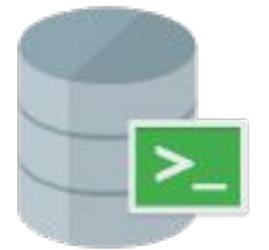


The Educational Conference For Oracle Technology Users



Welcome

Oracle-enhanced Liquibase SQLcl features vs standalone Liquibase. What's best for you?



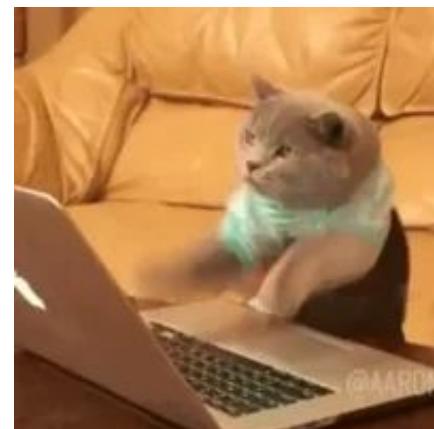
Kscope23, Monday , June 26th 01:30 PM - 02:30 PM



Rafał Grzegorczyk
Oracle APEX & PL/SQL Developer
Pretius Low-Code
rgrzegorczyk@pretius.com

How it all started?





Poprawki [REDACTED] z dnia 2020-08-14 ➔

Rafał Grzegorczyk <rgrzegorczyk@pretius.com>

Proszę o wgranie paczki [REDACTED]
Instrukcja instalacji i zmiany w pliku readme.

Paczka rozwiązuje zgłoszenie RM#36482

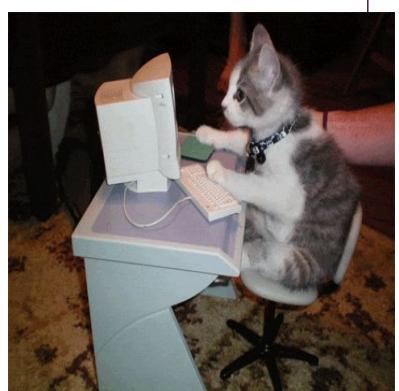
Pozdrawiam,

Rafał Grzegorczyk
Oracle APEX Developer

site: www.pretius.com



9:48 AM Rafał Grzegorczyk  Hey, please deploy attached code to UAT env, it's a change from TASK-45



fix_task_45.sql ▾

1 code fix



4



SCU-781
Zgłoszenie korekty billingowej dla [REDACTED]

Zmień Komentarz Przypisz Rejestruj pracę Więcej ▾ Zamknij Zrobior

Szczegóły

Typ: Błąd
Priorytet: Nieokreślony
Etykiety: Brak

Opis

1. Załadowanie do bufora BILLING danych billingowych (plik - załącznik). Dane znalazły się w raporcie [REDACTED]
2. Przeliczenie sesji dla Partnera [REDACTED] za okres 04.2022 (gdyż w kwietniu został wgrany billing)
3. W efekcie brak korekty billingowej w raporcie [REDACTED]

Załączniki

 STATEMENT_GENERATOR_PKG.sql



This was NOT fine

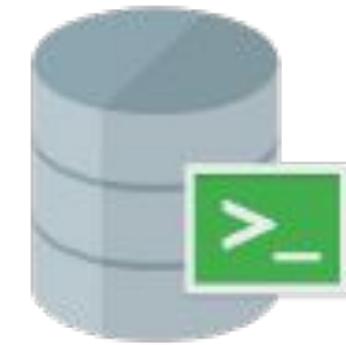


Let's throw away this



No more mess



 **Liquibase** & **ORACLE**[®]

EXPLAINED



Get this presentation and examples: https://github.com/rgrzegorczyk/sqlcl_vs_core_liquibase



- Oracle APEX & PL/SQL Developer at Pretius Low-Code
- 10+ years in IT
- Speaker since 2021 (Kscope, Apex World, DOAG, Switzerland, Croatia, Scotland, Poland)

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<https://rafal.hasnode.dev>

www.pretius.com/blog/

Rafał Grzegorczyk

 Oracle ACE
Associate

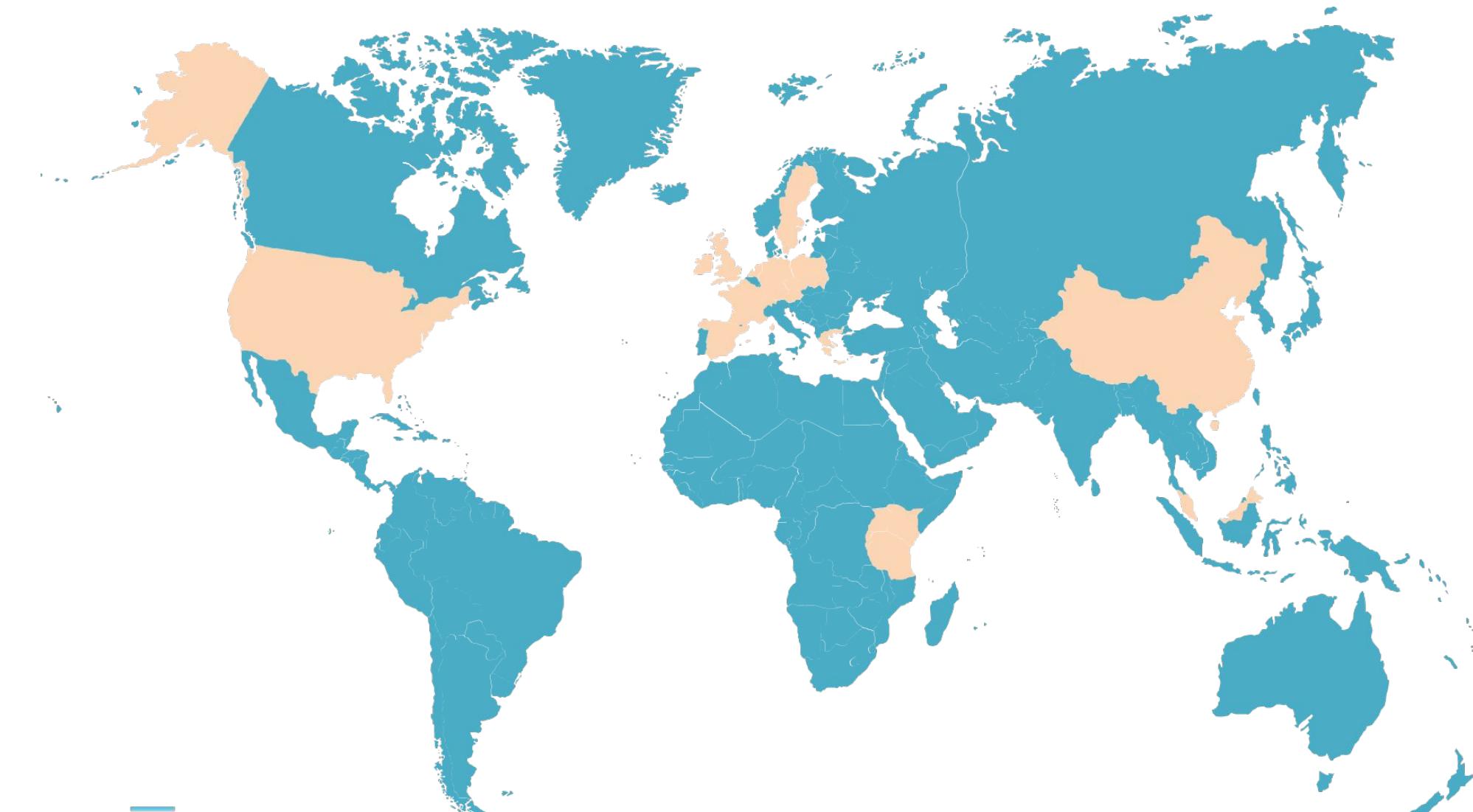
Pretius Low-code

60+
APEX
Devs

5
Oracle
ACEs

4
Continents

2
Warsaw, PL
London, UK



What is Liquibase?

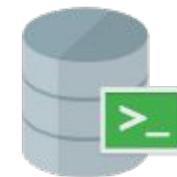
Open-Source Java based tool



Developed since 2006



Enhanced & implemented into SQLcl in 2019

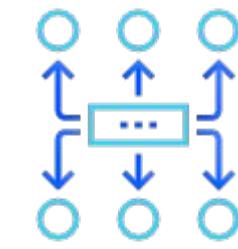


Command-line based



How it works?





Changelog

Ledger of changes. It holds information about what and when to execute.



Changeset

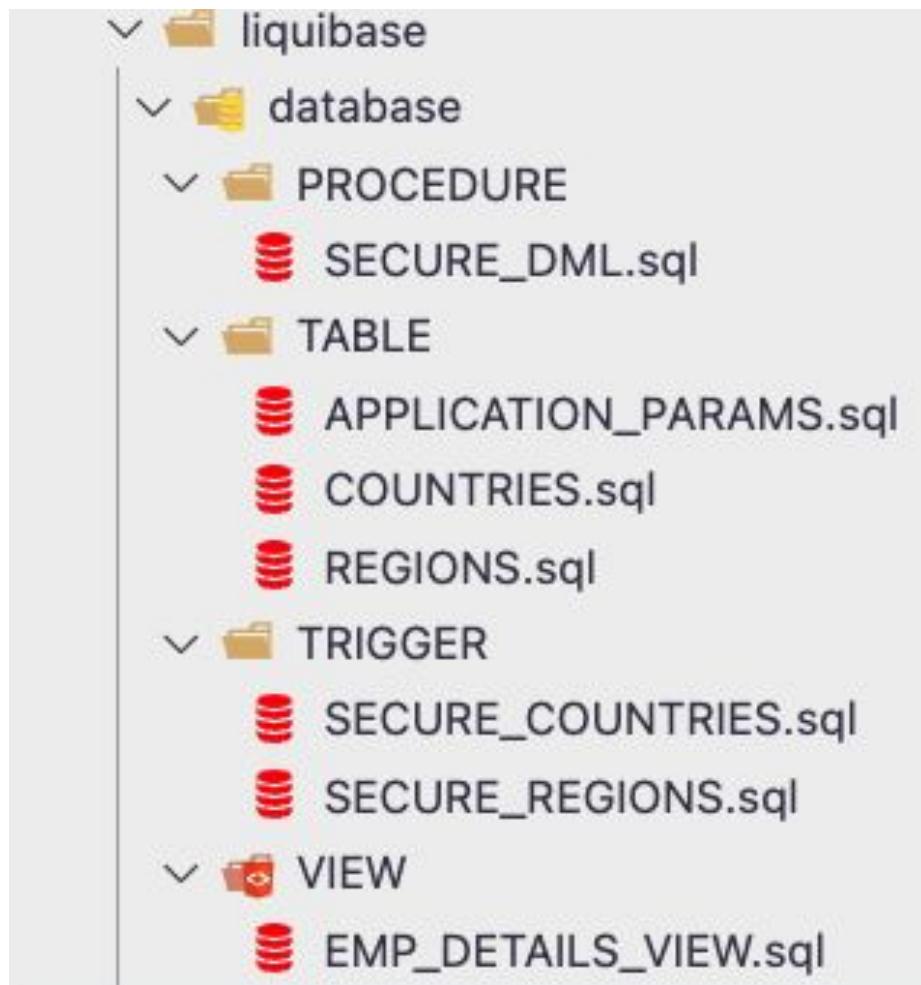
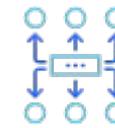
Single DB change identified by ID, author and file path.
SQL, XML, YAML or JSON



Tracking table

History of changes. Who, when and what. Comments, labels, tags.

Changelog



```
</> controller.xml <

sqlcl_liquibase > liquibase > </> controller.xml > databaseChangeLog
1   <?xml version="1.0" encoding="UTF-8"?>
2   <databaseChangeLog
3     xmlns="http://www.liquibase.org/xml/ns/dbchangelog"
4     xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
5     xsi:schemaLocation="http://www.liquibase.org/xml/ns/dbchangelog
6       http://www.liquibase.org/xml/ns/dbchangelog/dbchangelog-latest.xsd">
7
8     <include file="database/table/regions.sql"/>...
9     <include file="database/table/countries.sql"/>...
10    <include file="database/table/application_params.sql"/>...
11
12    <includeAll path="database/procedure"/>
13    <includeAll path="database/trigger"/>...
14    <includeAll path="database/view"/>...
15
16  </databaseChangeLog>
```

Changesets



liquibase

- database
 - PROCEDURE
 - SECURE_DML.sql
 - TABLE
 - APPLICATION_PARAMS.sql
 - COUNTRIES.sql
 - REGIONS.sql
 - TRIGGER
 - SECURE_COUNTRIES.sql
 - SECURE_REGIONS.sql
 - VIEW
 - EMP_DETAILS_VIEW.sql

APPLICATION_PARAMS.sql

```

sqlcl_liquibase > liquibase > database > TABLE > APPLICATION_PARAMS.sql > ...
1 --liquibase-formatted.sql
2 --changeset=rgrzegorczyk:APPLICATION_PARAMS--runOnChange:false
3 --comment=APPLICATION_PARAMS-table
4 --CREATE TABLE "APPLICATION_PARAMS"
5   --> "CODE" VARCHAR2(50),
6   --> "VALUE" VARCHAR2(500)
7 ;

```

SECURE_COUNTRIES.sql

```

sqlcl_liquibase > liquibase > database > TRIGGER > SECURE_COUNTRIES.sql
1 --liquibase-formatted.sql
2 --changeset=rgrzegorczyk:SECURE_COUNTRIES--runOnChange:true
3 --comment=SECURE_COUNTRIES-first-version
4 CREATE OR REPLACE EDITIONABLE TRIGGER "SECURE_COUNTRIES"
5 before insert or update or delete on countries
6 begin
7   ...secure_dml;
8 end secure_countries;
9
10 /
11 ALTER TRIGGER "SECURE_COUNTRIES" DISABLE;

```

EMP_DETAILS_VIEW.sql

```

sqlcl_liquibase > liquibase > database > VIEW > EMP_DETAILS_VIEW.sql > ...
1 --liquibase-formatted.sql
2 --changeset=rgrzegorczyk:EMP_DETAILS_VIEW--runOnChange:true
3 --comment=EMP_DETAILS_VIEW-first-version
4 --CREATE OR REPLACE VIEW "EMP_DETAILS_VIEW" ("COUNTRY_NAME", "REGION_NAME")
5 AS
6 select c.country_name,
7       r.region_name
8   from countries c
9      join regions r
10     on c.region_id = r.region_id;

```

Tracking table



DATABASECHANGELOG

Columns Data Model Constraints Grants Statistics Triggers Flashback Dependencies Details Partitions Indexes SQL

ID AUTHOR FILENAME DATEEXECUTED MD5SUM COMMENTS

1	REGIONS	rgrzegorczyk database/table/regions.sql	2023-03-07 07:52:02,300175000	8:f43434582d009980021e85851fb9626d	REGIONS table
2	COUNTRIES	rgrzegorczyk database/table/countries.sql	2023-03-07 07:52:02,968867000	8:9fd1a2073de3191651054949aaab1580	COUNTRIES table
3	APPLICATION_PARAMS	rgrzegorczyk database/table/application_params.sql	2023-03-07 07:52:03,594816000	8:f8e8f3d9bf37034fdd3ecac69c34ed47	APPLICATION_PARAMS table
4	add_col_description	rgrzegorczyk database/table/application_params.sql	2023-03-07 07:52:04,414706000	8:e8e0571ab2e0a41299500ab4chd16b6a	(null)
5	SECURE_DML	rgrzegorczyk database/procedure/SECURE_DML.sql	2023-03-07 07:52:05,074303000	8:1a2d8b94fd04ed0840b1f35ecd8358f7	Secure dml proc first version
6	SECURE_COUNTRIES	rgrzegorczyk database/trigger/SECURE_COUNTRIES.sql	2023-03-07 07:52:05,985844000	8:f27caee7682cb79842ebce1109a44c07	SECURE_COUNTRIES first version
7	SECURE_REGIONS	rgrzegorczyk database/trigger/SECURE_REGIONS.sql	2023-03-07 07:52:06,892042000	8:a858d6ded934520369300f53b4352173	SECURE_REGIONS first version
8	EMP_DETAILS_VIEW	rgrzegorczyk database/view/EMP_DETAILS_VIEW.sql	2023-03-07 07:52:07,753123000	8:67c206a624d7f791199fafcbc903a668	EMP_DETAILS_VIEW first version

APPLICATION_PARAMS.sql

```

liquibase > database > TABLE > APPLICATION_PARAMS.sql > ...
1 --liquibase-formatted-sql
2 --changeset=rgrzegorczyk:APPLICATION_PARAMS--runOnChange:false
3 --comment=APPLICATION_PARAMS-table
4 <--CREATE TABLE "APPLICATION_PARAMS"
5 <--  (→ "CODE" -> VARCHAR2(50),
6 <--  "VALUE" -> VARCHAR2(500)
7 <-- );
8
9 <-- --changeset=rgrzegorczyk:add_col_description--runOnChange:false
10 <-- --comment--Added column name
11 <-- <--ALTER TABLE APPLICATION_PARAMS ADD DESCRIPTION VARCHAR2(50);
12

```

Update command



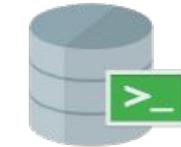
- 1 Deployes any changes in the changelog file that have not been deployed to database yet.
- 2 If the unique identifiers do not exist, Liquibase will apply the changeset to the database.
- 3 If the unique identifiers exist, the MD5Sum of the changeset is compared to the one in the database.
- 4 If they are different, Liquibase will produce an error unless runOnChange is set to true.

