

ORACLE



# CI/CD with SqlCl and Liquibase

Automate CI/CD on Oracle Database

## EMEA Data Management Experts Team

- Ulrike Schwinn      ➤ Jesus Robles
- Stephane Duprat

# Being a developer isn't easy...

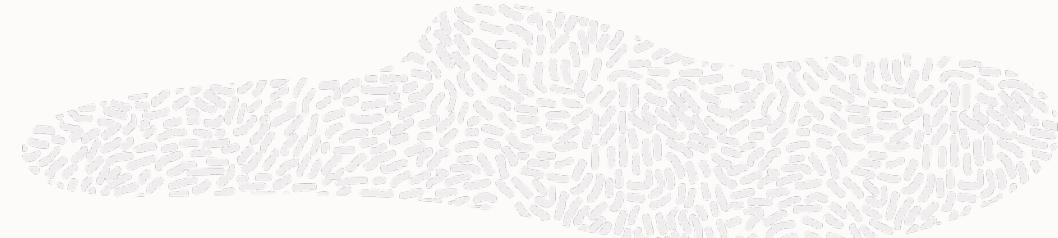
Frequent delivery

Changing requirements

Create quality products



# Liquibase – Source Control for your DB

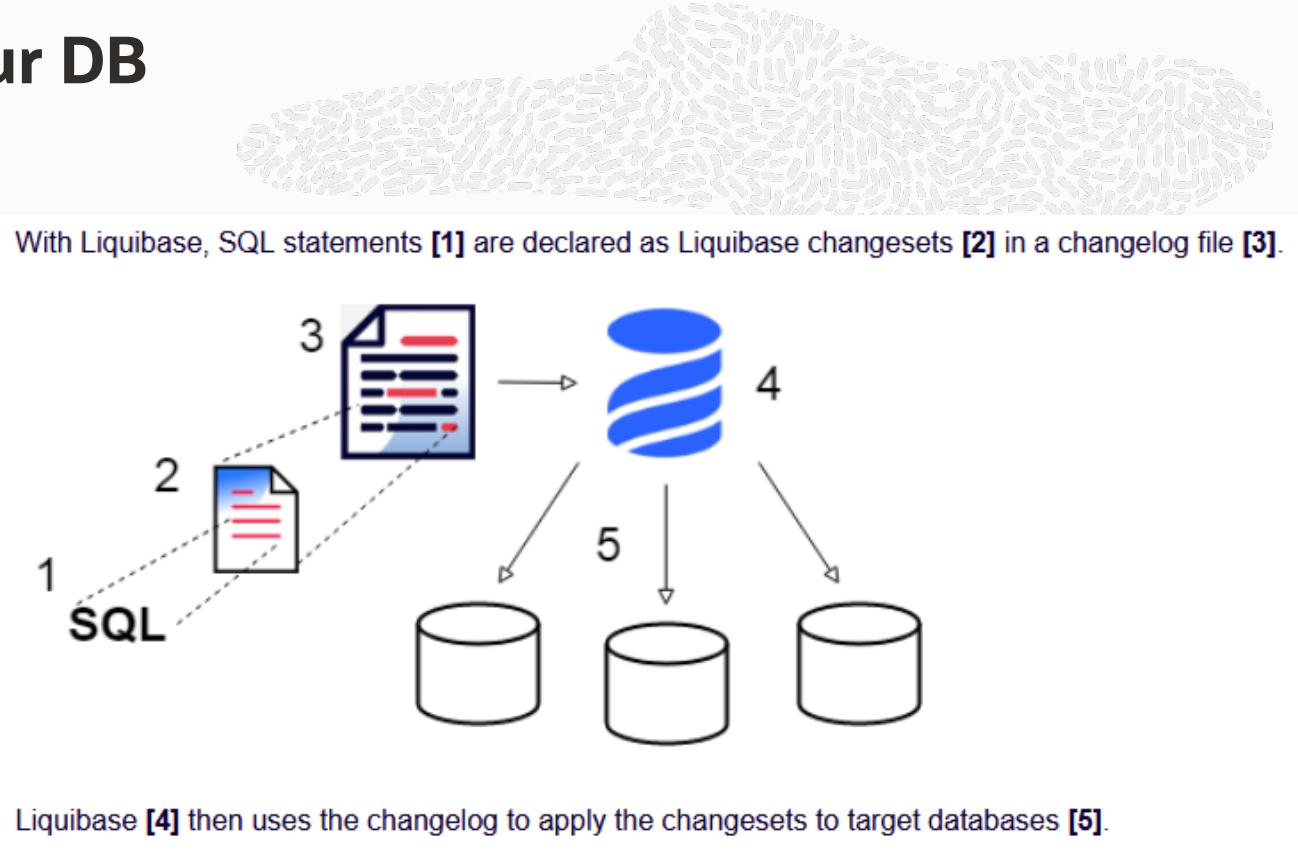


- Open source project
- Deploys versions of your database schema/user
- Supports popular DBMS solutions, **including Oracle**
- **Installs, upgrades, or rollbacks**
- Executable via command line,
  - Apache Ant,
  - Apache Maven,
  - servlet container,
  - Spring Framework.

