	Emit additional diagnostic information as the command makes progress.
-version <version>	The version of the programming language.

Alter Module

Change an existing MLE module.

Syntax

```
mle alter-module {OPTIONS}
```

Options

Option	Description
Required	
-module-name <module>	The name of the module to change in the current schema.
-metadata <metadata>	Any valid JSON text that describes the module. This option is mutually exclusive with -metafile.
-metafile <metafile>	The path to a valid JSON file that describes the module. This option is mutually exclusive with -metadata.
Optional	
-if-exists	Modify the module only if it exists.
-verbose	Emit additional diagnostic information as the command makes progress.
-schema <schema>	The name of an alternate schema that owns the module.

9.10 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 Language 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 Language statements from the selected Data Modeler design.

Syntax

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

Parameters

Parameter	Description
<code>-design (d) <file></code>	Full path to the design's file name.
<code>-relmodel (rm) <name></code>	Name of the relational model.
<code>-dbsite (ds) <name></code>	(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.
<code>-outputfile (o) <file></code>	Full path to the output file for the generated DDL content.
<code>-systemTypesDir (td) <path></code>	Full path to the system types directory.
<code>-settingsFile (s) <file></code>	Full path to the exported Data Modeler settings file.
<code>-ddlConfigFile (c) <file></code>	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

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

9.11 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_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

9.12 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](#)

9.13 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]
REFP[OOTER]
REPH[EADER]
SGA
SPOOL
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.

9.14 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>`

9.15 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`

A

SQL Performance Troubleshooting

This appendix provides a list of SQL coding patterns that cause potential performance issues in SQL queries.

- [Columns Defined as Literal Constants in Sub-Query Joined Later in Main Query](#)
- [Redundant Table in LEFT OUTER JOIN](#)
- [Too Many Join Conditions Between Factored WITH Sub Queries](#)
- [Data Security Predicates Wrapped Inside Redundant Sub-Query](#)
- [Aggregate Functions in Correlated Scalar Sub-query](#)
- [Use XMLTYPE Data Type Instead of CLOB](#)
- [Large Number of UNION \(ALL\) Query Blocks in a Single SQL](#)
- [Function Calls in WHERE Clause Predicates](#)
- [Long CASE Expressions in SELECT and WHERE Clauses](#)
- [Long in IN-LISTS in SQL Clauses](#)
- [Scalar Sub-Queries with DISTINCT Modifier or ROWNUM Keyword](#)
- [Custom PL/SQL Calls in SELECT Clause](#)

Columns Defined as Literal Constants in Sub-Query Joined Later in Main Query

In cases where you have literal constants defined as columns in a single sub-query and later used in joins in the main query, consider passing them as direct filters instead. Refer to the following example of such usage:

```
(SELECT
    ...
    UPPER('HXT') AS DUMMY
    ...
) V1,
(SELECT
    T2.C2 AS C2
FROM T2
) V2
WHERE
    V1.DUMMY = V2.C2
...
```

The more efficient SQL design is to pass it directly to the main query:

```
(SELECT
    ...
) V1,
(SELECT
    T2.C2 AS C2
```

```

FROM T2
) V2
WHERE
V2.C2 = UPPER('HXT')
...

```

Redundant Table in LEFT OUTER JOIN

Some of Left Outer Joins (LOJ) may be redundant if you join two tables through LOJ but do not select any attributes from the table on the 'optional' side of the LOJ. Review the following example:

```

SELECT
  b.book_title,
  b.author,
  b.language
FROM
  books b,
  book_languages 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 optimal 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
      (...)
    )
  )
)
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:

P_APPLICATION_ID: Type: Menu

Display Label: P_APPLICATION_ID

List of Values: LOV_APPLICATION_ID

Number of Values to Display in List: 100

Options: Multiple Selection

Can select all

NULL Value Passed All Values Passed

Refresh other parameters on change

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 mccl
     WHERE mccl.category_id = mat.parent_category_id
           AND mccl.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.

B

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B.1 ANTLR4 Java Runtime 4.13.1

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B.2 Apache Mina SSHD-contrib 2.13.2

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```

Dependency #1

NAME: SLF4J-API

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```

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Dependency #2

NAME: JCL-OVER-SLF4J

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```

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NAME: SLF4J-API

```
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Dependency #2

NAME: JCL-OVER-SLF4J

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Dependency #2

NAME: JCL-OVER-SLF4J

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B.5 Apache Mina SSHD-scp 2.13.2

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It was originally written by Tatu Saloranta (tatu.saloranta@iki.fi), and has
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It is currently developed by a community of developers.

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It was originally written by Tatu Saloranta (tatu.saloranta@iki.fi), and has
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This is a Java port of Daniel Lemire's `fast_float` project.
This project provides parsers for double, float, BigDecimal and BigInteger values.

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```
-
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-----
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```
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```

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This project provides parsers for double, float, BigDecimal and BigInteger values.

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B.20 JLine 3.25.1, 3.26.3

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This is a Java port of Daniel Lemire's fast_float project.
This project provides parsers for double, float, BigDecimal and BigInteger values.

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B.25 OCI SDK for Java 3.44.3

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Jackson JSON processor

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FastDoubleParser

jackson-core bundles a shaded copy of FastDoubleParser <<https://github.com/wrandelshofer/FastDoubleParser>>.
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jakarta.ws.rs-api

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Notices for fastdoubleparser

FastDoubleParser

This is a Java port of Daniel Lemire's fast_float project.
This project provides parsers for double, float, BigDecimal and BigInteger values.

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B.28 slf4j-jdk14 2.0.13

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B.29 StringTemplate 4.3.4

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B.30 ucanaccess 5.1.1

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For integration of HSQLDB

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