The screenshot shows the Liquibase Database Changelog interface. The title bar says "DATABASECHANGELOG". Below it is a toolbar with icons for creating, deleting, and filtering changesets, along with "Sort.." and "Filter:" buttons. The main area is the "Data" tab, which displays a table of changesets:

ID	AUTHOR	FILENAME	MD5SUM
1	rgrzegorczyk	database/table/application_params.sql	8:b1fee6c60845ab29eae6c4c3f8b5a741
2	rgrzegorczyk	database/table/application_params.sql	8:4e131c1437edc63f631de6e1074c3d04

Resources: <https://docs.liquibase.com/commands/update/update.html>

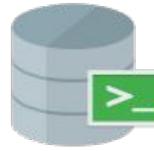
Install & Run



Liquibase (built-in SQLcl)

- Having SQLcl, you already have Liquibase
- Recommended minimum version 23.1
- Connect to DB as usual
- `liquibase | 1b COMMAND [--OPTIONS]`

Install & Run



Liquibase (built-in SQLcl)

- Having SQLcl, you already have Liquibase
- Recommended minimum version 22.4
- Connect to DB as usual
- `liquibase | lb COMMAND --OPTIONS`

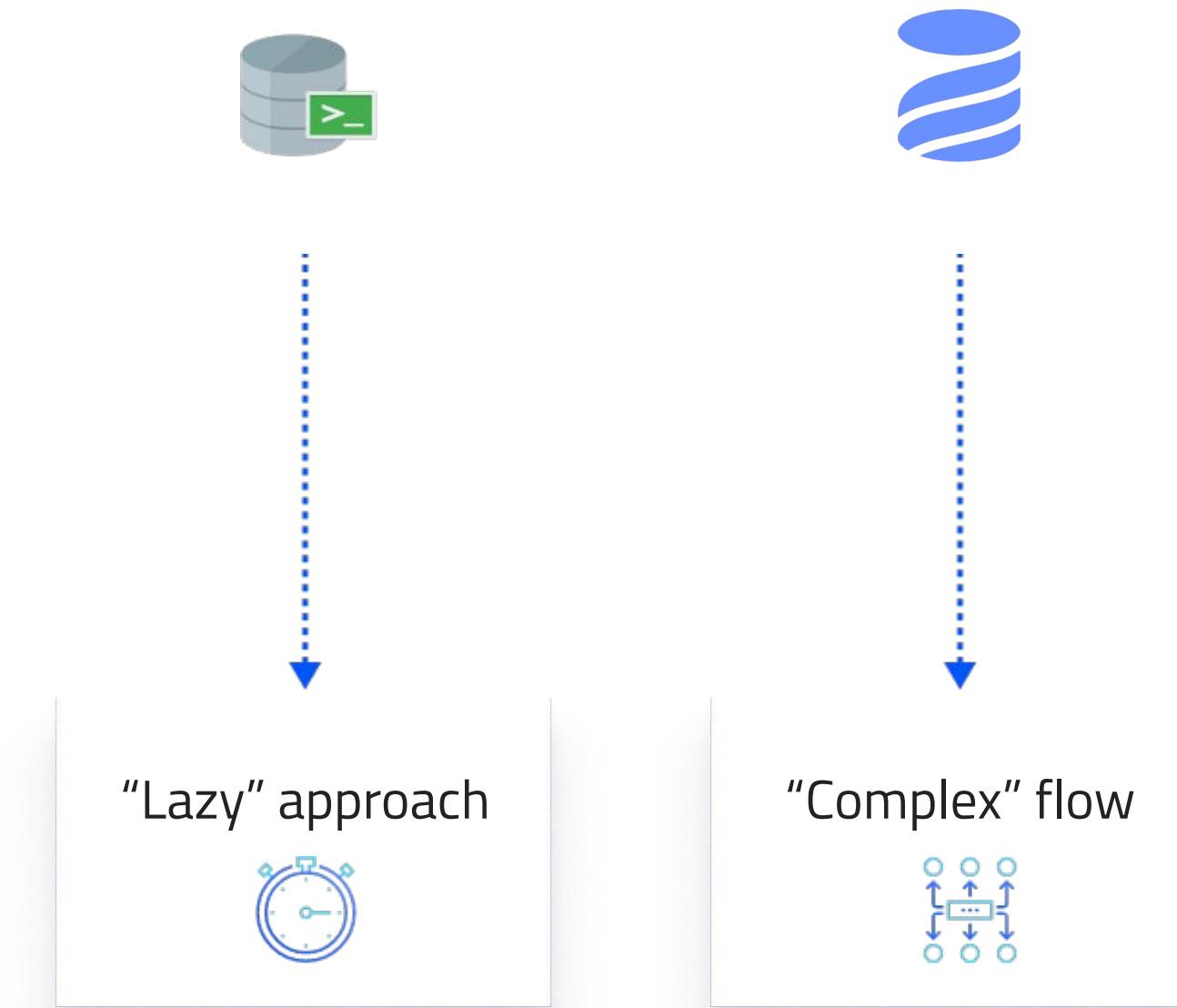


Liquibase (standalone)

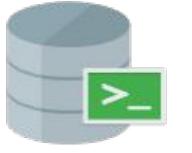
- Download and add to PATH
- Use the installer (includes JAVA and the most popular database drivers)
- Recommended minimum version 4.19.0
- Define “properties” file
- `liquibase COMMAND --OPTIONS`

Challenge

SQLcl enhanced Liquibase vs Liquibase (Standalone)



Track and control
database changes



SQLcl Liquibase “lazy” development

1 →

Making changes directly in DEV schema

```

1 CREATE TABLE "APPLICATION_PARAMS"
2   ( "CODE" VARCHAR2(50),
3     "VALUE" VARCHAR2(500)
4   );
5

```

```

1 CREATE UNIQUE INDEX "DEV"."COUNTRY_C_ID_PK" ON "DEV"."COUNTRIES" ("COUNTRY_ID");
2
3

```

```

1 create or replace PROCEDURE "SECURE_DML"
2 is
3 begin
4   if TO_CHAR(SYSDATE, 'HH24:MI') not between '08:00' and '18:00'
5     or TO_CHAR(SYSDATE, 'DY') in ('SAT', 'SUN')
6     then
7       RAISE_APPLICATION_ERROR(-20205,
8                               'You may only make changes during normal office hours');
9     end if;
10    end secure_dml;

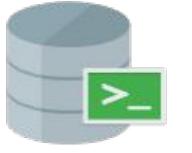
```



SQLcl Liquibase “lazy” development



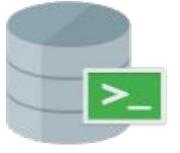
Resources: [Requirements for Using Liquibase](#)



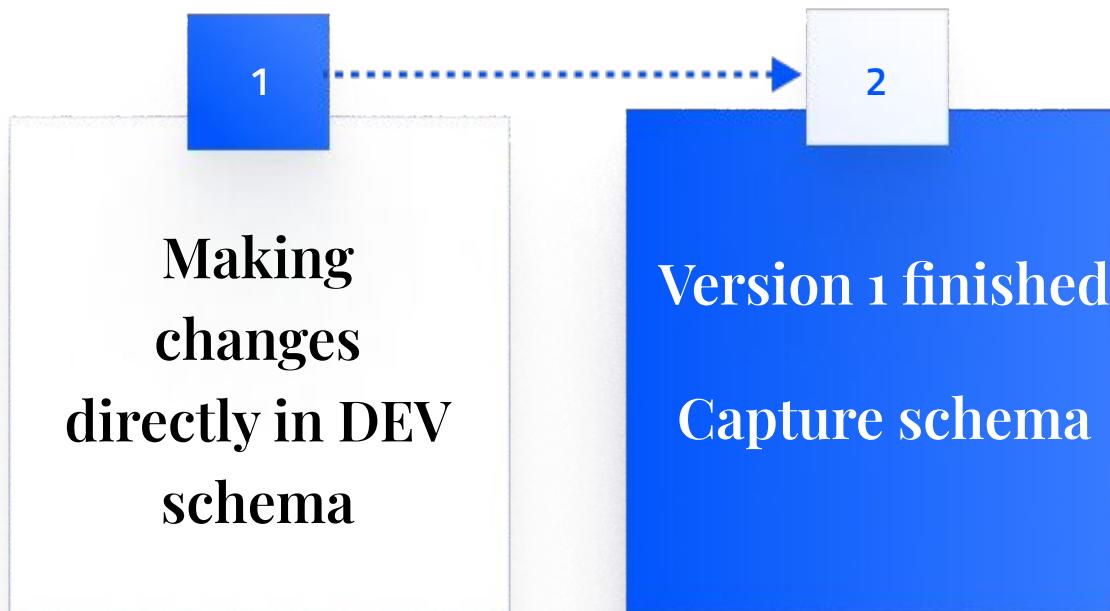
SQLcl Liquibase “lazy” development



* You can only capture objects from the schema you are connected to



SQLcl Liquibase “lazy” development



controller.xml

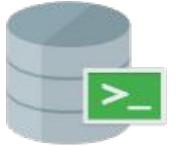
```

</> controller.xml <input>
schema > v1 > </> controller.xml > ...
1   <?xml version="1.0" encoding="UTF-8"?>
2   <databaseChangeLog
3     xmlns="http://www.liquibase.org/xml/ns/dbchangelog"
4     xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
5     xsi:schemaLocation="http://www.liquibase.org/xml/ns/dbchangelog
6     http://www.liquibase.org/xml/ns/dbchangelog/dbchangel
7     <include file="table/application_params_table.xml"/>
8     <include file="table/regions_table.xml"/>
9     <include file="table/countries_table.xml"/>
10    <include file="comment/regions_comments.xml"/>
11    <include file="comment/countries_comments.xml"/>
12    <include file="view/emp_details_view_view.xml"/>
13    <include file="ref_constraint/countr_reg_fk_ref_constraint.xml"/>
14    <include file="procedure/secure_dml_procedure.xml"/>
15    <include file="trigger/secure_regions_trigger.xml"/>
16    <include file="trigger/secure_countries_trigger.xml"/>
17  </databaseChangeLog>
  
```

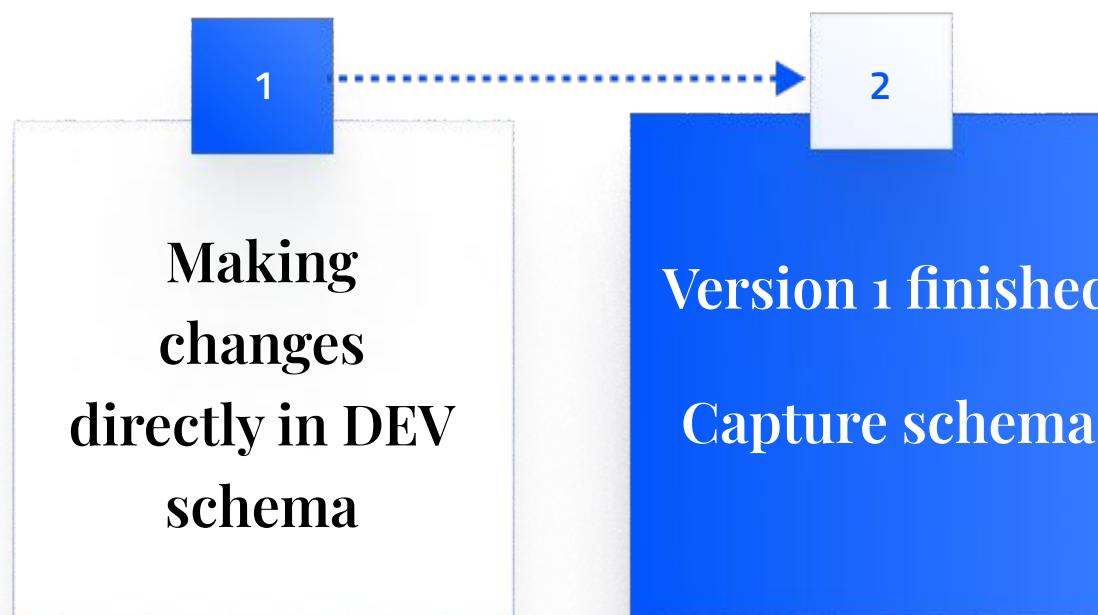
schema/v1

```

</> schema/v1 <input>
> comment
> procedure
> ref_constraint
</> table
  </> application_params_table.xml
  </> countries_table.xml
  </> regions_table.xml
> trigger
> view
</> controller.xml
  
```

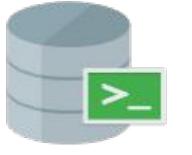


SQLcl Liquibase “lazy” development

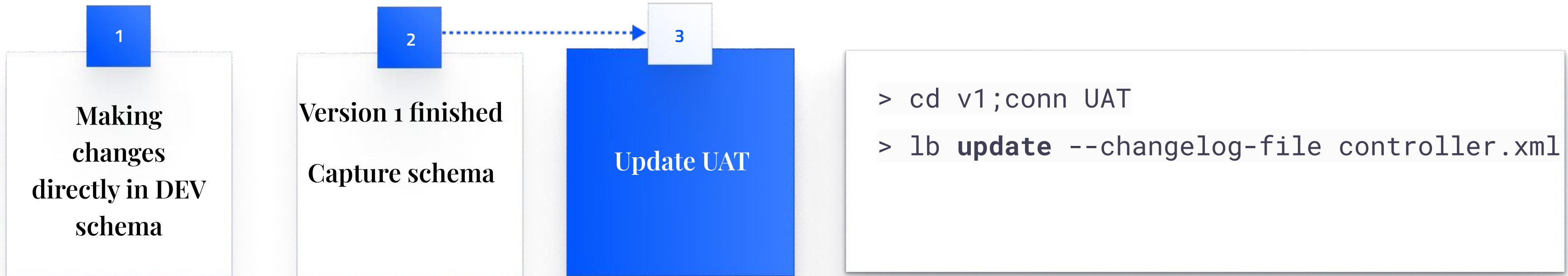


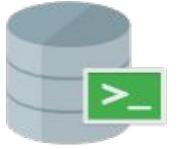
- **SXML** representation of DDL
- uses **DBMS_METADATA** to transform the state of the database objects dynamically
- **You don't even need to open it!**

```
</> regions_table.xml <schema> v1 <table> </> regions_table.xml <databaseChangeLog> <changeSet> <n0:createSxmlObject> <databaseChangeLog> <ns>http://www.liquibase.org/xml/ns/dbchangelog</ns> <xsi>http://www.w3.org/2001/XMLSchema-instance</xsi> <n0>http://www.oracle.com/xml/ns/dbchangelog-ext</n0> <xsi:schemaLocation>http://www.liquibase.org/xml/ns/dbchangelog-dbchangelog-latest.xsd</xsi:schemaLocation> <changeSet id="f549e64c5c7bd9023ce0bbe15168fb7da3d1a708" author="(DEV)-Generated"> <n0:createSxmlObject objectName="REGIONS" objectType="TABLE" ownerName="DEV"> <n0:source><![CDATA[ <TABLE xmlns="http://xmlns.oracle.com/ku" version="1.0"> <SCHEMA>DEV</SCHEMA> <NAME>REGIONS</NAME> <RELATIONAL_TABLE> <COL_LIST> <COL_LIST_ITEM> <NAME>REGION_ID</NAME> <DATATYPE>NUMBER</DATATYPE> <NOT_NULL> <NAME>REGION_ID_NN</NAME> </NOT_NULL> </COL_LIST_ITEM> <COL_LIST_ITEM> <NAME>REGION_NAME</NAME> <DATATYPE>VARCHAR2</DATATYPE> <LENGTH>25</LENGTH> <COLLATE_NAME>USING_NLS_COMP</COLLATE_NAME> </COL_LIST_ITEM> </COL_LIST> </RELATIONAL_TABLE> </TABLE> ]]></n0:source> </n0:createSxmlObject> </changeSet> </databaseChangeLog> </>
```



SQLcl Liquibase “lazy” development



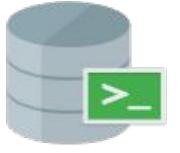


SQLcl Liquibase “lazy” development

```
SQL> lb update --changelog-file controller.xml
--Starting Liquibase at 08:51:03 (version 4.17.0 #0 built at 2022-11-02 21:48+0000)

-- Loaded 10 change(s)
Running Changeset: table/application_params_table.xml::8bb0d8b2198aa3b5a6ce0b549d83020889ea2ff7::(DEV)–Generated
Table "APPLICATION_PARAMS" created.
Running Changeset: table/regions_table.xml::f549e64c5c7bd9023ce0bbe15168fb7da3d1a708::(DEV)–Generated
Statement executed successfully
Running Changeset: table/countries_table.xml::59337c43c7ef8e47d22317cac25d3b0bbd0dfa99::(DEV)–Generated
Table "UAT"."COUNTRIES" altered.
Table "UAT"."COUNTRIES" altered.
Table "UAT"."COUNTRIES" altered.
Running Changeset: comment/regions_comments.xml::42e394a329d3bb0ab72a2b6d67d7a6284c489129::(DEV)–Generated
Comment created.
Comment created.
Comment created.
Running Changeset: comment/countries_comments.xml::1dc13ed32f7b496e47d8dbc79e4e97460aef7eb6::(DEV)–Generated
Comment created.
Comment created.
Comment created.
Comment created.
Running Changeset: view/emp_details_view_view.xml::82011d7dc3f5cc8ced037ecc1acf821b8637fe49::(DEV)–Generated
View "EMP_DETAILS_VIEW" created.
Running Changeset: ref_constraint/countr_reg_fk_ref_constraint.xml::a1ac6651cca640937133a1aa27544319af6dade6::(DEV)–Generated
Referential constraint already exists skipping
Running Changeset: procedure/secure_dml_procedure.xml::7e8bfea4ac3a6750e8611ddb05022786170c2ef6::(DEV)–Generated
Procedure SECURE_DML compiled
Running Changeset: trigger/secure_regions_trigger.xml::2ac7a86d32053a55e75b5a790d23a8e780542a90::(DEV)–Generated
Trigger SECURE_REGIONS compiled
Trigger "SECURE_REGIONS" altered.
Running Changeset: trigger/secure_countries_trigger.xml::96d625ec94177a9a431713192bd590d26590065c::(DEV)–Generated
Trigger SECURE_COUNTRIES compiled
Trigger "SECURE_COUNTRIES" altered.

Operation completed successfully.
```



SQLcl Liquibase “lazy” development

DATABASECHANGELOG						
Columns	Data	Model	Constraints	Grants	Statistics	Triggers
Flashback Dependencies Details Partitions Indexes SQL						
						Sort.. Filter:
ID	AUTHOR	FILENAME	DATEEXECUTED	ORDEREXECUTED	EXECTYPE	MD5SUM
1	8bb0d8b2198aa3b5a6ce0b549d83020889ea2ff7	(DEV)-Generated table/application_params_table.xml	2023-03-02 07:51:31,684350000	1	EXECUTED	8:87e9c88849b79c577da27030a3d80dc1
2	f549e64c5c7bd9023ce0bbe15168fb7da3d1a708	(DEV)-Generated table/regions_table.xml	2023-03-02 07:51:39,524668000	2	EXECUTED	8:c579dfa26b060ec08338ae115589b87c
3	59337c43c7ef8e47d22317cac25d3b0bb0dfa99	(DEV)-Generated table/countries_table.xml	2023-03-02 07:51:43,780650000	3	EXECUTED	8:f89db143d357ada5e284324e741dfa88
4	42e394a329d3bb0ab72a2b6d67d7a6284c489129	(DEV)-Generated comment/regions_comments.xml	2023-03-02 07:51:45,906099000	4	EXECUTED	8:9a6391d594e421704b0eb8d8191a192d
5	1dc13ed32f7b496e47d8dbc79e4e97460aef7eb6	(DEV)-Generated comment/countries_comments.xml	2023-03-02 07:51:47,961198000	5	EXECUTED	8:a4163c4e45bb042ce10e12a9dc072def
6	82011d7dc3f5cc8ced037ecc1acf821b8637fe49	(DEV)-Generated view/emp_details_view_view.xml	2023-03-02 07:51:52,679657000	6	EXECUTED	8:602a11211e0bc50940e549d61ddc7286
7	a1ac6651cca640937133a1aa27544319af6dade6	(DEV)-Generated ref_constraint/countr_reg_fk_ref_constraint.xml	2023-03-02 07:51:54,766517000	7	EXECUTED	8:ca84dd01830e9e935ecc54021365942
8	7e8bfea4ac3a6750e8611ddb05022786170c2ef6	(DEV)-Generated procedure/secure_dml_procedure.xml	2023-03-02 07:51:56,890967000	8	EXECUTED	8:6689b798cd755441f65ef98beef28d14
9	2ac7a86d32053a55e75b5a790d23a8e780542a90	(DEV)-Generated trigger/secure_regions_trigger.xml	2023-03-02 07:51:59,096408000	9	EXECUTED	8:fe5aa9c7b8c0cc92fa05c1d446496b76
10	96d625ec94177a9a431713192bd590d26590065c	(DEV)-Generated trigger/secure_countries_trigger.xml	2023-03-02 07:52:01,321864000	10	EXECUTED	8:3865190a7546eefd5c187b0e13fc8b6

Liquibase (standalone)



1 Initialize projects (DEV,UAT)

```
> liquibase init project  
"Setup new liquibase.properties (...)?" / Y(Yes)
```

```
7 sqlcl_liquibase > liquibase.properties  
1 # Enter the path for your changelog file.  
2 changeLogFile=controller.xml  
3 ##### Enter the Target database 'url' information #####  
4 liquibase.command.url=jdbc:oracle:thin:@rgatp28_low?TNS_ADMIN=/users/rg/apps/oracle/wallets/priv/Wallet_REGIONAL  
5 # Enter the username for your Target database.  
6 liquibase.command.username: DEV  
7 # Enter the password for your Target database.  
8 liquibase.command.password: Qwerty12345$
```

Resources: <https://docs.liquibase.com/concepts/connections/creating-config-properties.html>

Liquibase (standalone)