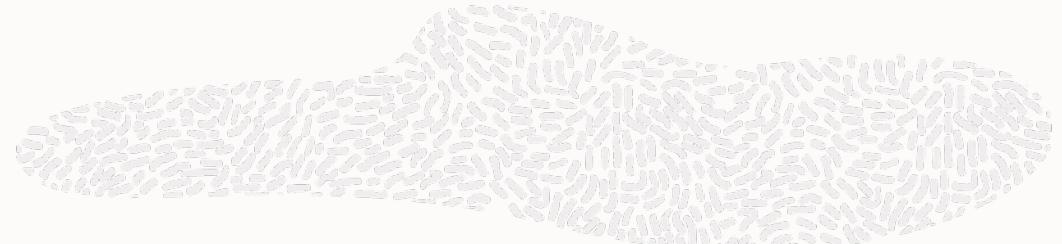
```
java -jar liquibase.jar \
--driver=oracle.jdbc.OracleDriver \
--classpath=\path\to\classes:jdbcdriver.jar \
--changeLogFile=com/example/db.changelog.xml \
--url="jdbc:oracle:thin:@localhost:1521:oracle" \
--username=scott \
--password=tiger \
update
```

# Liquibase – Source Control for your DB

- Concepts of **Changesets** and **Changelog**
  - Generate changes on a source DB (DEV) with SQL statements
  - Declare those statements as Liquibase **changesets within a changelog file**
  - Use github repository for your code (optional)
  - Use the changelog file to apply the changesets on a target DB (PROD/ITG)



# Your Choice



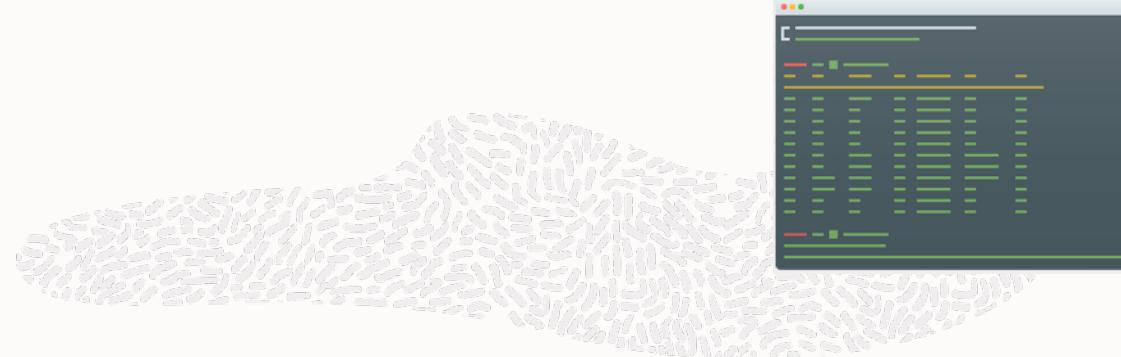
## Liquibase standalone

- A lot of power, but...
- ...YOU code the upgrade AND rollback changelogs
- YOU worry about the order of changelogs to be applied
- Extra Tooling

## Solution with Oracle tools: leverage Liquibase + SQLcl

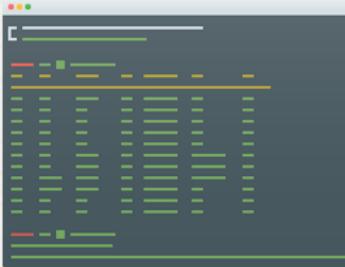
- Less coding
- Familiar, friendly interface
- Database object dependency ordering is taken care of
- Updates automatically generate rollback scenarios
- For FREE

# SQLcl



- Belongs to the SQL Developer family solution:
  - SQL Developer (desktop)
  - Database Actions (web)
  - SQLcl (linemode)
- Is a free Java-based **command line** interface for Oracle Database
- Quarterly releases
- 25MB download, only requires a JRE
- Available in OCI YUM, Download from OTN and container registry
- No Oracle client required

# SQLcl – Installation (Java 11+ required)



```
wget https://download.oracle.com/otn\_software/java/sqldeveloper/sqlcl-latest.zip
```

```
--2023-04-21 07:33:35-- https://download.oracle.com/otn\_software/java/sqldeveloper/sqlcl-latest.zip
```

```
Resolving download.oracle.com (download.oracle.com)... 104.111.216.80
```

```
Connecting to download.oracle.com (download.oracle.com)|104.111.216.80|:443... connected.
```

```
HTTP request sent, awaiting response... 200 OK
```

```
Length: 39744160 (38M) [application/zip]
```

```
Saving to: 'sqlcl-latest.zip'
```

```
sqlcl-latest.zip          100%[=====] 37.90M 116MB/s in 0.3s
```

```
2023-04-21 07:33:36 (116 MB/s) - 'sqlcl-latest.zip' saved [39744160/39744160]
```

```
-- Install java 11:
```

```
unzip /home/oracle/sqlcl-latest.zip -d /opt/oracle/
```

```
ln -s /opt/oracle/sqlcl/bin/sql /home/oracle/.local/bin/sql
```

```
sudo yum install java
```

```
Last metadata expiration check: 0:36:23 ago on Fri 21 Apr 2023 07:00:35 AM GMT.
```

```
Package java-1.8.0-openjdk-1:1.8.0.302.b08-0.el8_4.x86_64 is already installed.
```

```
Dependencies resolved.
```