1 Initialize projects (DEV,UAT)

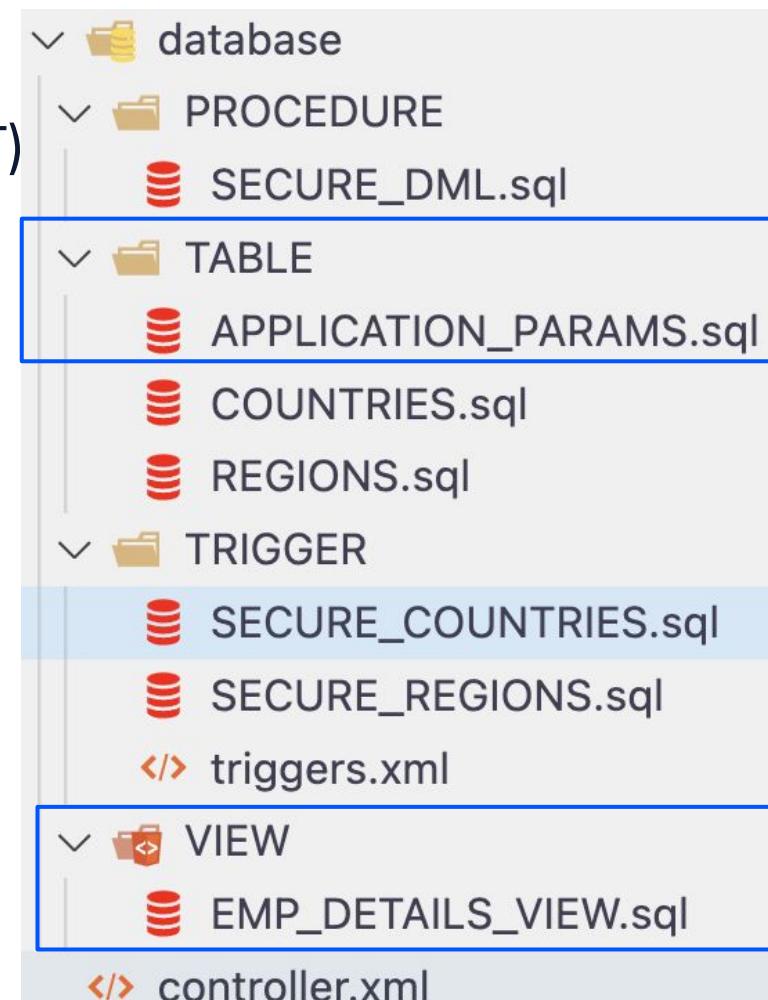
```
> liquibase init project  
"Setup new liquibase.properties (...)?" / Y(Yes)
```

```
liquibase > uat.properties  
1  # Enter the path for your changelog file.  
2  changeLogFile=controller.xml  
3  ##### Enter the Target database 'url' information #####  
4  liquibase.command.url=jdbc:oracle:thin:@rgatp28_low?TNS_ADMIN=/users/rg/apps/oracle/wallets/priv/Wallet_REGIONAL  
5  # Enter the username for your Target database.  
6  liquibase.command.username: UAT  
7  # Enter the password for your Target database.  
8  liquibase.command.password: Qwerty12345$  
9  outputFile: UAT_output.sql
```

Resources: <https://docs.liquibase.com/concepts/connections/creating-config-properties.html>



Liquibase (standalone)



liquibase.properties

```

  liquibase > liquibase.properties
  1 # Enter the path for your changelog file.
  2 changeLogFile=controller.xml
  
```

controller.xml

```

<!-- controller.xml
-->

<?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"
  xsi:schemaLocation="http://www.liquibase.org/xml/ns/dbchangelog
  http://www.liquibase.org/xml/ns/dbchangelog-dbchangelog-latest.xsd">

  <include file="database/table/regions.sql"/>...
  <include file="database/table/countries.sql"/>...
  <include file="database/table/application_params.sql"/>...

  <includeAll path="database/procedure"/>

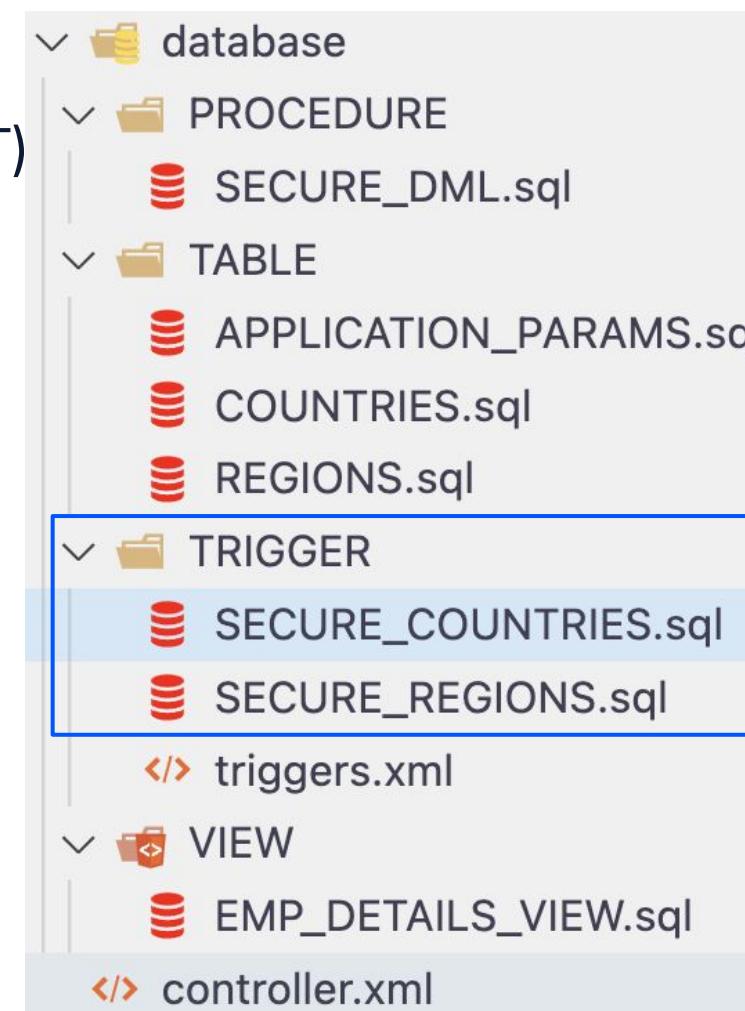
  <include file="database/trigger/triggers.xml"/>...

  <includeAll path="database/view"/>

</databaseChangeLog>
  
```

Liquibase (standalone)

- 1 Initialize projects (DEV,UAT)
- 2 Create changelog(s)
- 3
- 4
- (i)



```

</> controller.xml <
liquibase > </> controller.xml > ...
13
14   ... <include file="database/trigger/triggers.xml"/>
15

</> triggers.xml <
liquibase > database > TRIGGER > </> triggers.xml > ...
1   <?xml version="1.0" encoding="UTF-8"?>
2   <databaseChangeLog
3     xmlns="http://www.liquibase.org/xml/ns/dbchangelog"
4     xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
5     xsi:schemaLocation="http://www.liquibase.org/xml/ns/dbchangelog
6       http://www.liquibase.org/xml/ns/dbchangelog/dbchangelog-latest.xsd">
7
8     <include file="database/trigger/SECURE_COUNTRIES.sql"/>
9     <include file="database/trigger/SECURE_REGIONS.sql"/>
10
11 </databaseChangeLog>
  
```

Resources: <https://docs.liquibase.com/concepts/changelogs/home.html>

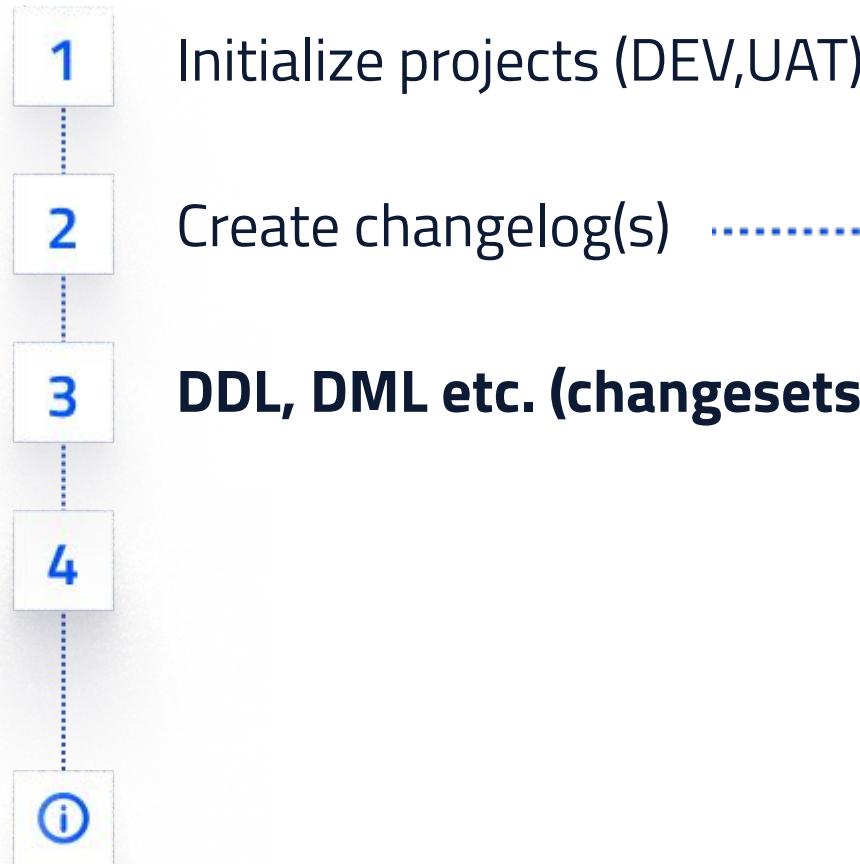
Liquibase (standalone)

- 1 Initialize projects (DEV,UAT)
- 2 Create changelog(s)
- 3 DDL, DML etc. (changesets)
- 4
- (i)

```
APPLICATION_PARAMS.sql ×  
liquibase > database > TABLE > APPLICATION_PARAMS.sql > ...  
1 --liquibase.formatted.sql  
2 → --changeset=rgrzegorczyk:APPLICATION_PARAMS--runOnChange:false  
3 --comment=APPLICATION_PARAMS.table  
4 ...CREATE TABLE "APPLICATION_PARAMS"  
5 ... ("CODE" VARCHAR2(50),  
6 "VALUE" VARCHAR2(500)  
7 ...);  
8  
9 → ...--changeset=rgrzegorczyk:add_col_description--runOnChange:false  
10 ...--comment--Added column name  
11 ...ALTER TABLE APPLICATION_PARAMS ADD DESCRIPTION (VARCHAR2(50));
```

Resources: <https://docs.liquibase.com/concepts/changelogs/changeset.html>

Liquibase (standalone)



Resources: <https://docs.liquibase.com/concepts/changelogs/changeset.html>

Liquibase (standalone)

- 1 Initialize new project
 - 2 Create changelog(s)
 - 3 DDL, DML etc. (changesets)
 - 4 Preview SQL
- (i)

```
> liquibase updateSQL
```

Liquibase (standalone)



```

21  -- Create Database Change Log Table
22  CREATE TABLE DEV.DATABASECHANGELOG (ID VARCHAR2(255) NOT NULL, AUTHOR VARCHAR2(255) NOT NULL, FILENAME VARCHAR2(255) NOT NULL, DATEEXECUTED TIMESTAMP NOT NULL, ORDEREXECUTED INTEGER NOT NULL, EXECTYPE VARCHAR2(35), DESCRIPTION VARCHAR2(255), COMMENTS VARCHAR2(255), TAG VARCHAR2(255), LIQUIBASE VARCHAR2(20), CONTEXTS VARCHAR2(255), LABELS VARCHAR2(255), DEPLOYMENT_ID VARCHAR2(10));
23
24  -- Changeset database/table/regions.sql::REGIONS::rgrzegorczyk
25  -- REGIONS table
26  CREATE TABLE "REGIONS"
27  | - ("REGION_ID" NUMBER CONSTRAINT "REGION_ID_NN" NOT NULL ENABLE,
28  | - "REGION_NAME" VARCHAR2(25);
29
30  CREATE UNIQUE INDEX "REG_ID_PK" ON "REGIONS" ("REGION_ID");
31
32  ALTER TABLE "REGIONS" ADD CONSTRAINT "REG_ID_PK" PRIMARY KEY ("REGION_ID")
33  | - USING INDEX "REG_ID_PK" ENABLE;
34
35  INSERT INTO DEV.DATABASECHANGELOG (ID, AUTHOR, FILENAME, DATEEXECUTED, ORDEREXECUTED, MD5SUM, DESCRIPTION, COMMENTS, EXECTYPE, CONTEXTS, LABELS, LIQUIBASE, DEPLOYMENT_ID) VALUES ('REGIONS', 'rgrzegorczyk'
36  SYSTIMESTAMP, 1, '8:f0b0f26941a24cd07df3130b9c237879', 'sql', 'REGIONS table', 'EXECUTED', NULL, NULL, '4.19.0', '8130421811');
37
38  -- Changeset database/table/countries.sql::COUNTRIES::rgrzegorczyk
39  -- COUNTRIES table
40  CREATE TABLE "COUNTRIES"
41  | - ("COUNTRY_ID" CHAR(2) CONSTRAINT "COUNTRY_ID_NN" NOT NULL ENABLE,
42  | - "COUNTRY_NAME" VARCHAR2(40),
43  | - "REGION_ID" NUMBER,
44  | - CONSTRAINT "COUNTRY_C_ID_PK" PRIMARY KEY ("COUNTRY_ID")
45  | - USING INDEX ENABLE,
46  | - CONSTRAINT "COUNTR_REG_FK" FOREIGN KEY ("REGION_ID")
47  | - REFERENCES "REGIONS" ("REGION_ID") ENABLE
48  | - );
49
50  INSERT INTO DEV.DATABASECHANGELOG (ID, AUTHOR, FILENAME, DATEEXECUTED, ORDEREXECUTED, MD5SUM, DESCRIPTION, COMMENTS, EXECTYPE, CONTEXTS, LABELS, LIQUIBASE, DEPLOYMENT_ID) VALUES ('COUNTRIES', 'rgrzegorczyk'
51  sql', SYSTIMESTAMP, 2, '8:9fd1a2073de3191651054949aab1580', 'sql', 'COUNTRIES table', 'EXECUTED', NULL, NULL, '4.19.0', '8130421811');
  
```

Liquibase (standalone)

- 1 Initialize new project
- 2 Create changelog(s)
- 3 DDL, DML etc. (changesets)
- 4 Preview SQL
- i Update database (DEV)**

```
> liquibase update
```

Liquibase (standalone)



Tracking table preview (DEV)

DATABASECHANGELOG					
Columns	Data	Model	Constraints	Grants	Statistics
ID	AUTHOR	FILENAME	DATEEXECUTED	MD5SUM	COMMENTS
1	REGIONS	rgrzegorczyk database/table/regions.sql	2023-03-06 19:40:24,474393000	8:f43434582d009980021e85851fb9626d	REGIONS table
2	COUNTRIES	rgrzegorczyk database/table/countries.sql	2023-03-06 19:40:25,217105000	8:9fd1a2073de3191651054949aab1580	COUNTRIES table
3	APPLICATION_PARAMS	rgrzegorczyk database/table/application_params.sql	2023-03-06 19:40:25,975285000	8:f8e8f3d9bf37034fdd3ecac69c34ed47	APPLICATION_PARAMS table
4	add_col_descrip...	rgrzegorczyk database/table/application_params.sql	2023-03-06 19:40:26,724696000	8:e8e0571ab2e0a41299500ab4cbdf6b6a	(null)
5	SECURE_DML	rgrzegorczyk database/procedure/SECURE_DML.sql	2023-03-06 19:40:27,673223000	8:1a2d8b94fd04ed0840b1f35ecd8358f7	Secure dml proc first version
6	SECURE_COUNTRIES	rgrzegorczyk database/trigger/SECURE_COUNTRIES.sql	2023-03-06 19:40:28,787351000	8:f27caee7682cb79842ebce1109a44c07	SECURE_COUNTRIES first version
7	SECURE_REGIONS	rgrzegorczyk database/trigger/SECURE_REGIONS.sql	2023-03-06 19:40:29,889505000	8:a858d6ded934520369300f53b4352173	SECURE_REGIONS first version
8	EMP_DETAILS_VIEW	rgrzegorczyk database/view/EMP_DETAILS_VIEW.sql	2023-03-06 19:40:30,623681000	8:67c206a624d7f791199fafcbc903a668	EMP_DETAILS_VIEW first version

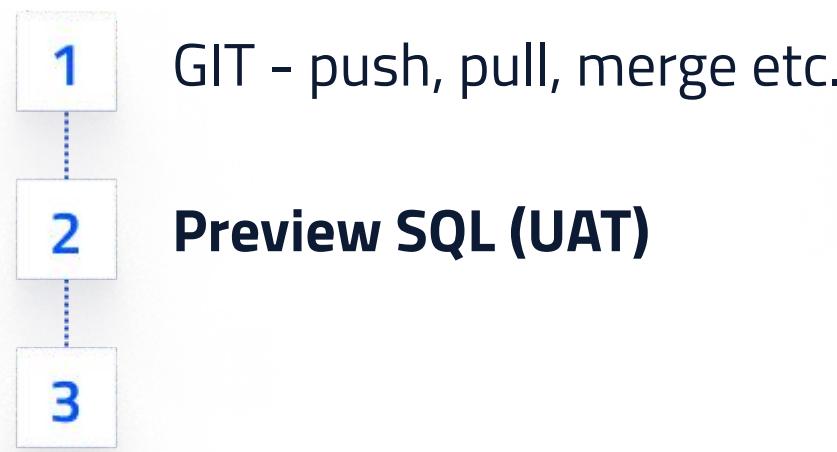
Update UAT



GIT - push, pull, merge etc.



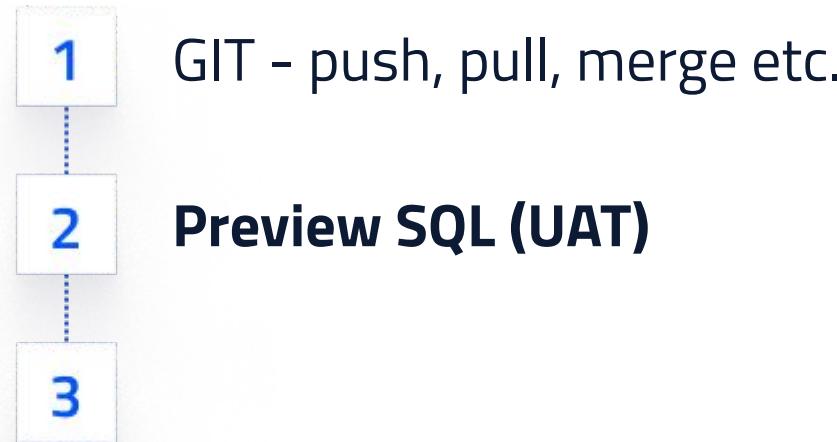
Update UAT



```
> liquibase --defaults-file=uat.properties updateSQL
```

```
liquibase > uat.properties
1  # Enter the path for your changelog file.
2  changeLogFile=controller.xml
3  ##### Enter the Target database 'url' information #####
4  liquibase.command.url=jdbc:oracle:thin:@rgatp28_low?TNS_ADMIN=/users/rg/apps/oracle/wallets/priv/Wallet_REGIONAL
5  # Enter the username for your Target database.
6  liquibase.command.username: UAT
7  # Enter the password for your Target database.
8  liquibase.command.password: Qwerty12345$
9  outputFile: UAT_output.sql
```

Update UAT



UAT_output.sql

```

1  liquibase > UAT_output.sql > ...
2
3
4
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36
  
```

The code block shows a snippet of Liquibase SQL script for updating a UAT database. It includes creating a lock table, initializing it, inserting a lock record, locking the database, creating a change log table, defining a regions table with constraints, creating a primary key index, and finally inserting a record into the change log table.