Package	Architecture	Version	Repository	Size
<hr/>				
jdk-11.0.10	x86_64	2000:11.0.10-ga	ol8_oci_included	156 M

```
Transaction Summary
```

```
Install 1 Package
```

```
Total download size: 156 M
```

```
Installed size: 292 M
```

```
Is this ok [y/N]: y
```

# SQLcl>

- Modern replacement to SQL\*Plus
  - All commands + more
- Accessible anywhere:
  - Windows
  - Mac
  - Linux
  - OCI Cloudshell
- Loaded with features:
  - Query History
  - Formatting Options
  - Code Completion
  - Customizable Status Bar
  - vi & EMACS Support
  - Oracle Data Pump

SQLcl: Release 22.4 Production on Thu Feb 2 10:32:03 2023

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Connected to:

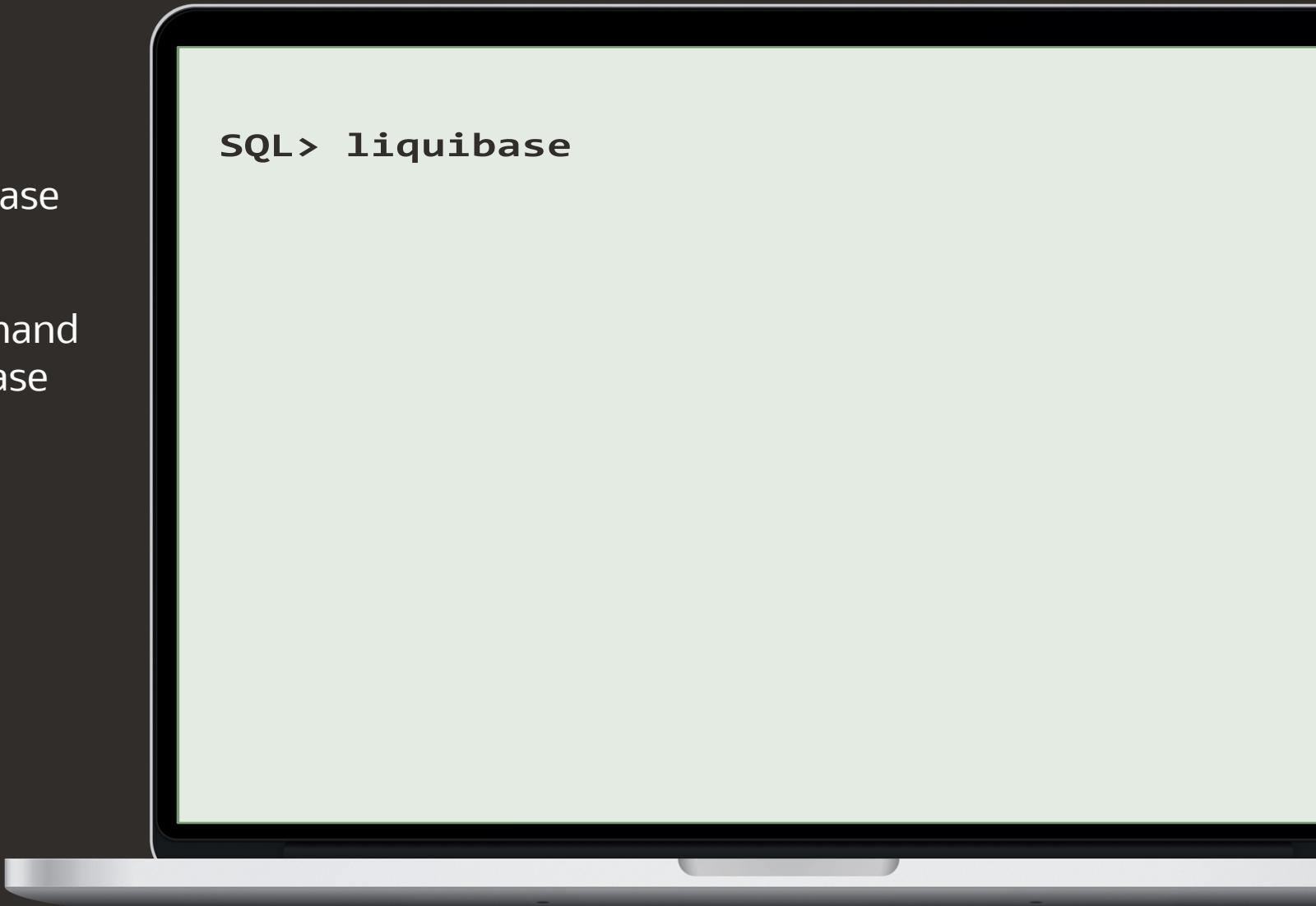
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - Production

# Liquibase – Installation



# SQLcl> Liquibase

- Capture, version, and deploy database changes
- Embedded in SQLcl: our free command line interface tool for Oracle Database
- SQLcl: Execute SQL & PL/SQL.  
Supports all SQL\*Plus commands
- ‘!b’ command in SQLcl



SQL> liquibase

# Liquibase from sqlcl command line



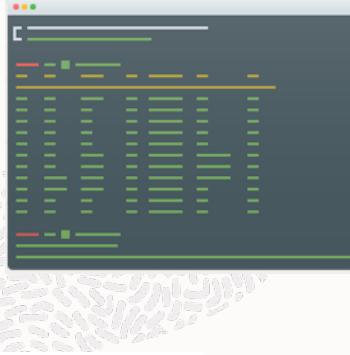
```
SQL> lb rollback help -example
```

Example(s):

Example: Roll back changes to tag.

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

# Liquibase from sqlcl command line



```
SQL> lb validate --changelog-file ./hr-master.xml

--Starting Liquibase at 08:37:58 (version 4.17.0 #0 built at 2022-11-02 21:48+0000)

-- Loaded 37 change(s)
No validation errors found.

Operation completed successfully.

-- Mark all these initial changes as deployed in the local development database, as they belong to the initial HR schema we used for our project.

SQL> lb tag -tag "version1.0"
SQL> lb changelog-sync-sql --changelog-file ./hr-master.xml --output-file /tmp/lb.out
--Starting Liquibase at 08:46:39 (version 4.17.0 #0 built at 2022-11-02 21:48+0000)

-- Loaded 37 change(s)
Changelog /tmp/lb.out created successfully

Operation completed successfully.
```

# Your Database Objects: Anytime, Anywhere

SQL> liquibase update -changelog-file controller.xml

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

# Familiar with Liquibase? Ours is Supercharged



Contains all the great features of open-source Liquibase with much more extended functionality

New commands optimized for:

- Capturing the entire Oracle Database schema
- Individual objects
- APEX objects
- Oracle REST Data Service (ORDS) objects

Exclusively for the Oracle Database

# Demo



# Get Help At Your Fingertip

## Liquibase help

**SQL> Liquibase help**

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

The following commands are available within the Liquibase feature.

**Commands:**  
`calculate-checksum|cac`  
Calculates and prints a checksum for the changeset with the given id in the format `filepath::id::author`  
  
`changelog-sync|chs`  
Marks all changes in the changelog file as executed in the database  
  
`changelog-sync-sql|chss`  
Output the raw SQL used by Liquibase when running `changelogSync`  
  
`changelog-sync-to-tag|chstt`  
Marks all undeployed changesets as executed starting from the top of the changelog file and moving down up to and including the tag.  
  
`changelog-sync-to-tag-sql|chstts`  
Output the raw SQL used by Liquibase when running `changelogSyncToTag`  
  
`clear-checksums|clc`  
Clears all checksums and nullifies the `MD5SUM` column of the `DATABASECHANGELOG` table so that they will be re-computed on the next database update

**SQL> liquibase help [command]**

**Usage:**  
Liquibase|lb generate-schema|ges OPTIONS  
Writes Change Log XML to copy the current state of the database to files

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/updated identifying individual xml files generated.  
The files are used to deploy using UPDATE commands.

**Options:**  
`-contexts | -co`  
Context string to use for filtering which changes to operate on  
  
`-database-changelog-table-name | -dactn [Default:DATABASECHANGELOG]`  
Name of table to use for tracking change history  
[deprecated: `--databaseChangelogTableName`]  
  
`-debug | -de {true|false}`  
Enable Debug output  
  
`-fail-on-error | -foe [Default:false] {true|false}`  
Set `failonError` attribute to true in changelog  
  
`-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.