Update UAT

- 1** GIT - push, pull, merge etc.
- 2** Preview SQL (UAT)
- 3** **Update database (UAT)**

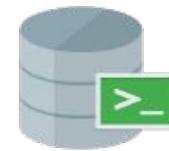
```
> liquibase --defaults-file=uat.properties update
```

```
Starting Liquibase at 20:40:16 (version 4.19.0 #6648 built at 2023-01-17 15:02+0000)
Liquibase Version: 4.19.0
Liquibase Open Source 4.19.0 by Liquibase
Running Changeset: database/table/regions.sql::REGIONS::rgrzegorczyk
Running Changeset: database/table/countries.sql::COUNTRIES::rgrzegorczyk
Running Changeset: database/table/application_params.sql::APPLICATION_PARAMS::rgrzegorczyk
Running Changeset: database/table/application_params.sql::add_col_description::rgrzegorczyk
Running Changeset: database/procedure/SECURE_DML.sql::SECURE_DML::rgrzegorczyk
Running Changeset: database/trigger/SECURE_COUNTRIES.sql::SECURE_COUNTRIES::rgrzegorczyk
Running Changeset: database/trigger/SECURE_REGIONS.sql::SECURE_REGIONS::rgrzegorczyk
Running Changeset: database/view/EMP_DETAILS_VIEW.sql::EMP_DETAILS_VIEW::rgrzegorczyk
Output saved to DEV_output.sql
Liquibase command 'update' was executed successfully.
rg@localhost liquibase % |
```

Tracking table preview (UAT)

DATABASECHANGELOG					
Columns	Data	Model	Constraints	Grants	Statistics
ID	AUTHOR	FILENAME	DATEEXECUTED	MD5SUM	COMMENTS
1	REGIONS	rgrzegorczyk database/table/regions.sql	2023-03-07 07:07:31,845367000	8:f43434582d009980021e85851fb9626d	REGIONS table
2	COUNTRIES	rgrzegorczyk database/table/countries.sql	2023-03-07 07:07:32,773892000	8:9fd1a2073de3191651054949aab1580	COUNTRIES table
3	APPLICATION_PARAMS	rgrzegorczyk database/table/application_params.sql	2023-03-07 07:07:33,697791000	8:f8e8f3d9bf37034fdd3ecac69c34ed47	APPLICATION_PARAMS table
4	add_col_description	rgrzegorczyk database/table/application_params.sql	2023-03-07 07:07:34,571075000	8:e8e0571ab2e0a41299500ab4cbdf6b6a	(null)
5	SECURE_DML	rgrzegorczyk database/procedure/SECURE_DML.sql	2023-03-07 07:07:35,231052000	8:1a2d8b94fd04ed0840b1f35ecd8358f7	Secure dml proc first version
6	SECURE_COUNTRIES	rgrzegorczyk database/trigger/SECURE_COUNTRIES.sql	2023-03-07 07:07:36,247014000	8:f27caeef7682cb79842ebce1109a44c07	SECURE_COUNTRIES first version
7	SECURE_REGIONS	rgrzegorczyk database/trigger/SECURE_REGIONS.sql	2023-03-07 07:07:37,190293000	8:a858d6ded934520369300f53b4352173	SECURE_REGIONS first version
8	EMP_DETAILS_VIEW	rgrzegorczyk database/view/EMP_DETAILS_VIEW.sql	2023-03-07 07:07:38,110205000	8:67c206a624d7f791199fafcbc903a668	EMP_DETAILS_VIEW first version

Web interface (deployments preview)



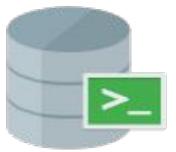
SQLcl Liquibase

- web preview for Oracle Cloud
- DATABASECHANGELOG (table)
- DATABASECHANGELOG_ACTIONS (table)
- DATABASECHANGELOG_DETAILS (view)



Liquibase (standalone)

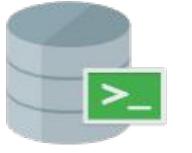
- no web interface
- DATABASECHANGELOG (table)



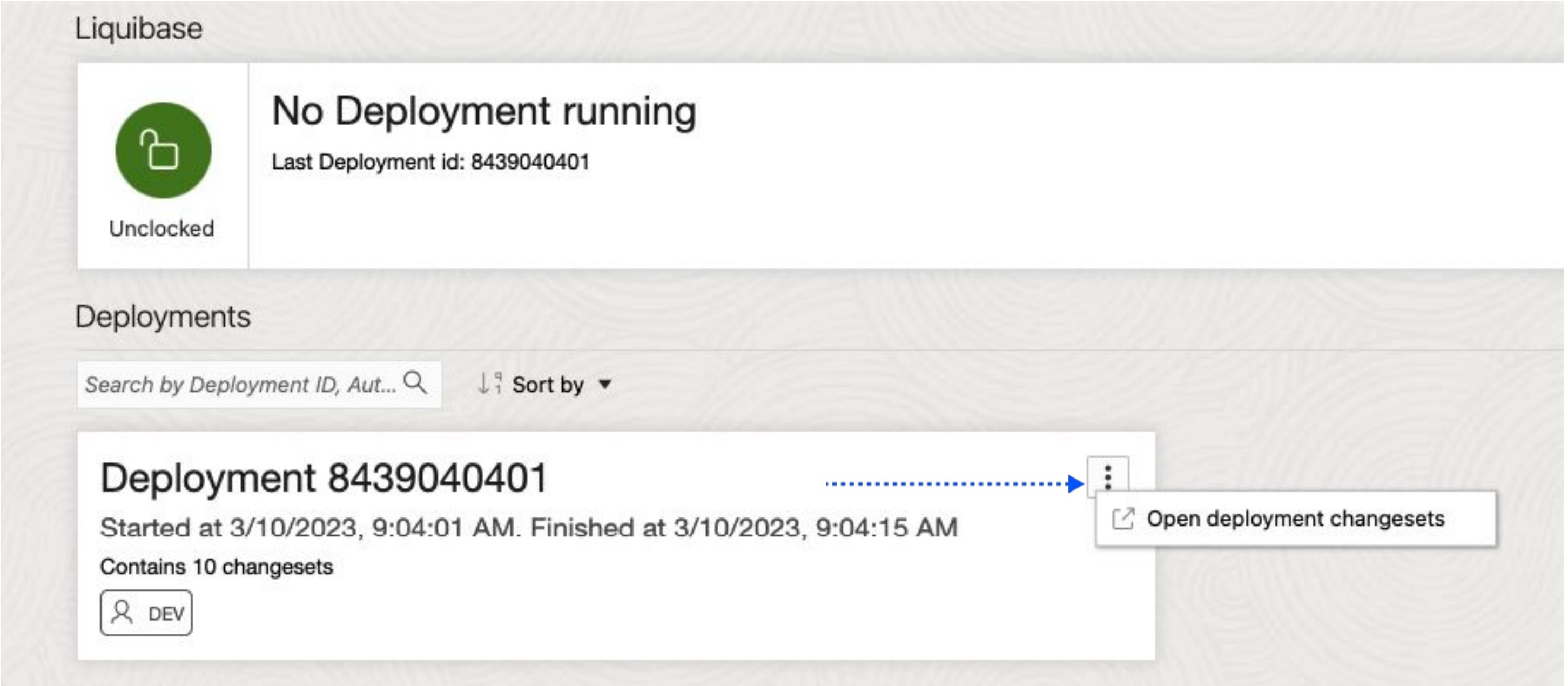
SQLcl Liquibase GUI

☰ ORACLE Database Actions | Launchpad

Development		Data Studio	
SQL Execute queries and scripts, browse and manage your...	DATA MODELER Reverse-engineer schemas to relational diagrams and data...	DATA STUDIO OVERVIEW Data Studio Tools	DATA I Load or ac files or rer
REST An IDE for your REST APIs that enables you to manage...	LIQUIBASE View ChangeLogs applied to your schema.	CATALOG Understand data dependencies and the impact of changes.	DATA I Discover a hidden pa
JSON Create collections, upload documents, query and filter you...	CHARTS Use SQL queries to build rich charts and dashboards...	DATA TRANSFORMS Transform data for analysis and other applications.	DATA / Analyze yo
SCHEDULING An interface for	ORACLE MACHINE LEARNING Oracle Machine Learning		



SQLcl Liquibase GUI

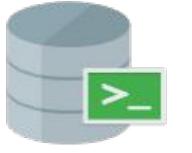


The screenshot shows the Liquibase GUI interface. At the top left, there's a green circular icon with a white padlock symbol and the word "Unclocked". To its right, the text "No Deployment running" is displayed, along with "Last Deployment id: 8439040401". Below this, the "Deployments" section lists a single deployment entry:

Deployment 8439040401
Started at 3/10/2023, 9:04:01 AM. Finished at 3/10/2023, 9:04:15 AM
Contains 10 changesets

A context menu is open over the deployment entry, indicated by a blue dotted arrow pointing from the top right towards the menu. The menu items shown are:

- Open deployment changesets



SQLcl Liquibase GUI

Current Deployment

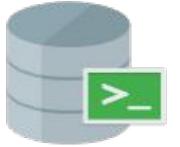
Deployment 8441987184
Started at 3/10/2023, 9:53:09 AM. Finished at 3/10/2023, 9:53:25 AM
Contains 10 changesets

DEV

Deployment changesets

Search by File name, Deployment... Sort by ▾

table/application_params_table.xml Started at 3/10/2023, 9:53:09 AM DEV	table/regions_table.xml Started at 3/10/2023, 9:53:11 AM DEV
table/countries_table.xml Started at 3/10/2023, 9:53:13 AM DEV	comment/regions_comments.xml Started at 3/10/2023, 9:53:15 AM DEV
trigger/secure_countries_trigger.xml Started at 3/10/2023, 9:53:25 AM DEV	view/emp_details_view_view.xml Started at 3/10/2023, 9:53:20 AM DEV
ref_constraint/countr_reg_fk_ref_constraint.xml Started at 3/10/2023, 9:53:21 AM DEV	procedure/secure_dml_procedure.xml Started at 3/10/2023, 9:53:22 AM DEV
trigger/secure_regions_trigger.xml Started at 3/10/2023, 9:53:23 AM DEV	comment/countries_comments.xml Started at 3/10/2023, 9:53:16 AM DEV



SQLcl Liquibase GUI

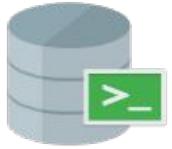
XML code

```
<TABLE xmlns="http://xmlns.oracle.com/ku" version="1.0">
<SCHEMA>DEV</SCHEMA>
<NAME>REGIONS</NAME>
<RELATIONAL_TABLE>
  <COL_LIST>
    <COL_LIST_ITEM>
      <NAME>REGION_ID</NAME>
      <DATATYPE>NUMBER</DATATYPE>
      <NOT_NULL>
        <NAME>REGION_ID_NN</NAME>
      </NOT_NULL>
    </COL_LIST_ITEM>
    <COL_LIST_ITEM>
      <NAME>REGION_NAME</NAME>
      <DATATYPE>VARCHAR2</DATATYPE>
      <LENGTH>25</LENGTH>
      <COLLATE_NAME>USING_NLS_COMP</COLLATE_NAME>
    </COL_LIST_ITEM>
  </COL_LIST>
  <PRIMARY_KEY_CONSTRAINT_LIST>
    <PRIMARY_KEY_CONSTRAINT_LIST_ITEM>
      <NAME>REG_ID_PK</NAME>
      <COL_LIST>
        <COL_LIST_ITEM>
          <NAME>REGION_ID</NAME>
        </COL_LIST_ITEM>
      </COL_LIST>
    <USING_INDEX>
      <INDEX_ATTRIBUTES>
        <PCTFREE>10</PCTFREE>
        <INITTRANS>20</INITTRANS>
        <MAXTRANS>255</MAXTRANS>
        <STORAGE>
          <INITIAL>65536</INITIAL>
          <NEXT>1048576</NEXT>
          <MINEXTENTS>1</MINEXTENTS>
          <MAXEXTENTS>2147483645</MAXEXTENTS>
          <PCTINCREASE>0</PCTINCREASE>
          <FREELISTS>1</FREELISTS>
        </STORAGE>
      </INDEX_ATTRIBUTES>
    </USING_INDEX>
  </PRIMARY_KEY_CONSTRAINT_LIST>
</RELATIONAL_TABLE>
</TABLE>
```

SQL code

```
CREATE TABLE "REGIONS"
(
  "REGION_ID" NUMBER CONSTRAINT "REGION_ID_NN" NOT NULL ENABLE,
  "REGION_NAME" VARCHAR2(25),
  CONSTRAINT "REG_ID_PK" PRIMARY KEY ("REGION_ID")
  USING INDEX
  PCTFREE 10 INITTRANS 20 MAXTRANS 255 LOGGING
  STORAGE( INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645
  PCTINCREASE 0 FREELISTS 1 FREELIST GROUPS 1 BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)
  TABLESPACE "DATA" ENABLE
  ) SEGMENT CREATION IMMEDIATE
  PCTFREE 10 PCTUSED 40 INITTRANS 10 NOCOMPRESS LOGGING
  STORAGE( INITIAL 65536 NEXT 1048576 MINEXTENTS 1 MAXEXTENTS 2147483645
  PCTINCREASE 0 FREELISTS 1 FREELIST GROUPS 1
  BUFFER_POOL DEFAULT FLASH_CACHE DEFAULT CELL_FLASH_CACHE DEFAULT)
  TABLESPACE "DATA"
```

Lesson learned



SQLcl “lazy” Liquibase

- you can develop directly at database
- no need to learn liquibase syntax
- no individual commits in GIT
- fits better for small projects?



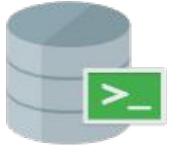
Liquibase (standalone)

- no direct database changes
- write changesets (use snippets!) and changelogs using syntax
- better GIT integration, full control on individual changes

Smart database updates ?



Add new table column



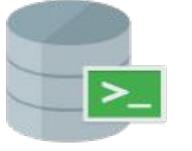
SQLcl Liquibase



Add new column directly on DEV

	COLUMN_NAME	DATA_TYPE	NULLABLE
1	CODE	VARCHAR2(50 BYTE)	Yes
2	VALUE	VARCHAR2(500 BYTE)	Yes

```
1 alter table APPLICATION_PARAMS add (DESCRIPTION varchar2(500));
```

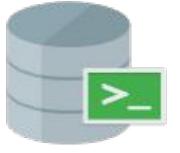


SQLcl Liquibase



- 1 Add new column directly on DEV
- 2 **Capture DEV schema once again**
- 3
- 4
- i

```
> mkdir v2; cd v2  
> conn DEV  
> liquibase generate-schema --split
```

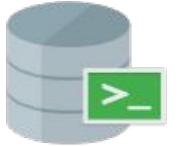


SQLcl Liquibase

- 1 Add new column directly on DEV
- 2 capture DEV schema once again
- 3 **Update UAT**
- 4

```
> cd v2  
> conn UAT  
> liquibase update controller.xml
```

Running Changeset: table/application_params_table
Table "UAT"."APPLICATION_PARAMS" altered.



SQLcl Liquibase

- 1 Add new column directly on DEV
- 2 Capture DEV schema once again
- 3 Update UAT
- 4 **Preview executed code**
- SQLcl will create your code

Current Deployment

Deployment 8567571844
Started at 3/11/2023, 8:46:16 PM. Finished at 3/11/2023, 8:46:21 PM
Contains 3 changesets

DEV

Deployment changesets

Search by File name, Deploym... Sort by ▾

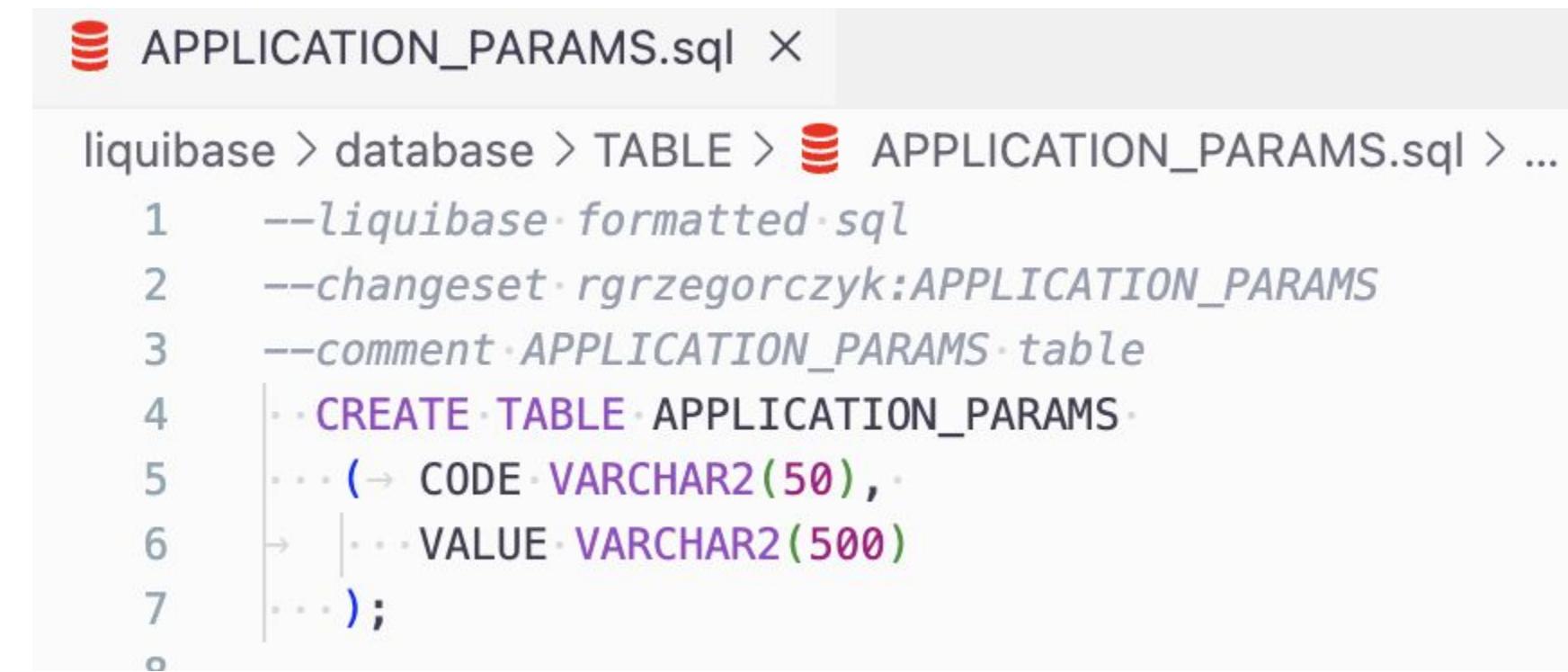
table/application_params_table.xml
Started at 3/11/2023, 8:46:16 PM

DEV

SQL code

```
ALTER TABLE "UAT"."APPLICATION_PARAMS" ADD ("DESCRIPTION" VARCHAR2(500 CHAR) COLLATE "USING_NLS_COMP")  
/
```

Liquibase (standalone)



```
APPLICATION_PARAMS.sql ×  
liquibase > database > TABLE > APPLICATION_PARAMS.sql > ...  
1 --liquibase-formatted-sql  
2 --changeset rgrzegorczyk:APPLICATION_PARAMS  
3 --comment APPLICATION_PARAMS-table  
4   .. CREATE TABLE APPLICATION_PARAMS.  
5     .. ( → CODE VARCHAR2(50),  
6     ..   .. VALUE VARCHAR2(500)  
7     .. );  
8
```

Liquibase (standalone)

APPLICATION_PARAMS.sql ×

liquibase > database > TABLE > APPLICATION_PARAMS.sql > ...

```
1 --liquibase.formatted.sql
2 --changeset.rgrzegorczyk:APPLICATION_PARAMS runOnchange:false
3 --comment.APPLICATION_PARAMS.table
4   .. CREATE TABLE APPLICATION_PARAMS.
5   ... ( → CODE VARCHAR2(50),
6   ...     VALUE VARCHAR2(500),
7   ...     → DESCRIPTION VARCHAR2(500)
8   ... );
```

That won't work

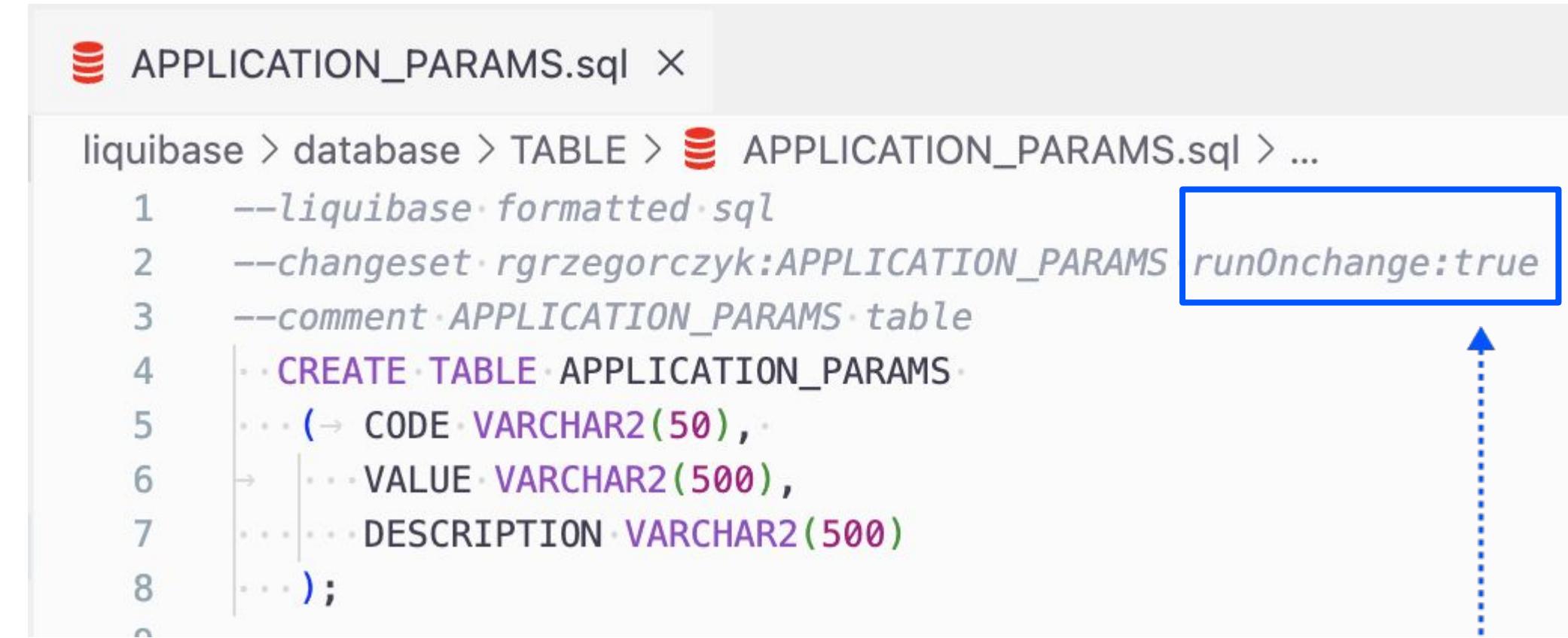
Liquibase (standalone)

Unexpected error running Liquibase: Validation Failed:

1 changesets check sum

database/table/application_params.sql::APPLICATION_PARAMS::rgrzegorczyk was: 8:f8e8f3d9bf37034fdd3ecac69c34ed47
but is now: 8:39e3af5839a3689f82d407a2e327214f

Liquibase (standalone)



```
APPLICATION_PARAMS.sql ×  
liquibase > database > TABLE > APPLICATION_PARAMS.sql > ...  
1 --liquibase.formatted.sql  
2 --changeset.rgrzegorczyk:APPLICATION_PARAMS runOnchange:true  
3 --comment.APPLICATION_PARAMS.table  
4   CREATE TABLE APPLICATION_PARAMS  
5     CODE VARCHAR2(50),  
6     VALUE VARCHAR2(500),  
7     DESCRIPTION VARCHAR2(500)  
8   );
```

This won't work too

Liquibase (standalone)

ORA-00955

Name is already used..

```
Unexpected error running Liquibase: Migration failed for changeset database/table/application_params.sql::APPL  
AMS::rgrzegorczyk:  
    Reason: liquibase.exception.DatabaseException: ORA-00955: nazwa jest już używana przez istniejący obiekt  
[Failed SQL: (955) CREATE TABLE APPLICATION_PARAMS  
  (    CODE VARCHAR2(50),  
      VALUE VARCHAR2(500),  
      DESCRIPTION VARCHAR2(500)  
)]
```

Liquibase (standalone)

```
liquibase > database > TABLE > 📁 APPLICATION_PARAMS.sql > ...
1  --liquibase.formatted.sql
2  --changeset.rgrzegorczyk:APPLICATION_PARAMS.runOnchange:false
3  --comment.APPLICATION_PARAMS.table
4  create table application_params
5  |   code varchar2(50),
6  |   value varchar2(500)
7  |
8
9  --changeset.michael:APP_PARAMS_add_col_description.runOnChange:false
10 --comment.Added column description
11 ➔ ALTER TABLE APPLICATION_PARAMS ADD DESCRIPTION VARCHAR2(500);
12
```

It will work :)

Add column that already exists?

Add column that already exists?

* Using standalone Liquibase you mustn't do any DB changes directly!



The screenshot shows the Liquibase Worksheet interface. The title bar says "DEV". The toolbar includes icons for running, committing, and undoing changesets. Below the toolbar, there are tabs for "Worksheet" and "Query Builder", with "Worksheet" selected. In the main area, there is a single line of SQL code:

```
1 | alter table APPLICATION_PARAMS add (DESCRIPTION varchar2(500));
```

Liquibase (standalone)

```
liquibase > database > TABLE > 📁 APPLICATION_PARAMS.sql > ...
1  --liquibase.formatted.sql
2  --changeset:rgrzegorczyk:APPLICATION_PARAMS.runOnchange:false
3  --comment.APPLICATION_PARAMS.table
4  create table application_params
5    |   code varchar2(50),
6    |   value varchar2(500)
7    |
8
9  --changeset:michael:APP_PARAMS_add_col_description.runOnChange:false
10 --comment..Added.column.description
11 ALTER TABLE APPLICATION_PARAMS ADD DESCRIPTION VARCHAR2(500);
12
```

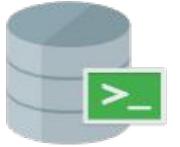
Liquibase (standalone)

```
#####
Starting Liquibase at 07:36:07 (version 4.19.0 #6648 built at 2023-01-17 15:02+0000)
Liquibase Version: 4.19.0
Liquibase Open Source 4.19.0 by Liquibase
Running Changeset: database/table/application_params.sql::add_col_description::rgrzegorczyk
```

ORA-01430

Column being added already exists

```
Unexpected error running Liquibase: Migration failed for changeset database/table/application_params.sql::add_col_description::rgrzegorczyk
Reason: liquibase.exception.DatabaseException: ORA-01430: dodawana kolumna już istnieje w tabeli
[Failed SQL: (1430) ALTER TABLE APPLICATION_PARAMS ADD DESCRIPTION VARCHAR2(500)]
```



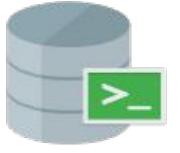
Really smart SQLcl Liquibase

```
SQL> lb update --changelog-file v2/controller.xml
--Starting Liquibase at 17:48:23 (version 4.17.0 #0 built at 2022-11-02 21:48+0000)

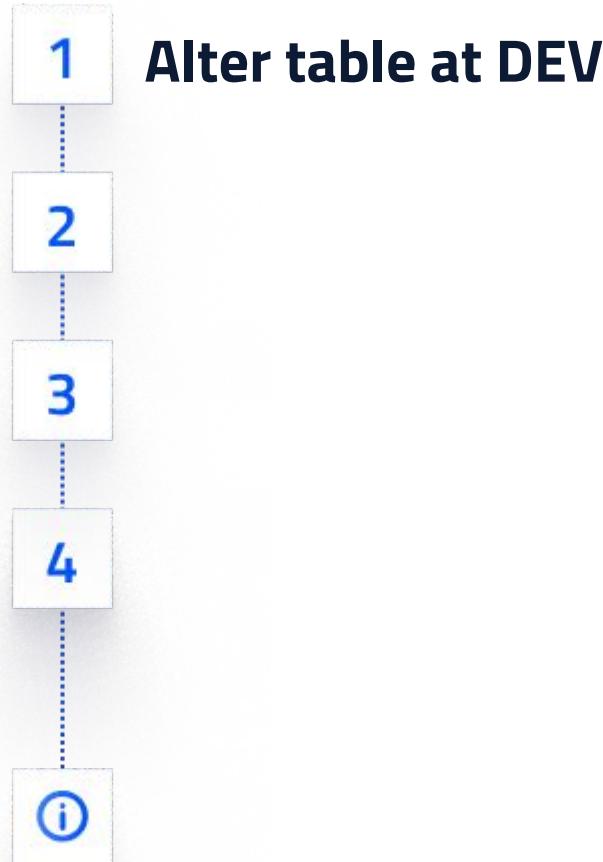
-- Loaded 10 change(s)
Running Changeset: table/application_params_table.xml::d22a4be266335875998380d846da57648f58c0cb::(DEV)--Generated
Statement executed successfully
```

DATABASECHANGELOG_DETAILS		
Columns	Data	Grants Dependencies Details Triggers SQL Errors
FILENAME	SQL	SXML
1 trigger/secure_countries_trigger.xml	CREATE OR REPLACE EDITIONABLE TRIGGER "SECURE_COUNTRIES" before insert ...	CREATE OR REPLACE
2 trigger/secure_regions_trigger.xml	CREATE OR REPLACE EDITIONABLE TRIGGER "SECURE_REGIONS" before insert or...	CREATE OR REPLACE
3 table/application_params_table.xml	-- object is the same nothing to do	<TABLE xmlns=
4 trigger/secure_countries_trigger.xml	CREATE OR REPLACE EDITIONABLE TRIGGER "SECURE_COUNTRIES" before insert ... (null)	(null)
5 trigger/secure_regions_trigger.xml	CREATE OR REPLACE EDITIONABLE TRIGGER "SECURE_REGIONS" before insert or... (null)	(null)
6 procedure/secure_dml_procedure.xml	CREATE OR REPLACE EDITIONABLE PROCEDURE "SECURE_DML" is begin if T0... (null)	(null)
7 ref_constraint/countr_reg_fk_ref_constraint.xml	ALTER TABLE "COUNTRIES" ADD CONSTRAINT "COUNTR_REG_FK" FOREIGN KEY ("REG... (null)	(null)
8 view/emp_details_view_view.xml	CREATE OR REPLACE FORCE EDITIONABLE VIEW "EMP_DETAILS_VIEW" ("COUNTRY... (null)	(null)
9 comment/countries_comments.xml	COMMENT ON COLUMN "COUNTRIES"."COUNTRY_ID" IS 'Primary key of countries ... (null)	(null)

Modify not empty column (not so smart Liquibase - both versions)



SQLcl Liquibase

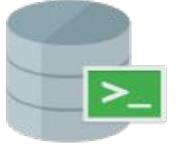


The screenshot shows the SQLcl Liquibase interface. The top bar indicates the connection is to 'DEV'. The main area is a 'Worksheet' tab showing the following SQL script:

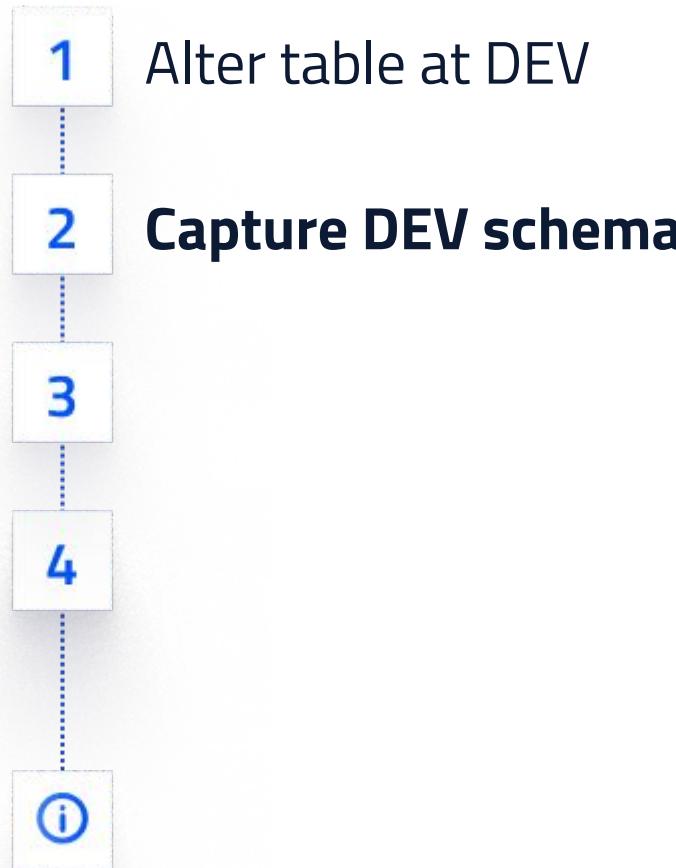
```
1 UPDATE REGIONS SET REGION_NAME = null;
2 commit;
3 ALTER TABLE REGIONS MODIFY (REGION_NAME NUMBER );
4
```

Below the worksheet is a 'Script Output' window displaying the results of the execution:

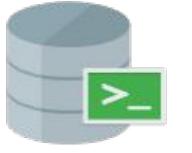
```
Task completed in 0,394 seconds
4 rows updated.
Commit complete.
Table REGIONS altered.
```



SQLcl Liquibase



```
> conn DEV  
> liquibase generate-schema --split
```



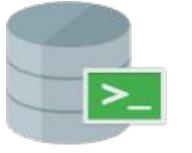
SQLcl Liquibase

- 1 Alter table at DEV
- 2 Capture DEV schema
- 3 Update UAT (preview)
- 4

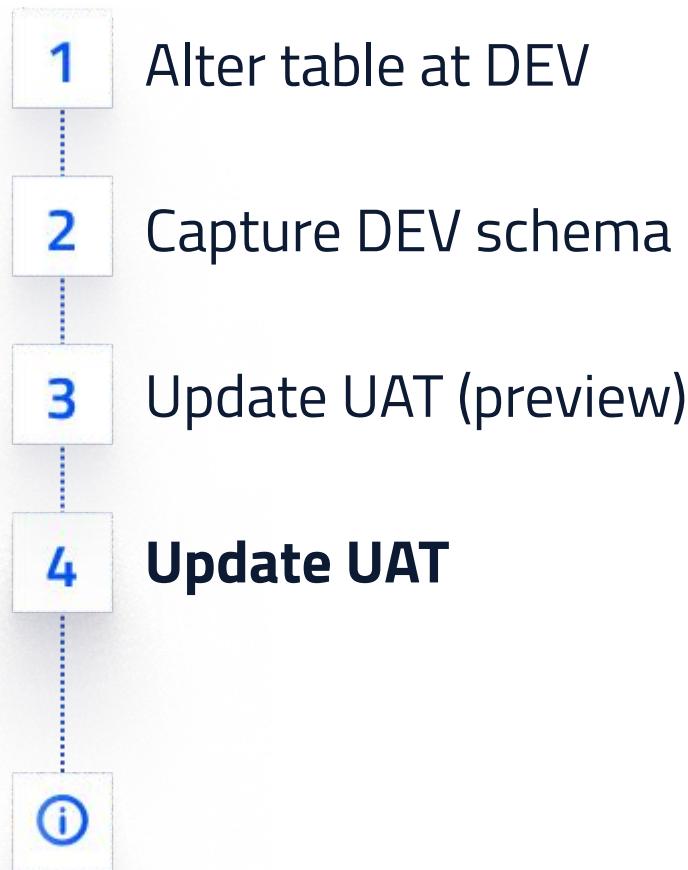
```
> conn UAT  
> liquibase updateSQL --changelog-file controller.xml
```

The screenshot shows a terminal window with the following content:

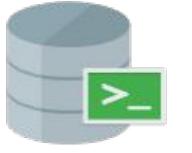
```
preview_uat.sql U X  
sql_cl > v1 > preview_uat.sql  
34  
35 --- Changeset table/regions_table.xml::d17bd6e15f1cc41209b85cd5fd7819e75bf8903d::(DEV)-Generated  
36 ALTER TABLE "UAT"."REGIONS" MODIFY ("REGION_NAME" NUMBER)  
37 /
```



SQLcl Liquibase



```
> conn UAT  
> liquibase update --changelog-file controller.xml
```



SQLcl Liquibase

- 1 Alter table at DEV
 - 2 Capture DEV schema
 - 3 Update UAT (preview)
 - 4 Update UAT
- Ooops...**

```
--Starting Liquibase at 18:52:32 (version 4.17.0 #0 built at 2022-11-02 21:48+0000)
-- Loaded 10 change(s)
Running Changeset: table/regions_table.xml::d17bd6e15f1cc41209b85cd5fd7819e75bf8903d::(DEV)-Generated
Error starting at line : 1 in command -
ALTER TABLE "UAT"."REGIONS" MODIFY ("REGION_NAME" NUMBER)
Error report -
ORA-01439: column to be modified must be empty to change datatype
01439. 00000 - "column to be modified must be empty to change datatype"
```

Liquibase (standalone)

The screenshot shows a code editor window with the following details:

- File name: REGIONS.sql
- Status: M (Modified)
- Icon: A red icon representing a database table.
- Path: liquibase > database > TABLE > REGIONS.sql > ...
- Content:

```
32 --changeset john:REGIONS_modify_col::context:v1::labels:jira-7
33 --comment Change region_name from varchar to number
34 ALTER TABLE REGIONS MODIFY REGION_NAME NUMBER;
35
```

```
> liquibase update
```

Liquibase (standalone)

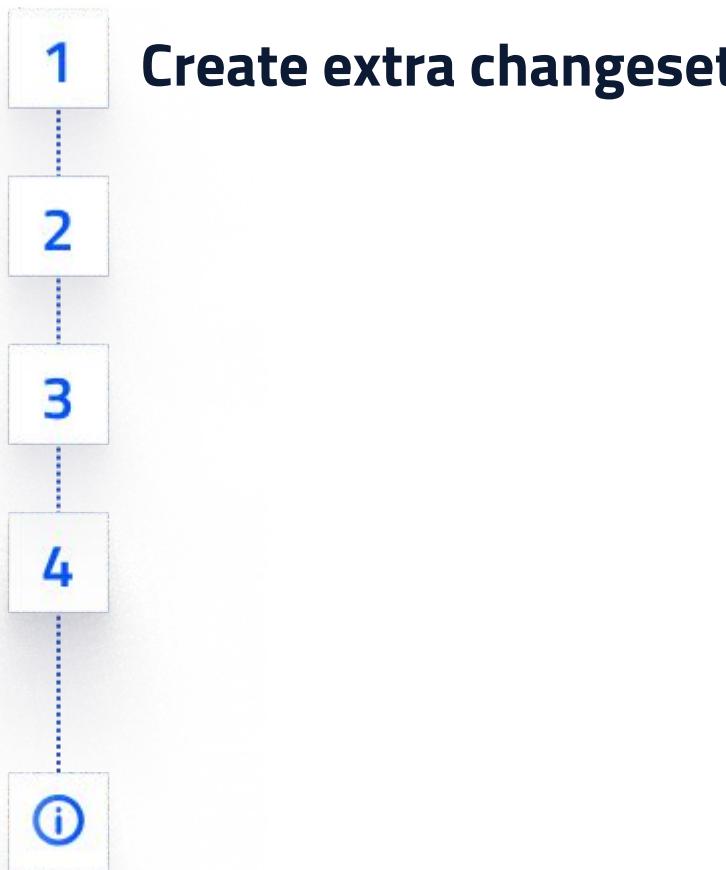
ORA-01439

Column must be empty

Liquibase Open Source 4.19.0 by Liquibase

```
Unexpected error running Liquibase: Migration failed for changeset database/table/regions.sql::REGIONS_modify_col::john:  
Reason: liquibase.exception.DatabaseException: ORA-01439: dla zmiany typu danych, modyfikowana kolumna musi być pusta  
[Failed SQL: (1439) ALTER TABLE REGIONS MODIFY REGION NAME NUMBER]
```