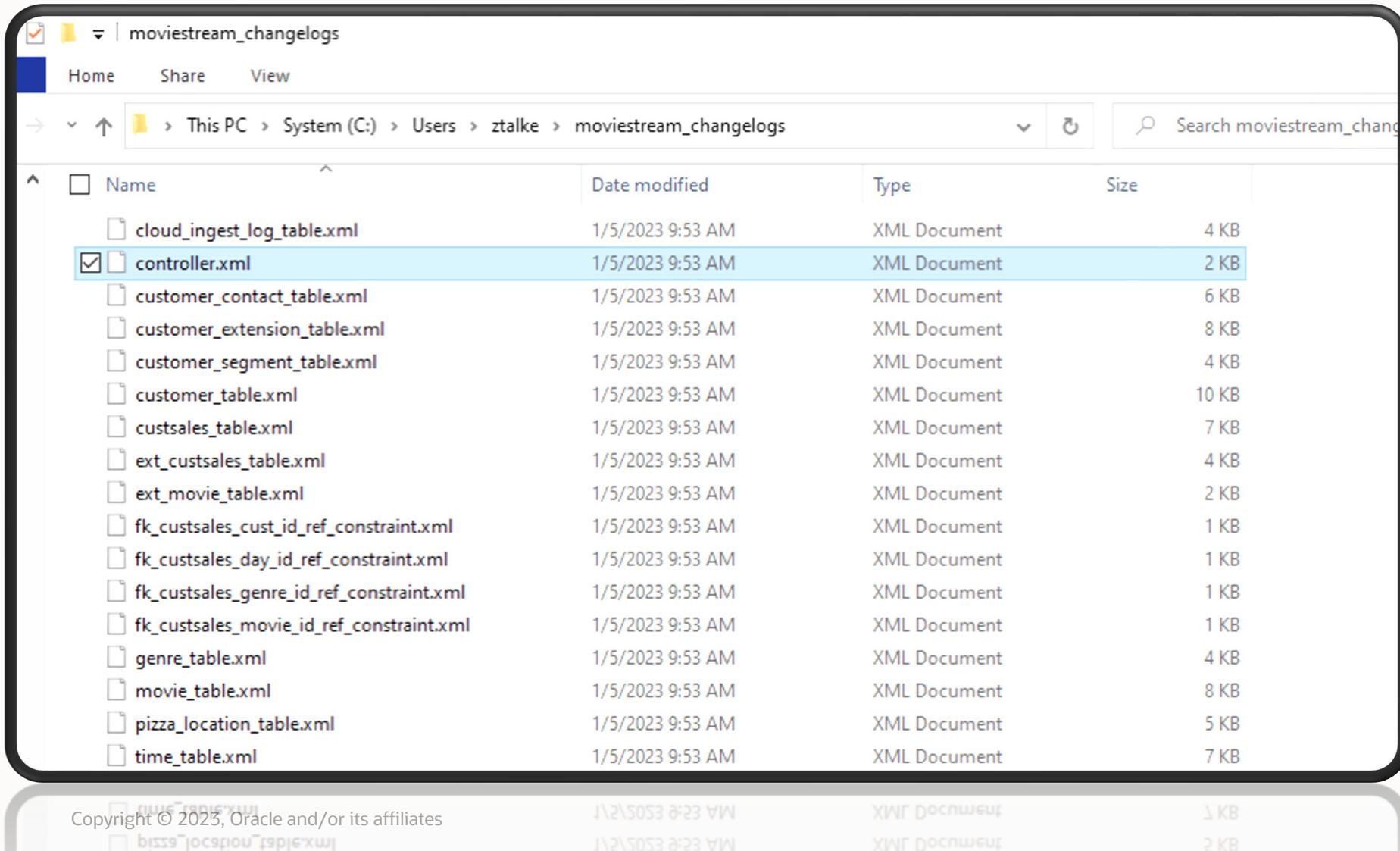
# Time To Capture Your Schema

SQL> liquibase generate-schema

```
SQL> liquibase generate-schema
```

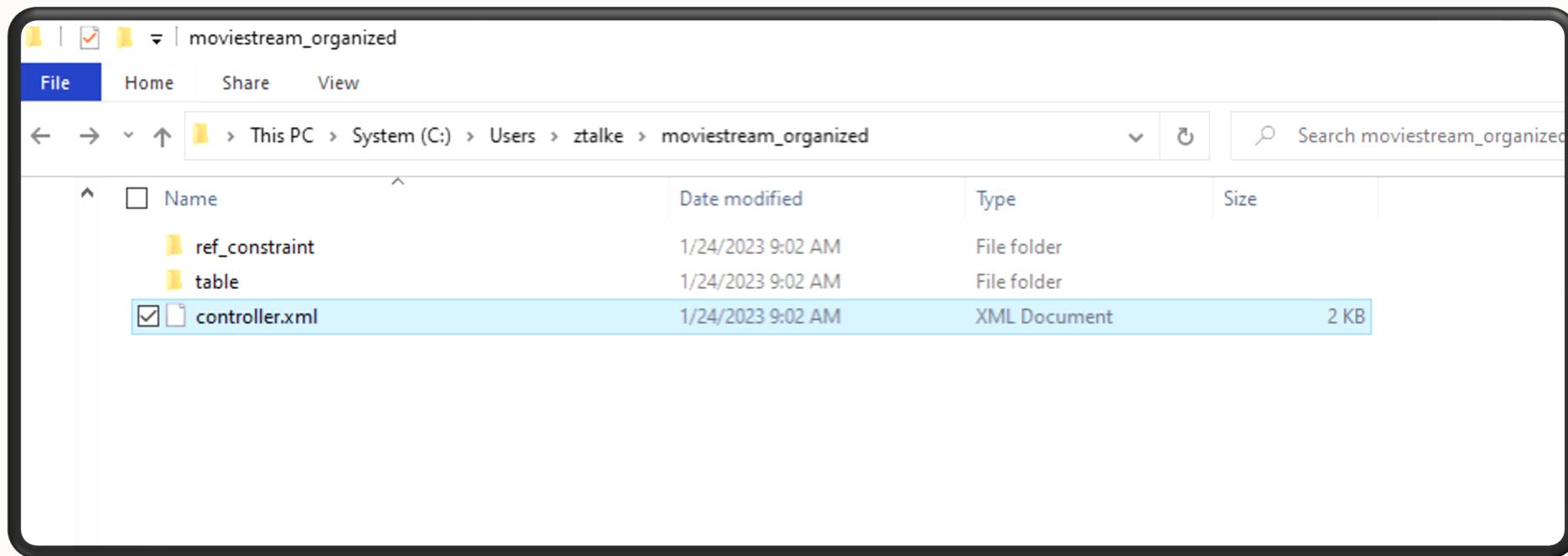
# Time To Capture Your Schema

Liquibase generate-schema



# Time To Capture Your Schema

Liquibase generate-schema -split



# Your Database Objects: Anytime, Anywhere

SQL> liquibase update -changelog-file controller.xml

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

# Your Database Objects: Anytime, Anywhere

Liquibase update: Database Changelog Tables

```
SQL> tables;
```

```
TABLES
```

```
-----  
DATABASECHANGELOGLOCK  
DATABASECHANGELOG_ACTIONS  
DATABASECHANGELOG
```

```
CUSTOMER_CONTACT  
CUSTOMER_EXTENSION  
MOVIE  
CUSTOMER  
CUSTOMER_SEGMENT  
GENRE  
TIME  
CUSTSALES
```

```
11 rows selected
```

```
SQL>
```

# Your Database Objects: Anytime, Anywhere

Liquibase update: Databasechangeloglock, Databasechangelog, Databasechangelog\_actions

```
SQL> select * from databasechangeloglock;
```

ID	LOCKED	LOCKGRANTED	LOCKEDBY
1	0		

```
SQL> select * from databasechangelog;
```

ID	AUTHOR	FILENAME	DATEEXECUTED	ORDEREXECUTED	...
9f69b1831cb7805624fc080b7bbdc0931991135	(MOVIFESTREAM)-Generated	customer_contact_table.xml	05-JAN-23	1	...
768b802e260899db647afac357db66d9c4aa82f2	(MOVIFESTREAM)-Generated	customer_extention_table.xml	05-JAN-23	2	...
2a738bcc3022538f6be368ece769a8d442831c00	(MOVIFESTREAM)-Generated	moive_Table.xml	05-JAN-23	3	...

```
SQL> select * from databasechangelog_actions;
```

ID	SEQUENCE	SQL	AUTHOR	FILENAME	STATUS	...
2a738bcc3022538f6be368ece769a8d442831c00	0	CREATE TABLE "MOVIE" ...	(MOVIFESTREAM)-Generated	moive_Table.xml	RAN	...

## Tag You're It: Making Changes and Rolling Them Back

# Liquibase tag

## Create Issue

All fields marked with an asterisk (\*) are required

---

Project*	 NEED THAT MERCH	
Issue Type*	 Improvement	 
<hr/>		
Summary*	Create MovieStream Merchandise Shop Page	
Product Hierarchy	Please select... 	None 
Product hierarchy		
Assignee*	 Automatic	 <a href="#">Assign to me</a>
Description	<div style="border-bottom: 1px solid #ccc; padding-bottom: 5px; margin-bottom: 5px;"> <span>Style</span>  </div> <div style="border-bottom: 1px solid #ccc; padding-bottom: 5px; margin-bottom: 5px;"> <span>B</span> <span>I</span> <span>U</span> <span>A</span>   </div> <div style="border-bottom: 1px solid #ccc; padding-bottom: 5px; margin-bottom: 5px;"> <span>C</span>  </div> <div style="border-bottom: 1px solid #ccc; padding-bottom: 5px; margin-bottom: 5px;"> <span>E</span>  </div> <div style="border-bottom: 1px solid #ccc; padding-bottom: 5px; margin-bottom: 5px;"> <span>S</span>  </div> <div style="border-bottom: 1px solid #ccc; padding-bottom: 5px; margin-bottom: 5px;"> <span>P</span>  </div> <div style="border-bottom: 1px solid #ccc; padding-bottom: 5px; margin-bottom: 5px;">  </div>	