Liquibase (standalone)



```
--changeset rgrzegorczyk:pre_column_modify::context:v1::labels:jira-7
--preconditions::onFail:MARK_RAN::onUpdateSQL:TEST
--precondition-sql-check::expectedResult:1::select count(*) from regions where
region_name is not null and rownum=1;
--comment::Script to run before modifying column. Executed if column is not
null
/*Create backup column*/
alter table regions add region_name_backup varchar2(25);
/*Move data to backup column*/
update regions
  set region_name_backup = region_name
  where region_name is not null;
/*Clear column that will be modified*/
update regions
  set region_name = null
  where region_name is not null;
```

Liquibase (standalone)

- 1 Create extra changeset
- 2 Add preConditions
- 3
- 4
- ⓘ

```
--changeset rgrzegorczyk:pre column modify context:v1 labels:jira-7
--preconditions onFailure:MARK_RAN onUpdateSQL:TEST
--precondition-sql-check expectedResult:1 select count(*) from regions where
region_name is not null and rownum=1;
--comment Script to run before modifying column. Executed if column is not
null
/*Create backup column*/
alter table regions add region_name_backup varchar2(25);
/*Move data to backup column*/
update regions
  set region_name_backup = region_name
  where region_name is not null;
/*Clear column that will be modified*/
update regions
  set region_name = null
  where region_name is not null;
```

Liquibase (standalone)

1 Create extra changeset

2 Add preConditions

3 Run changeset if condition is met

4

ⓘ

```
--changeset::rgrzegorczyk:pre column modify context:v1 labels:jira-7
--preconditions::onFail:MARK_RAN::onUpdateSQL:TEST
--precondition-sql-check::expectedResult:1::select count(*) from regions where
region_name is not null and rownum=1;
--comment::Script to run before modifying column. Executed if column is not
null
/*Create backup column*/
alter table regions add region_name_backup varchar2(25);
/*Move data to backup column*/
update regions
  set region_name_backup = region_name
  where region_name is not null;
/*Clear column that will be modified*/
update regions
  set region_name = null
  where region_name is not null;
```

Liquibase (standalone)

1 Create extra changeset

2 Add preConditions

3 Run changeset if condition is met

4



```
--changeset rgrzegorczyk:REGIONS_modify_col::context:v1::labels:jira-7
--preconditions::onFail:CONTINUE::onUpdateSQL:TEST
--precondition-sql-check::expectedResult:0::select count(*)::from regions::where region_name is not null and rownum=1;
--comment:Change region_name from varchar to number. Additional precondition to be sure that column is empty
alter table regions modify region_name number;
```

Liquibase (standalone)

- 1 Create extra changeset
- 2 Add preConditions
- 3 Run changeset if condition is met
- 4 Preview SQL by updateSQL

```

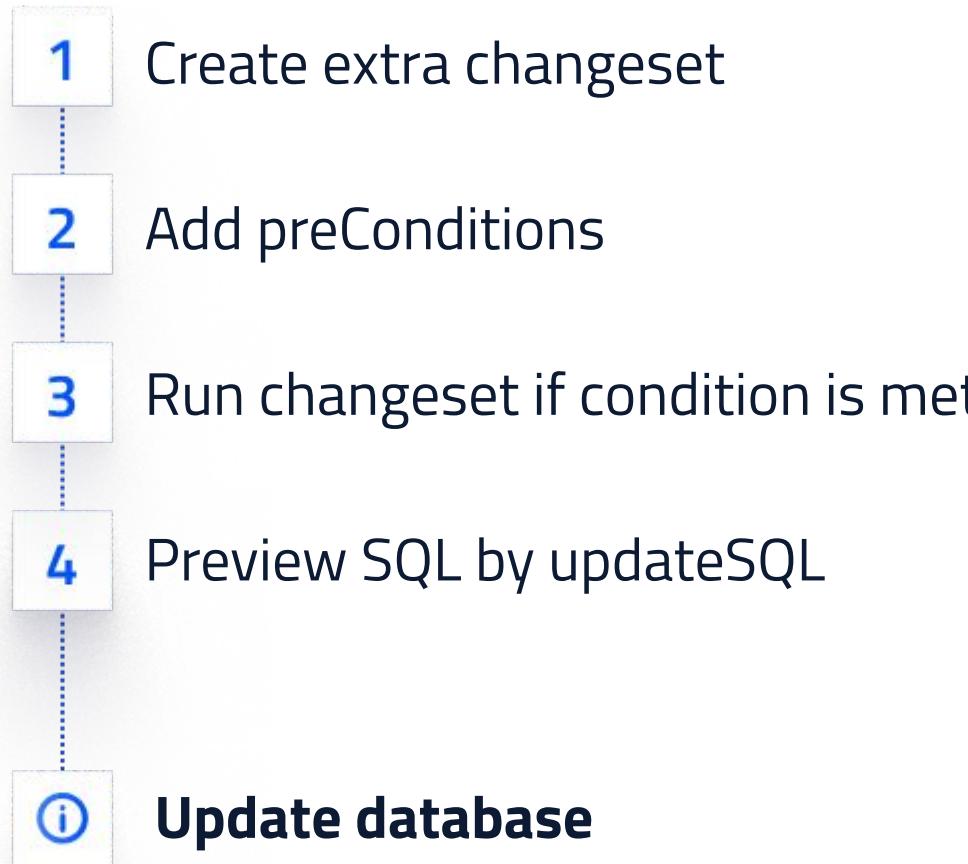
DEV_output.sql ×

sqlcl_liquibase > liquibase > DEV_output.sql

13  --- Changeset database/table/regions.sql::pre_column_modify::rgrzegorczyk
14  --- Script to run before modifying column. Executed if column is not null
15  alter table regions add region_name_backup varchar2(25);
16
17  update regions
18  set region_name_backup = region_name
19  where region_name is not null;
20
21  update regions
22  set region_name = null
23  where region_name is not null;
24
25  INSERT INTO DEV.DATABASECHANGELOG (ID, AUTHOR, FILENAME, DATEEXECUTED, ORDEREXECUTED,
MD5SUM, DESCRIPTION, COMMENTS, EXECTYPE, CONTEXTS, LABELS, LIQUIBASE, DEPLOYMENT_ID)
VALUES ('pre_column_modify', 'rgrzegorczyk', 'database/table/regions.sql', SYSTIMESTAMP,
14, '8:a96baf5fa1d32318e30784b9dcf87c72', 'sql', 'Script to run before modifying column.
Executed if column is not null', 'EXECUTED', 'v1', 'jira-7', '4.19.0', '8909986335');
26
27  --- Changeset database/table/regions.sql::REGIONS_modify_col::rgrzegorczyk
28  --- Change region_name from varchar to number
29  alter table regions modify region_name number;

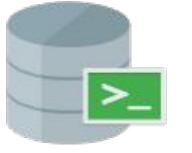
```

Liquibase (standalone)



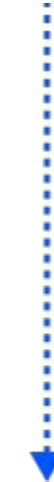
Rollbacks



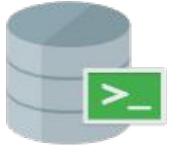


SQLcl Liquibase

SQLcl knows exact code that was executed
(DATABASECHANGELOG_ACTIONS table)

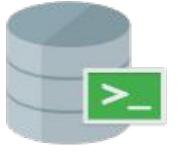


Rollback script is created automatically



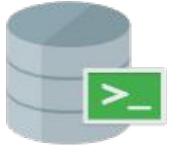
SQLcl Liquibase

- 1 rollback (to specific tag)
- 2 rollback-to-date
- 3 rollback-count



SQLcl Liquibase

```
--preview rollback script, not execute
> conn UAT
> lb rollback-count-sql --changelog-file controller.xml --count 999 --output-file test.sql
```



SQLcl Liquibase

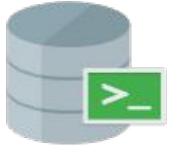
The screenshot shows a code editor window with the file name "test.sql" at the top left. The code itself is a series of SQL statements, primarily UPDATE and DELETE commands, used for managing database change logs. The code includes comments indicating it's part of a "Rolling Back ChangeSet" and specifies XML files like "trigger/secure_countries_trigger.xml" and "trigger/secure_regions_trigger.xml". The code is color-coded for syntax highlighting.

```
test.sql U ×
sqlcl_liquibase > sql_cl > v1 > test.sql
11 UPDATE UAT.DATABASECHANGELOGLOCK SET LOCKED = 1, LOCKEDBY = '192.168.8.121 (192.168.8.121)', LOCKGRANTED = SYSTIMESTAMP WHERE ID = 1 AND LOCKED = 0;
12
13 update UAT.DATABASECHANGELOG_ACTIONS set status = 'willRollback0-' where id = '96d625ec94177a9a431713192bd590d26590065c' and sequence = (select max(sequence) from UAT.DATABASECHANGELOG_ACTIONS where id = '96d625ec94177a9a431713192bd590d26590065c');
14
15 -- Rolling Back ChangeSet: trigger/secure_countries_trigger.xml::96d625ec94177a9a431713192bd590d26590065c::(DEV)-Generated
16 DROP TRIGGER "SECURE_COUNTRIES";
17
18 DELETE FROM UAT.DATABASECHANGELOG WHERE ID = '96d625ec94177a9a431713192bd590d26590065c' AND AUTHOR = '(DEV)-Generated' AND FILENAME = 'trigger/secure_countries_trigger.xml';
19
20 delete from UAT.DATABASECHANGELOG_ACTIONS where id = '96d625ec94177a9a431713192bd590d26590065c' and sequence = (select max(sequence) from UAT.DATABASECHANGELOG_ACTIONS where id = '96d625ec94177a9a431713192bd590d26590065c');
21
22 update UAT.DATABASECHANGELOG_ACTIONS set status = 'willRollback0-' where id = '2ac7a86d32053a55e75b5a790d23a8e780542a90' and sequence = (select max(sequence) from UAT.DATABASECHANGELOG_ACTIONS where id = '2ac7a86d32053a55e75b5a790d23a8e780542a90');
23
24 -- Rolling Back ChangeSet: trigger/secure_regions_trigger.xml::2ac7a86d32053a55e75b5a790d23a8e780542a90::(DEV)-Generated
25 DROP TRIGGER "SECURE_REGIONS";
26
27 DELETE FROM UAT.DATABASECHANGELOG WHERE ID = '2ac7a86d32053a55e75b5a790d23a8e780542a90' AND AUTHOR = '(DEV)-Generated' AND FILENAME = 'trigger/secure_regions_trigger.xml';
28
29 delete from UAT.DATABASECHANGELOG_ACTIONS where id = '2ac7a86d32053a55e75b5a790d23a8e780542a90' and sequence = (select max(sequence) from UAT.DATABASECHANGELOG_ACTIONS where id = '2ac7a86d32053a55e75b5a790d23a8e780542a90');
```



SQLcl Liquibase

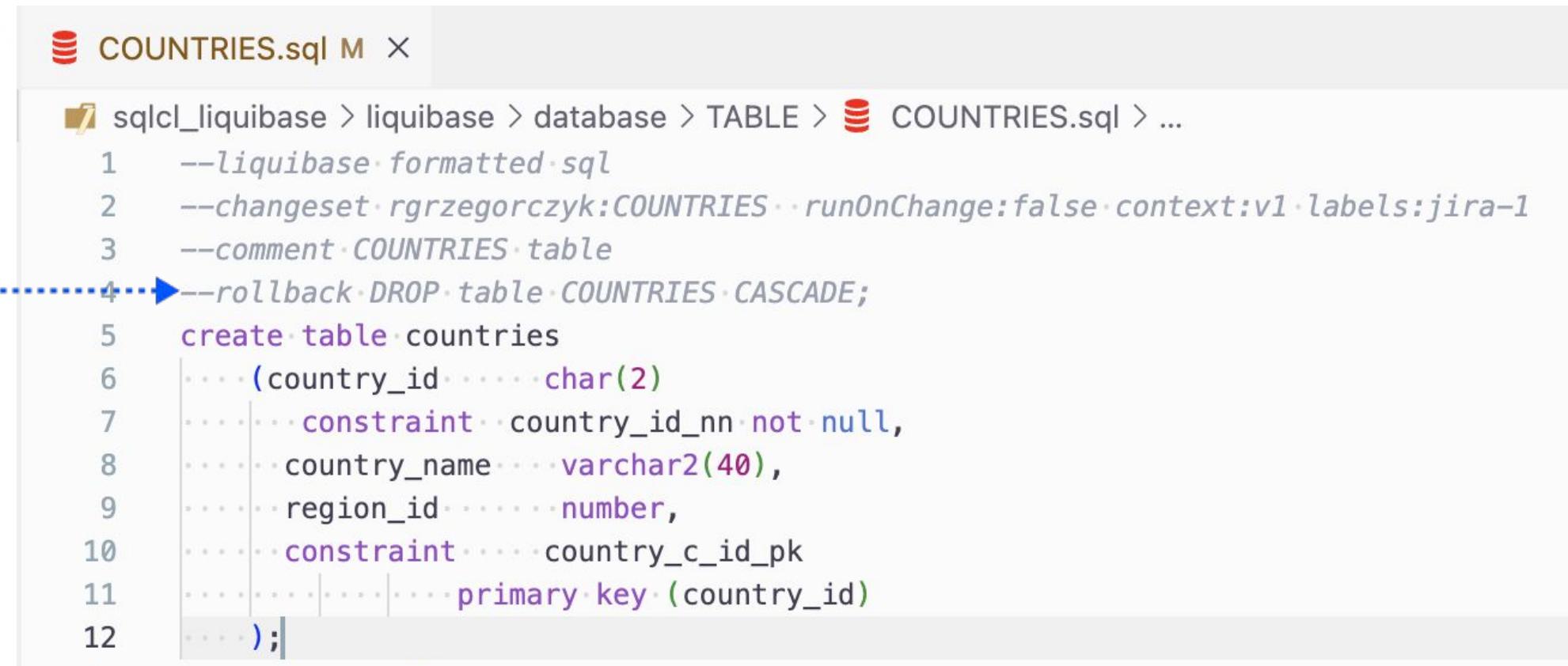
```
--execute rollback  
> conn UAT  
> lb rollback-count --changelog-file controller.xml --count 999
```



SQLcl Liquibase

Liquibase (standalone)

- 1 Developers write rollbacks
- 2 More control
- 3 Rollbacks can be automated with XML changesets (but who wants to write it instead of SQL?)



The screenshot shows a code editor with a file named "COUNTRIES.sql". The code is a SQL script for creating a table named "countries". A specific line of code is highlighted with a blue dotted arrow pointing to it:

```
1 --liquibase.formatted.sql
2 --changeset.rgrzegorczyk:COUNTRIES--runOnChange:false.context:v1.labels:jira-1
3 --comment.COUNTRIES.table
4 ----->--rollback.DROP.table.COUNTRIES.CASCADE;
5 create table countries
6     (country_id char(2)
7         constraint country_id_nn not null,
8         country_name varchar2(40),
9         region_id number,
10        constraint country_c_id_pk
11         primary key (country_id)
12     );
```

Liquibase rollbacks: <https://pretius.com/blog/liquibase-rollback-jenkins-oracle-apex/>



Integration

SQLcl “lazy” Liquibase vs GIT



Development - phase 1

```

1 CREATE TABLE "APPLICATION_PARAMS"
2   ( "CODE" VARCHAR2(50),
3     "VALUE" VARCHAR2(500)
4   );
5
  
```

```

1 CREATE UNIQUE INDEX "DEV"."COUNTRY_C_ID_PK" ON "DEV"."COUNTRIES" ("COUNTRY_ID");
2
3
  
```

```

1 create or replace PROCEDURE "SECURE_DML"
2 is
3 begin
4 if TO_CHAR(SYSDATE, 'HH24:MI') not between '08:00' and '18:00'
5   or TO_CHAR(SYSDATE, 'DY') in ('SAT', 'SUN')
6 then
7   RAISE_APPLICATION_ERROR(-20205,
8     'You may only make changes during normal office hours');
9 end if;
10 end secure_dml;
  
```

SQLcl “lazy” Liquibase vs GIT



Development - phase 1

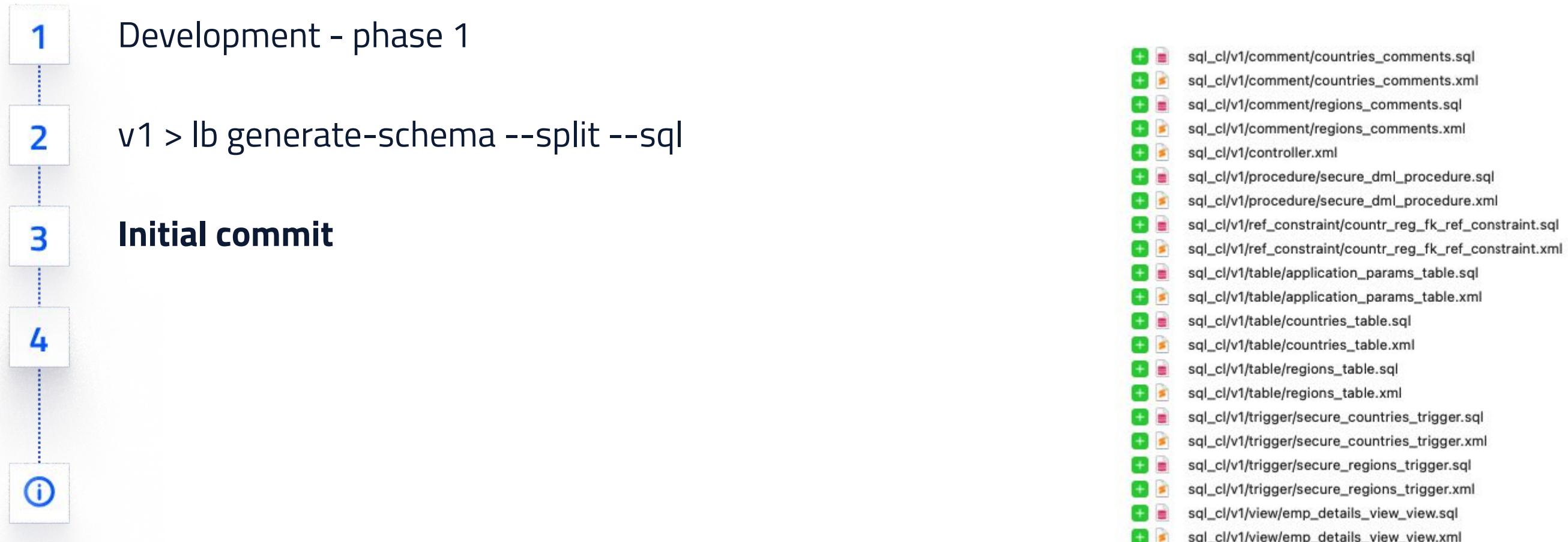
v1 > lb generate-schema --split --sql

```

application_params_table.sql M X
sql_cl > v1 > table > application_params_table.sql > ...
1 CREATE TABLE "DEV"."APPLICATION_PARAMS"
2   ("CODE" VARCHAR2(50),
3   "VALUE" VARCHAR2(500)
4   ) SEGMENT CREATION DEFERRED
5   PCTFREE 10 PCTUSED 40 INITTRANS 10 NOCOMPRESS LOGGING
6   TABLESPACE "DATA";
7

application_params_table.xml M X
sql_cl > v1 > table > application_params_table.xml > databaseChangeLog > changeSet > n0:createSxmlObject
1 <?xml version="1.0" encoding="UTF-8"?>
2 <databaseChangeLog
3   xmlns="http://www.liquibase.org/xml/ns/dbchangelog"
4   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
5   xmlns:n0="http://www.oracle.com/xml/ns/dbchangelog-ext"
6   xsi:schemaLocation="http://www.liquibase.org/xml/ns/dbchangelog-
7   http://www.liquibase.org/xml/ns/dbchangelog/dbchangelog-latest.xsd">
8   <changeSet id="6f988062902f7b3b2083224e59edcba3b19786ca" author="(DEV)-Generated"....>
9     <n0:createSxmlObject objectName="APPLICATION_PARAMS" objectType="TABLE" ownerName="DEV"....>
10    <n0:source><! [CDATA[
11      <TABLE xmlns="http://xmlns.oracle.com/ku" version="1.0">
12        <SCHEMA>DEV</SCHEMA>
13        <NAME>APPLICATION_PARAMS</NAME>
14        <RELATIONAL_TABLE>
15          <COL_LIST>
16            <COL_LIST_ITEM>
17              <NAME>CODE</NAME>
18              <DATATYPE>VARCHAR2</DATATYPE>
19              <LENGTH>50</LENGTH>
20              <COLLATE_NAME>USING_NLS_COMP</COLLATE_NAME>
21            </COL_LIST_ITEM>
22            <COL_LIST_ITEM>
23              <NAME>VALUE</NAME>
24              <DATATYPE>VARCHAR2</DATATYPE>
  