# Tag You're It: Making Changes and Rolling Them Back

## Liquibase tag

```
SQL> liquibase tag -tag version1
```

```
-- Starting Liquibase at 11:35:41 (version 4.17.0. #- built at 2022-11-02 2148+0000)
```

```
Tag version1 was successfully applied to database
jdbc:oracle:thin:@(description=(retry_count=20)(retry_deplay=3)(address=(protocol=tcps)(port=1522)(host=adb.us-ashburn-
1.oraclecloud.com))(connect_data=(service_name=ga40fce8ac41b73_moviestream_high_adb.oraclecloud.com))(security=(ssl_server_cert_db="CN=adwc.
uscom-east-1.oraclecloud.com, OU=Oracle BMCS US, O=Oracle Corporation, L=Redwood City, ST=California,C=US"))).
```

```
Operation completed successfully.
```

```
SQL> liquibase update -changelog-file merchandise_table.xml
```

```
-- Starting Liquibase at 11:41:17 (version 4.17.0. #- built at 2022-11-02 2148+0000)
```

```
-- Loaded 1 change(s)
```

```
Running Changeset: merchandise_table.xml::6488738e35144e5d5d3680989ae5b02cc12f21f6:(MOVIFESTREAM)-Generated Table "MERCHANDISE"
created.
```

```
Operation completed successfully.
```

```
SQL>
```

# Tag You're It: Making Changes and Rolling Them Back

Liquibase rollback

```
SQL> tables;
```

```
TABLES
```

```
-----  
DATABASECHANGELOGLOCK  
DATABASECHANGELOG_ACTIONS  
DATABASECHANGELOG  
CUSTOMER_CONTACT  
CUSTOMER_EXTENSION  
MOVIE  
CUSTOMER  
CUSTOMER_SEGMENT  
GENRE  
TIME  
CUSTSALES  
MERCHANDISE
```

```
12 rows selected
```

```
SQL>
```

# Tag You're It: Making Changes and Rolling Them Back

## Liquibase rollback

```
SQL> liquibase rollback -changelog-file merchandise_table.xml -tag version1
-- Starting Liquibase at 11:49:32 (version 4.17.0. #- built at 2022-11-02 2148+0000)

--Loaded 1 change(s)
Rolling Back Changeset: merchandise_table.xml::6488738e3514425d5d3680989ae5b02cc12f21f6::(MOVIFESTREAM)-Generated Table
“MERCHANDISE” dropped.

Operation completed successfully.
```

# Tag You're It: Making Changes and Rolling Them Back

Liquibase rollback

```
SQL> tables;
```

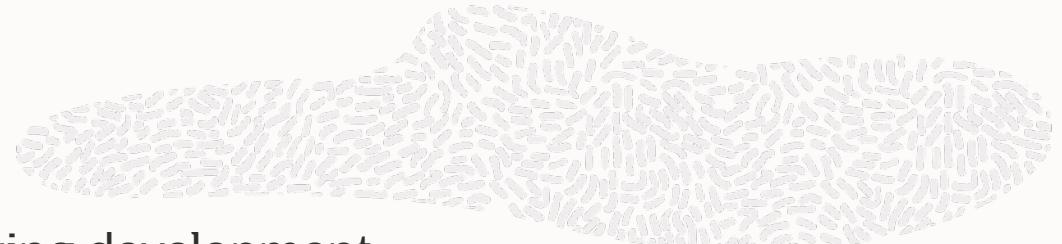
```
TABLES
```

```
-----  
DATABASECHANGELOGLOCK  
DATABASECHANGELOG_ACTIONS  
DATABASECHANGELOG  
CUSTOMER_CONTACT  
CUSTOMER_EXTENSION  
MOVIE  
CUSTOMER  
CUSTOMER_SEGMENT  
GENRE  
TIME  
CUSTSALES
```

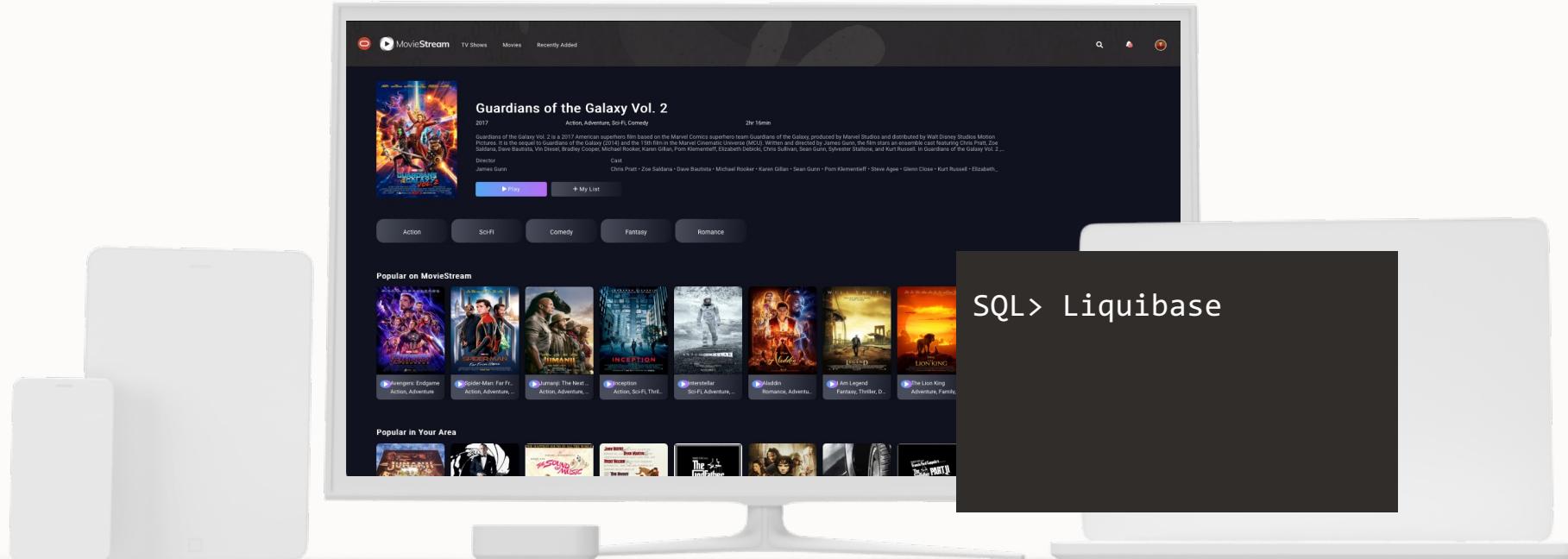
```
11 rows selected
```

```
SQL>
```

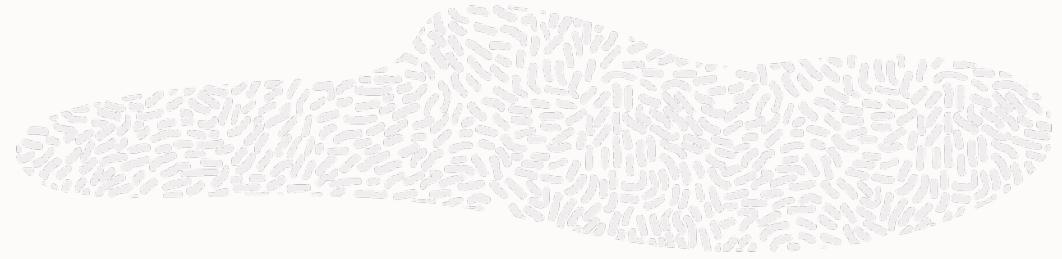
# Who Is Liquibase For?



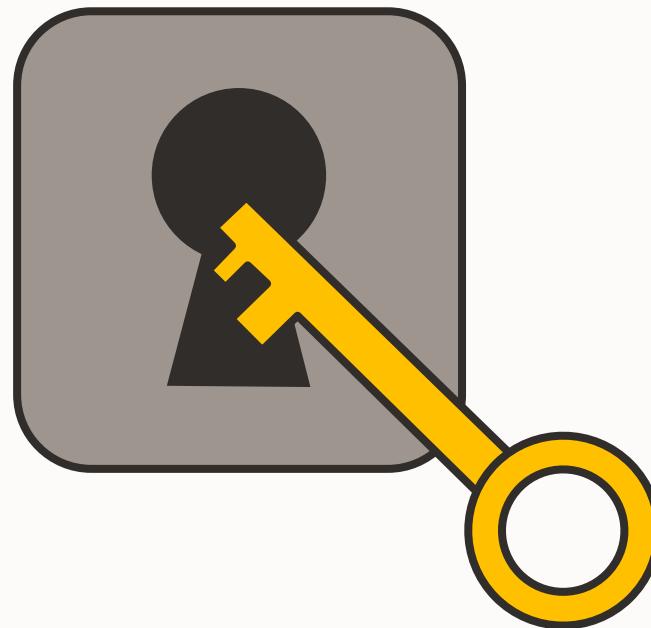
Anyone contributing to/deploying a database schema during development  
Those looking to save time and reduce human error



# Unlock Liquibase's True Power



Integrate into your larger CI/CD pipeline to leverage its true automation strength



Track your changelogs with version control and GitHub

# Summary



1

SQLcl is a free command line interface containing our enhanced Liquibase solution for database change management

2

Generate changelogs, apply updates, tag database states, and rollback changes

3

Easily plugs into your CI/CD pipeline for automated database updates

# Where To Get More Information



<http://bit.ly/3YFkUai> Download SQLcl 22.4 (Includes Liquibase)



<https://bit.ly/3Wg83cN> SQLcl & SQLcl Liquibase 22.4 Documentation



[bit.ly/3GljEvU](http://bit.ly/3GljEvU) SQLcl Liquibase Blog Articles



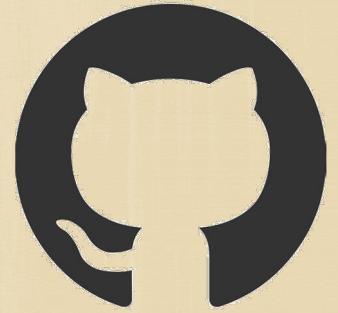
[@talke\\_tech](https://twitter.com/talke_tech)



[zachary.talke@oracle.com](mailto:zachary.talke@oracle.com)



# Try it For Free



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[developer.oracle.com  
/livelabs](https://developer.oracle.com/livelabs)

# It's now time for Q&A

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Got any questions?