```

SQLcl “lazy” Liquibase vs GIT



SQLcl “lazy” Liquibase vs GIT



Development - phase 1

v1 > lb generate-schema --split --sql

Commit changes

Development - phase 2

Remove files inside /v1/

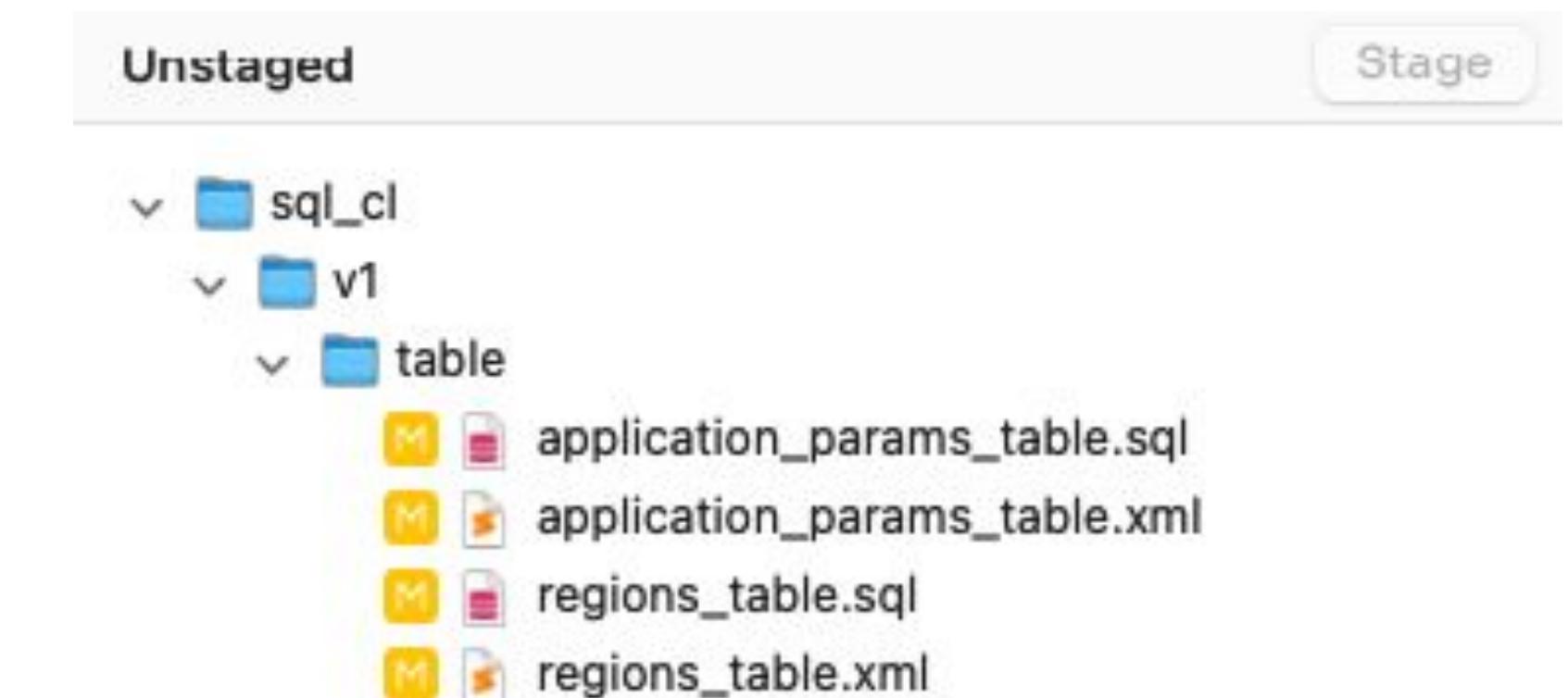
v1 > lb generate-schema --split --sql

Commit changes

```
1 | ALTER TABLE APPLICATION_PARAMS ADD DESCRIPTION VARCHAR2(500);
2 |
3 | ALTER TABLE REGIONS ADD COUNTRY_NAME VARCHAR2(500);
4 |
```

SQLcl “lazy” Liquibase vs GIT

- 1 Development - phase 1
- 2 v1 > lb generate-schema --split --sql
- 3 Commit changes
- 4 Development - phase 2
- Remove files inside /v1/**
- v1 > lb generate-schema --split --sql
- Commit changes



SQLcl “lazy” Liquibase vs GIT



Development - phase 1

v1 > lb generate-schema --split --sql

Commit changes

Development - phase 2

Remove files inside /v1/

v1 > lb generate-schema --split --sql

Commit changes

Deploy

```

diff --git a/sql_cl/v1/table/application_params_table.xml b/sql_cl/v1/table/application_params_table.xml
@@ -5,7 +5,7 @@
      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="8bb0d8b2198aa3b5a6ce0b549d83020889ea2ff7" author="(DEV)-Generated" >
-      <changeSet id="6f988062902f7b3b2083224e59edcba3b19786ca" author="(DEV)-Generated" >
+      <n0:createSqlObject objectName="APPLICATION_PARAMS" objectType="TABLE" ownerName="DEV" >
          <n0:source><![CDATA[
              <TABLE xmlns="http://xmlns.oracle.com/ku" version="1.0">
@@ -25,6 +25,12 @@
                  <LENGTH>500</LENGTH>
                  <COLLATE_NAME>USING_NLS_COMP</COLLATE_NAME>
              </COL_LIST_ITEM>
+              <COL_LIST_ITEM>
+                  <NAME>DESCRIPTION</NAME>
+                  <DATATYPE>VARCHAR2</DATATYPE>
+                  <LENGTH>500</LENGTH>
+                  <COLLATE_NAME>USING_NLS_COMP</COLLATE_NAME>
+              </COL_LIST_ITEM>
+          </COL_LIST>
+          <DEFAULT_COLLATION>USING_NLS_COMP</DEFAULT_COLLATION>
+          <PHYSICAL_PROPERTIES>
      </n0:createSqlObject>
  </changeSet>
</changeSet>

```



```

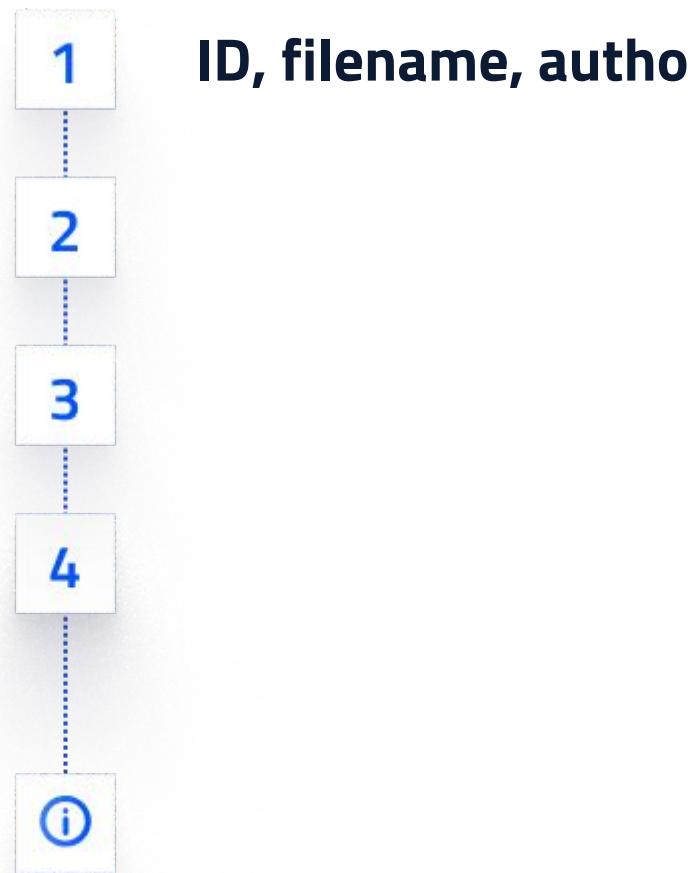
diff --git a/sql_cl/v1/table/regions_table.sql b/sql_cl/v1/table/regions_table.sql
@@ -1,6 +1,7 @@
 CREATE TABLE "DEV"."REGIONS"
 (
     "REGION_ID" NUMBER CONSTRAINT "REGION_ID_NN" NOT NULL ENABLE,
     "REGION_NAME" VARCHAR2(25),
+    "COUNTRY_NAME" VARCHAR2(500),
     CONSTRAINT "REG_ID_PK" PRIMARY KEY ("REGION_ID")
 )
 USING INDEX
 PCTFREE 10 INITTRANS 20 MAXTRANS 255 LOGGING

```

SQLcl “lazy” Liquibase vs GIT

DATABASECHANGELOG							
Columns	Data	Model	Constraints	Grants	Statistics	Triggers	Flashback
ID	AUTHOR	FILENAME	COMMENTS	DESCRIPTION	CONTEXTS	LABELS	
1 96d625ec94177a9a431713192bd590d26590065c	(DEV)-Generated	trigger/secure_countries_trigger.xml	(null)	createOracleTrigger objectName=SECURE_COUNTRIES, ownerName=DEV	(null)	(null)	
2 2ac7a86d32053a55e75b5a790d23a8e780542a90	(DEV)-Generated	trigger/secure_regions_trigger.xml	(null)	createOracleTrigger objectName=SECURE_REGIONS, ownerName=DEV	(null)	(null)	
3 7e8bfea4ac3a6750e8611ddb05022786170c2ef6	(DEV)-Generated	procedure/secure_dml_procedure.xml	(null)	createOracleProcedure objectName=SECURE_DML, ownerName=DEV	(null)	(null)	
4 a1ac6651cca640937133a1aa27544319af6dade6	(DEV)-Generated	ref_constraint/countr_reg_fk_ref_c...	(null)	createOracleRefConstraint objectName=COUNTR_REG_FK, ownerName=DEV	(null)	(null)	
5 82011d7dc3f5cc8ced037ecc1acf821b8637fe49	(DEV)-Generated	view/emp_details_view_view.xml	(null)	createSxmlObject objectName=EMP_DETAILS_VIEW, ownerName=DEV	(null)	(null)	
6 1dc13ed32f7b496e47d8dbc79e4e97460aef7eb6	(DEV)-Generated	comment/countries_comments.xml	(null)	createOracleComment objectName=COUNTRIES_comments, ownerName=DEV	(null)	(null)	
7 42e394a329d3bb0ab72a2b6d67d7a6284c489129	(DEV)-Generated	comment/regions_comments.xml	(null)	createOracleComment objectName=REGIONS_comments, ownerName=DEV	(null)	(null)	
8 59337c43c7ef8e47d22317cac25d3b0bb0dfa99	(DEV)-Generated	table/countries_table.xml	(null)	createSxmlObject objectName=COUNTRIES, ownerName=DEV	(null)	(null)	
9 f549e64c5c7bd9023ce0bbe15168fb7da3d1a708	(DEV)-Generated	table/regions_table.xml	(null)	createSxmlObject objectName=REGIONS, ownerName=DEV	(null)	(null)	
10 8bb0d8b2198aa3b5a6ce0b549d83020889ea2fff7	(DEV)-Generated	table/application_params_table.xml	(null)	createSxmlObject objectName=APPLICATION_PARAMS, ownerName=DEV	(null)	(null)	

Liquibase (standalone) vs GIT



```

APPLICATION_PARAMS.sql M ×
liquibase > database > TABLE > APPLICATION_PARAMS.sql > ...
1 --liquibase-formatted-sql
2 --changeset:rgrzegorczyk:APPLICATION_PARAMS-runOnchange:true--context:v1-labels:jira-1
3 --comment APPLICATION_PARAMS-table
4 create table application_params
5   code varchar2(50),
6   value varchar2(500)
7   );
8
9 --changeset:michael:add_col_description-runOnChange:false--context:v1-labels:jira-2
10 --comment Added column name
11 ALTER TABLE APPLICATION_PARAMS ADD DESCRIPTION VARCHAR2(500);
12

REGIONS.sql M ×
liquibase > database > TABLE > REGIONS.sql > ...
17
18 --changeset:rgrzegorczyk:REGIONS_add_PK-context:v1-labels:jira-1
19 --comment Added primary key
20 create unique index reg_id_pk
21 on regions (region_id);
22
23 alter table regions
24 add (constraint reg_id_pk
25   primary key (region_id)
26   );
27
28 --changeset:john:REGIONS_add_col-context:v1-labels:jira-3
29 --comment Added new column
30 ALTER TABLE REGIONS ADD COUNTRY_NAME VARCHAR2(50);
```

Liquibase (standalone) vs GIT

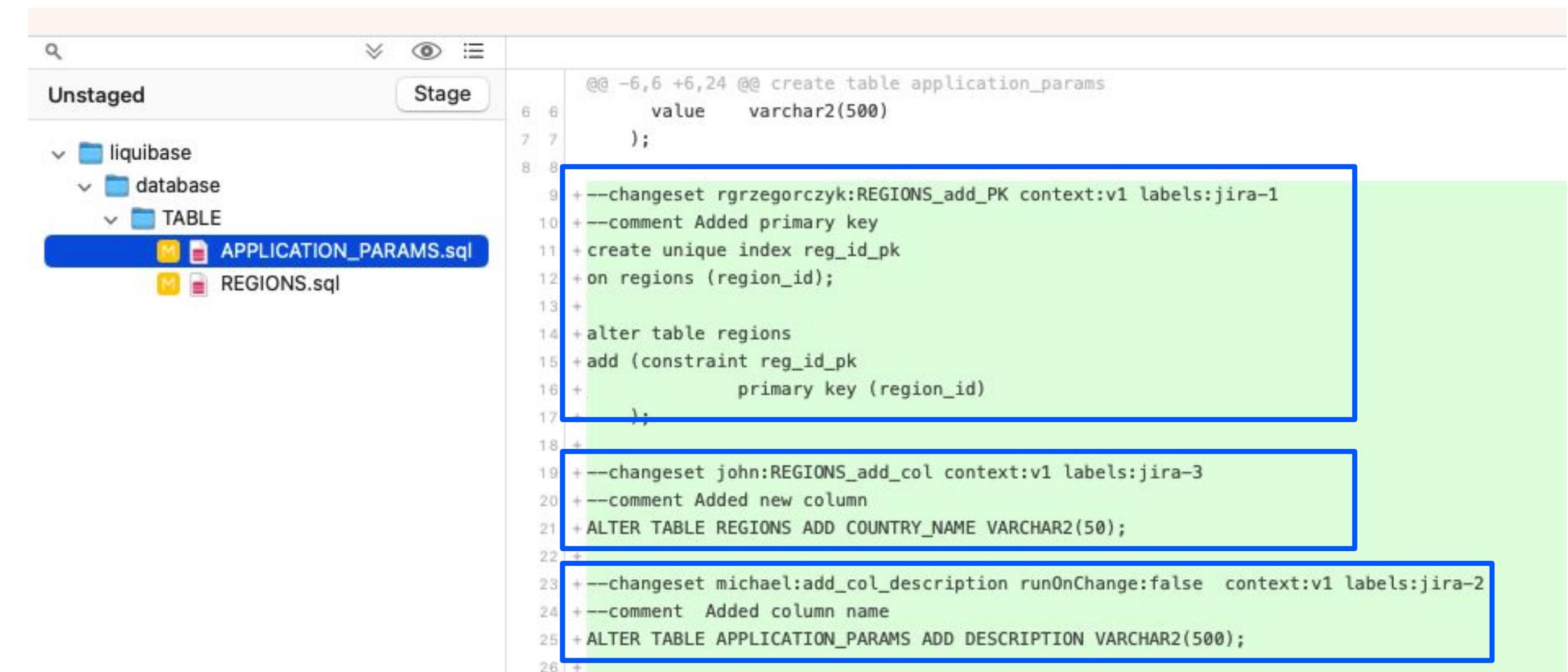
1

ID, filename, author

2

All details in GIT

3



The screenshot shows a Git interface with the 'Unstaged' tab selected. In the file tree, there is a 'liquibase' folder containing a 'database' folder which has a 'TABLE' folder. Inside 'TABLE' are two files: 'APPLICATION_PARAMS.sql' and 'REGIONS.sql'. The code editor on the right displays SQL scripts for Liquibase change sets:

```

@@ -6,6 +6,24 @@ create table application_params
      value      varchar2(500)
);

--changeset rgrzegorczyk:REGIONS_add_PK context:v1 labels:jira-1
+--comment Added primary key
+create unique index reg_id_pk
+on regions (region_id);

+alter table regions
+add (constraint reg_id_pk
+      primary key (region_id)
);

--changeset john:REGIONS_add_col context:v1 labels:jira-3
+--comment Added new column
+ALTER TABLE REGIONS ADD COUNTRY_NAME VARCHAR2(50);

--changeset michael:add_col_description runOnChange:false context:v1 labels:jira-2
+--comment Added column name
+ALTER TABLE APPLICATION_PARAMS ADD DESCRIPTION VARCHAR2(500);

```

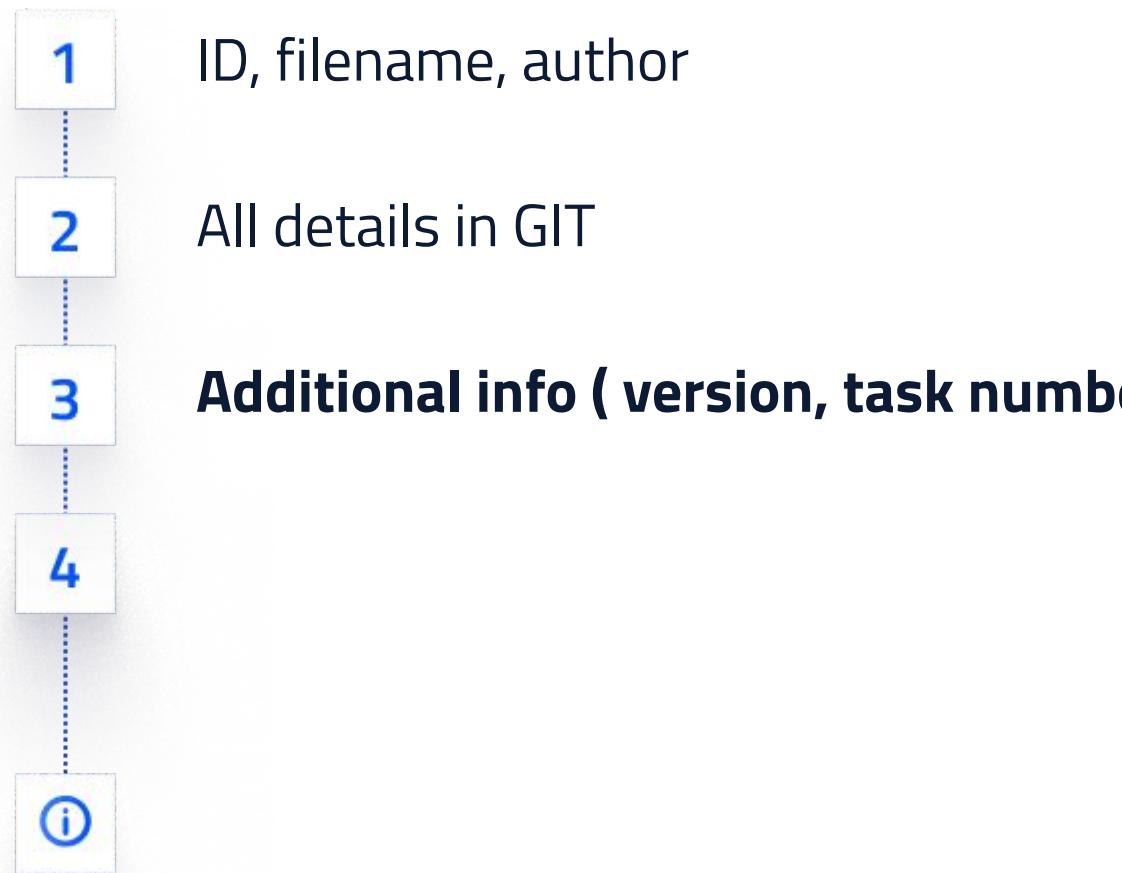
Three specific sections of the code are highlighted with blue boxes and green background shading:

- Line 9: `--changeset rgrzegorczyk:REGIONS_add_PK context:v1 labels:jira-1`
- Line 19: `--changeset john:REGIONS_add_col context:v1 labels:jira-3`
- Line 23: `--changeset michael:add_col_description runOnChange:false context:v1 labels:jira-2`

4

i

Liquibase (standalone) vs GIT

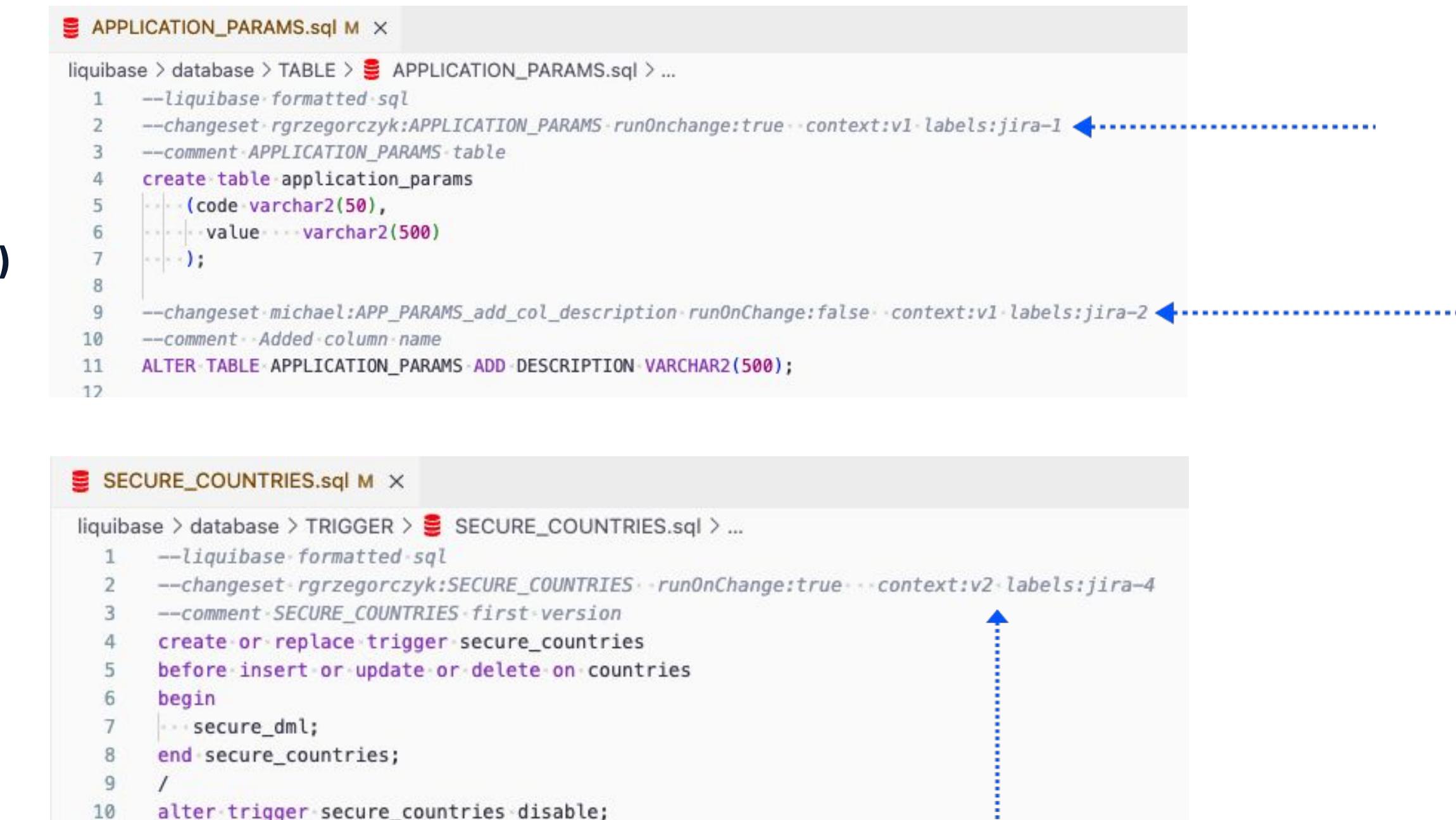


```

APPLICATION_PARAMS.sql M X
liquibase > database > TABLE > APPLICATION_PARAMS.sql > ...
1 --liquibase-formatted-sql
2 --changeset rgrzegorczyk:APPLICATION_PARAMS-runOnchange:true--context:v1-labels:jira-1
3 --comment APPLICATION_PARAMS-table
4 create table application_params
5   (code varchar2(50),
6    value varchar2(500)
7   );
8
9 --changeset michael:APP_PARAMS_add_col_description-runOnChange:false--context:v1-labels:jira-2
10 --comment Added column name
11 ALTER TABLE APPLICATION_PARAMS ADD DESCRIPTION VARCHAR2(500);
12

SECURE_COUNTRIES.sql M X
liquibase > database > TRIGGER > SECURE_COUNTRIES.sql > ...
1 --liquibase-formatted-sql
2 --changeset rgrzegorczyk:SECURE_COUNTRIES-runOnChange:true--context:v2-labels:jira-4
3 --comment SECURE_COUNTRIES-first-version
4 create or replace trigger secure_countries
5 before insert or update or delete on countries
6 begin
7   secure_dml;
8 end secure_countries;
9 /
10 alter trigger secure_countries disable;

```



Liquibase (standalone) vs GIT

- 1 ID, filename, author
- 2 All details in GIT
- 3 Additional info (version, task number)
- 4 **Selected deployment by:**
 - **specific branch**
 - **liquibase contexts, labels or tags**



```

SECURE_COUNTRIES.sql M X
liquibase > database > TRIGGER > SECURE_COUNTRIES.sql > ...
1 --liquibase-formatted-sql
2 --changeset=rgrzegorczyk:SECURE_COUNTRIES--runOnChange:true--context:v2-labels:jira-4
3 --comment=SECURE_COUNTRIES-first-version
4 create or replace trigger secure_countries
5 before insert or update or delete on countries
6 begin
7   ...secure_dml;
8   end secure_countries;
9 /
10 alter trigger secure_countries disable;

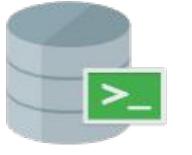
```

```
> liquibase update --contexts=v2 --labels=jira-4
```

- Liquibase advanced features: <https://pretius.com/blog/liquibase-database-version-control/>
- Liquibase contexts and labels: <https://www.liquibase.com/blog/context-vs-labels>

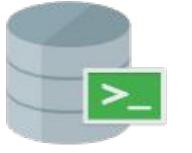


SQLcl exclusive commands



Oracle APEX export

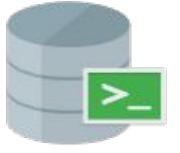
```
SQLcl> liquibase generate-apex-object -applicationid 200
```



Oracle APEX export

```
</> f200.xml U X
apex > </> f200.xml > databaseChangeLog > changeSet > n0:runApexScript > n0:source

1  <?xml version="1.0" encoding="UTF-8"?>
2  <databaseChangeLog>
3  <!-- xmlns="http://www.liquibase.org/xml/ns/dbchangelog" -->
4  <!-- xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" -->
5  <!-- xmlns:n0="http://www.oracle.com/xml/ns/dbchangelog-ext" -->
6  <!-- xsi:schemaLocation="http://www.liquibase.org/xml/ns/dbchangelog http://www.liquibase.org/xml/ns/dbchangelog-dbchangelog-latest.xsd">
7  <changeSet id="665cc66273af13b14135601ffbc1f91fbb104a8" author="(DEV)-Generated" runInTransaction="true">
8    <n0:runApexScript objectName="APEX" objectType="SCRIPT" ownerName="DEV" sourceType="STRING">
9      <n0:source><![CDATA[prompt --application/set_environment
10 set define off verify off feedback off
11 whenever sqlerror exit sql.sqlcode rollback
12 -----
13 --
14 --
15 --- Oracle APEX export file
16 ---
17 --- You should run the script connected to SQL*Plus as the owner (parsing schema)
18 --- of the application.
19 ---
20 --- NOTE: Calls to apex_application_install override the defaults below.
21 ---
22 -----
23 begin
24   wv_flow_imp.import_begin (
25     p_version_yyyy_mm_dd=>'2022.10.07'
26   ,p_release=>'22.2.2'
27   ,p_default_workspace_id=>20489147056497804
28   ,p_default_application_id=>200
29   ,p_default_id_offset=>14823645364608663118
30   ,p_default_owner=>'DEV'
31   );
32 end;
33 /
```

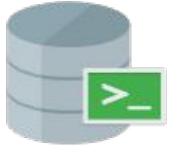


Oracle APEX deploy

```
SQLcl> connect UAT  
SQLcl> liquibase update -changelog-file f200.xml
```

DATABASECHANGELOG			
Columns	Data	Model	Constraints Grants Statistics Triggers Flashback Dependencies Details Partitions Indexes SQL
ID	AUTHOR	FILENAME	DESCRIPTION
1 665cc66273af13b14135601ffbcbb1f91fbb104a8	(DEV)-Generated	f200.xml	runApexScript objectName=APEX, ownerName=DEV

APEX scripts are not supported in Open Source Liquibase (standalone) *



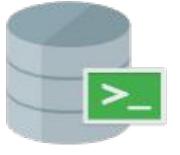
Generate object

```
SQLcl> lb generate-object -object-type table -object-name regions
```

```
○ SQL> lb generate-object -object-type table -object-name regions
--Starting Liquibase at 07:52:11 (version 4.17.0 #0 built at 2022-11-02 21:48+0000)

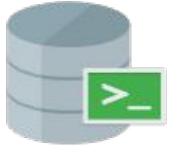
Changelog created and written out to file regions_table.xml

Operation completed successfully.
```



</> regions_table.xml U X

```
</> regions_table.xml > databaseChangeLog > changeSet > n0:createSxmlObject > n0:source
1   <?xml version="1.0" encoding="UTF-8"?>
2   <databaseChangeLog>
3     xmlns="http://www.liquibase.org/xml/ns/dbchangelog".
4     xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance".
5     xmlns:n0="http://www.oracle.com/xml/ns/dbchangelog-ext".
6     xsi:schemaLocation="http://www.liquibase.org/xml/ns/dbchangelog-
7       http://www.liquibase.org/xml/ns/dbchangelog/dbchangelog-latest.xsd">
8     <changeSet id="f549e64c5c7bd9023ce0bbe15168fb7da3d1a708" author="(DEV)-Generated"....>
9       <n0:createSxmlObject objectName="REGIONS" objectType="TABLE" ownerName="DEV"....>
10      <n0:source><![CDATA[
11        <TABLE xmlns="http://xmlns.oracle.com/ku" version="1.0">
12          <SCHEMA>DEV</SCHEMA>
13          <NAME>REGIONS</NAME>
14          <RELATIONAL_TABLE>
15            <COL_LIST>
16              <COL_LIST_ITEM>
17                <NAME>REGION_ID</NAME>
18                <DATATYPE>NUMBER</DATATYPE>
19                <NOT_NULL>
20                  <NAME>REGION_ID_NN</NAME>
21                  </NOT_NULL>
22              </COL_LIST_ITEM>
23              <COL_LIST_ITEM>
24                <NAME>REGION_NAME</NAME>
25                <DATATYPE>VARCHAR2</DATATYPE>
26                <LENGTH>25</LENGTH>
27                <COLLATE_NAME>USING_NLS_COMP</COLLATE_NAME>
28              </COL_LIST_ITEM>
29            </COL_LIST>
30            <PRIMARY_KEY_CONSTRAINT_LIST>
31              <PRIMARY_KEY_CONSTRAINT_LIST_ITEM>
32                <NAME>REG_ID_PK</NAME>
33                <COL_LIST>
34                  <COL_LIST_ITEM>
```



</> regions_table.xml M X



```
sql_cl > v1 > table > </> regions_table.xml > databaseChangeLog
1  <?xml version="1.0" encoding="UTF-8"?>
2  <databaseChangeLog>
3  >   xmlns="http://www.liquibase.org/xml/ns/dbchangelog".
4  >   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance".
5  >   xmlns:n0="http://www.oracle.com/xml/ns/dbchangelog-ext".
6  >   xsi:schemaLocation="http://www.liquibase.org/xml/ns/dbchangelog-
7  >   http://www.liquibase.org/xml/ns/dbchangelog/dbchangelog-latest.xsd">
8
9  <!-- custom script you would like to execute before creating/altering regions table-->
10 <include file="custom_scripts/pre_script.sql"/>
11
12 <changeSet id="f549e64c5c7bd9023ce0bbe15168fb7da3d1a708" author="(DEV)-Generated" . . . . .>
13 >   <n0:createSxmlObject objectName="REGIONS" objectType="TABLE" ownerName="DEV" . . . . .>
14 >     <n0:source><![CDATA[
15     <TABLE xmlns="http://xmlns.oracle.com/ku" version="1.0">
16       <SCHEMA>DEV</SCHEMA>
17       <NAME>REGIONS</NAME>
18       <RELATIONAL_TABLE>
19         <COL_LIST>
20           <COL_LIST_ITEM>
```



EXPLORER ... **pre_script.sql** U X

SQLCL_VS_CORE_LIQUIBASE

- > demo
- > liquibase
- > presentation
- > **sql_cl/v1**
- > comment
- > custom_scripts
- pre_script.sql**

sql_cl > v1 > custom_scripts > **pre_script.sql**

```

1 --liquibase.formatted.sql
2 --changeset=rgrzegorczyk:pre_regions_script--context:ALL.labels:ALL
3 --comment--Custom script you would like to execute before creating/altering regions table
4 --rollback--SELECT 1 FROM DUAL;
5 SELECT 1 FROM DUAL;

```

regions_table.xml M X

sql_cl > v1 > table > regions_table.xml > databaseChangeLog

```

90     ...
91     ...
92     ...
93     ...
94     ...
95     ...
96     ...
97     ...
98     ...
99     ...
100    ...
101    ...
102    ...
103    ...

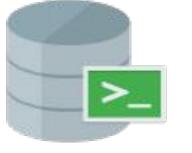
```

```

97     <changeSet author="rgrzegorczyk" id="insert_into_regions">
98         <sql dbms="oracle"
99             stripComments="true">
100             insert into regions (region_id, region_name) values (999, 'test_region');
101         </sql>
102     </changeSet>

```

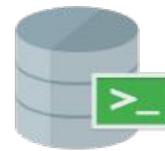
110



All SQLcl exclusive commands

- 1 generate-ords-schema
- 2 generate-control-file
- 3 generate-ords-module
- 4 generate-object
- 5 generate-apex-object
- (i) generate-schema

Summary



SQLcl “lazy” Liquibase

- transforms state of the database objects dynamically
- automatic object updates
- automated rollbacks
- web reporting (OCI only)
- APEX, ORDS support
- all objects and data types included
- better for small projects



Liquibase (standalone)

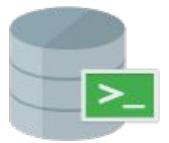
- need to learn syntax (use snippets!)
- full control over individual changes
- selected deployment (contexts, labels, tags)
- rollbacks needs to be written
- no APEX support in open source version
- not all objects / data types supported (e.g BFILE or JSON)
- fits better to advanced projects

Challenge is now.....

SQLcl enhanced Liquibase

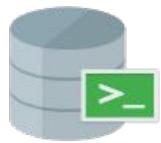
vs

Liquibase (standalone)



Cooperation

SQLcl enhanced Liquibase



Liquibase (standalone)



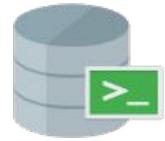
SQLcl Liquibase + Liquibase(standalone)

- add .jar files from SQLcl to liquibase/lib
- use Liquibase (standalone) with full support of SQLcl generated changesets (schema, APEX, ORDS etc.)
- combine files created with **generate-schema** command with advanced logic from manually created changesets

Read more: <https://docs.oracle.com/en/database/oracle/sql-developer-command-line/22.4/index.html>

What do you choose?

SQLcl enhanced Liquibase



Liquibase (standalone)



Questions & Answers

Presentation and examples: https://github.com/rgrzegorczyk/sqlcl_vs_core_liquibase

Want more? Pretius resources:

- Liquibase tutorial: <https://pretius.com/blog/liquibase-tutorial/>
- Liquibase rollbacks: <https://pretius.com/blog/liquibase-rollback-jenkins-oracle-apex/>
- Flyway, Gradle & APEX <https://pretius.com/gradle-flyway-oracle-apex-a-few-words-about-migration-part-1/>

Other resources:

- Liquibase standalone documentation: <https://docs.liquibase.com/home.html>
- SQLcl Liquibase documentation : <https://docs.oracle.com/en/database/oracle/sql-developer-command-line/22.4/index.html>
- SQLcl Liquibase features explained by Oracle : <https://speakerdeck.com/thatjeffsmith/oracle-change-management-with-sqlcl-and-liquibase>



Let's meet at Kscope!

- "APEX New Features 23.1 : An honest review from a non-APEX team perspective" **Matt Mulvaney**
Monday , June 26th 11:15 AM - 12:15 PM @ Summit 3
- "Oracle-enhanced Liquibase SQLcl features vs standalone Liquibase. What's best for you?" **Rafał Grzegorczyk**
Monday , June 26th 01:30 PM - 02:30 PM @ Summit 2
- "Oracle APEX as a Global Application Platform" **Przemysław Staniszewski**
Monday , June 26th 02:45 PM - 03:45 PM @ Aurora D
- "Deconstructing the APEX Application Development Lifecycle Paper" **Matt Mulvaney**
Tuesday , June 27th 08:30 AM - 09:30 AM @ Summit 7
- APEX ACE panel **Matt Mulvaney**
Tuesday, June 27th, 12:15 - 1:30 p.m @ Aurora Exhibit Hall 3
- "NO Control or KNOW Control? Time to Rule Your Database Changes People!" **Rafał Grzegorczyk**
Tuesday , June 27th 01:45 PM - 02:45 PM @ Summit 2
- "How to implement a low-code platform without losing a customer?" **Przemysław Staniszewski & Michał Lipinski**
Tuesday , June 27th 03:15 PM - 04:15 PM @ Aurora D
- "Based on a True Story: The APEX ChainSaw Massacre! All the Ways Your Project Can Go Wrong" **Dominik Grabinski**
Wednesday, June 28th 03:15 PM - 04:15 PM @ Summit 6
- APEX Lightning Talks **Michał Lipinski**
Thursday, June 29th 09:00 AM - 10:30 AM @ Aurora D

Thank you and feel free to reach
me at the event or online!



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You can find more at

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