Managing Constraints

Let us understand how we can manage constraints.

- We can add constraints while creating the tables or after creating the tables.
- Constraints such as NOT NULL, CHECK, FOREIGN KEY are automatically dropped when we drop the table.
- Even PRIMARY KEY and UNIQUE constraints are dropped if they are not used to enforce constraints. When PRIMARY KEY or UNIQUE constraint is referred by child table then there can be errors.
- We can add constraints to existing table using `ALTER TABLE` with `ADD`. We can specify the name using `CONSTRAINT` keyword.
- Constraints from the table can be dropped using `ALTER TABLE` with `DROP`.
- Let us perform tasks to understand how we can use `ALTER TABLE` command to add or drop the constraints.
  - Use the prior users table with out any constraints.
  - Add primary key constraint on user_id.
  - Add unique constraint on user_email_id.
  - Add not null constraints user_email_validated, user_role, created_dt, last_updated_ts
  - Add check constraint to user_role with 'U' and 'A' as accepted values.
  - Add new table user_logins with below columns and establish foreign key relationship with users.
    - user_login_id - `SERIAL` and `PRIMARY KEY`
    - user_id - `INT`
    - user_login_time - `TIMESTAMP` defaulted to `CURRENT_TIMESTAMP`
    - **user_logins** is child table to **users** with many to one relationship. Hence, create **foreign key** between **user_logins.user_id** to **users.user_id**.

```
%load_ext sql
```

```
%env
DATABASE_URL=postgresql://itversity_retail_user:retail_password@localhost:5432/itversity_retail
_db
```

```
env:
DATABASE_URL=postgresql://itversity_retail_user:retail_password@localhost:5432/itversity_reta
il_db
```

```
%sql DROP TABLE IF EXISTS users
```

```
 * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
Done.
```

```
[]
```

```
%sql DROP SEQUENCE IF EXISTS users_user_id_seq
```

```
 * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
Done.
```

```
[]
```

```
%%sql

CREATE TABLE users (
    user_id INT,
    user_first_name VARCHAR(30) NOT NULL,
    user_last_name VARCHAR(30) NOT NULL,
    user_email_id VARCHAR(50) NOT NULL,
    user_email_validated BOOLEAN,
    user_password VARCHAR(200),
    user_role VARCHAR(1),
    is_active BOOLEAN,
    created_dt DATE DEFAULT CURRENT_DATE
)
```

```
  * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
Done.
```

```
[]
```

%**sql** CREATE SEQUENCE users_user_id_seq

```
  * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
Done.
```

```
[]
```

%**sql** ALTER TABLE users ALTER COLUMN user_id SET DEFAULT nextval('users_user_id_seq')

```
  * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
Done.
```

```
[]
```

%%**sql**

```
ALTER TABLE users
    ALTER COLUMN user_email_validated SET DEFAULT FALSE,
    ALTER COLUMN is_active SET DEFAULT FALSE
```

```
  * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
Done.
```

```
[]
```

%%**sql**

```
ALTER TABLE users
    ALTER COLUMN user_role SET DATA TYPE CHAR(1),
    ALTER COLUMN user_role SET DEFAULT 'U'
```

```
  * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
Done.
```

```
[]
```

%%**sql**

```
ALTER TABLE users
    ADD COLUMN last_updated_ts TIMESTAMP DEFAULT CURRENT_TIMESTAMP
```

```
  * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
Done.
```

```
[]
```

%%**sql**

```
SELECT table_catalog,
    table_name,
    constraint_type,
    constraint_name
FROM information_schema.table_constraints
WHERE table_name = 'users'
```

```
  * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
3 rows affected.
```

table_catalog	table_name	constraint_type	constraint_name
itversity_retail_db	users	CHECK	2200_17328_2_not_null
itversity_retail_db	users	CHECK	2200_17328_3_not_null
itversity_retail_db	users	CHECK	2200_17328_4_not_null

```sql
%sql ALTER TABLE users ADD PRIMARY KEY (user_id)
```

```
 * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
Done.
```

```
[]
```

```sql
%%sql

SELECT table_catalog,
    table_name,
    constraint_type,
    constraint_name
FROM information_schema.table_constraints
WHERE table_name = 'users'
```

```
 * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
5 rows affected.
```

table_catalog	table_name	constraint_type	constraint_name
itversity_retail_db	users	PRIMARY KEY	users_pkey
itversity_retail_db	users	CHECK	2200_17328_1_not_null
itversity_retail_db	users	CHECK	2200_17328_2_not_null
itversity_retail_db	users	CHECK	2200_17328_3_not_null
itversity_retail_db	users	CHECK	2200_17328_4_not_null

```sql
%sql ALTER TABLE users DROP CONSTRAINT users_pkey
```

```
 * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
Done.
```

```
[]
```

```sql
%%sql

SELECT table_catalog,
    table_name,
    constraint_type,
    constraint_name
FROM information_schema.table_constraints
WHERE table_name = 'users'
```

```
 * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
4 rows affected.
```

table_catalog	table_name	constraint_type	constraint_name
itversity_retail_db	users	CHECK	2200_17328_1_not_null
itversity_retail_db	users	CHECK	2200_17328_2_not_null
itversity_retail_db	users	CHECK	2200_17328_3_not_null
itversity_retail_db	users	CHECK	2200_17328_4_not_null

```sql
%sql ALTER TABLE users ADD CONSTRAINT users_pk PRIMARY KEY (user_id)
```

```
 * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
Done.
```

```
[]
```

```sql
%%sql

SELECT table_catalog,
    table_name,
    constraint_type,
    constraint_name
FROM information_schema.table_constraints
WHERE table_name = 'users'
```

table_catalog	table_name	constraint_type	constraint_name
itversity_retail_db	users	PRIMARY KEY	users_pk
itversity_retail_db	users	CHECK	2200_17328_1_not_null
itversity_retail_db	users	CHECK	2200_17328_2_not_null
itversity_retail_db	users	CHECK	2200_17328_3_not_null
itversity_retail_db	users	CHECK	2200_17328_4_not_null

```sql
%sql ALTER TABLE users ADD UNIQUE (user_email_id)
```

```
[]
```

```sql
%%sql

SELECT table_catalog,
    table_name,
    constraint_type,
    constraint_name
FROM information_schema.table_constraints
WHERE table_name = 'users'
```

table_catalog	table_name	constraint_type	constraint_name
itversity_retail_db	users	PRIMARY KEY	users_pk
itversity_retail_db	users	UNIQUE	users_user_email_id_key
itversity_retail_db	users	CHECK	2200_17328_1_not_null
itversity_retail_db	users	CHECK	2200_17328_2_not_null
itversity_retail_db	users	CHECK	2200_17328_3_not_null
itversity_retail_db	users	CHECK	2200_17328_4_not_null

```sql
%%sql

ALTER TABLE users
    ALTER COLUMN user_email_validated SET NOT NULL,
    ALTER COLUMN user_role SET NOT NULL,
    ALTER COLUMN created_dt SET NOT NULL,
    ALTER COLUMN last_updated_ts SET NOT NULL
```

```
[]
```

```sql
%%sql

ALTER TABLE users
    ADD CHECK (user_role IN ('U', 'A') )
```

```
[]
```

```
%%sql

SELECT table_catalog,
    table_name,
    constraint_type,
    constraint_name
FROM information_schema.table_constraints
WHERE table_name = 'users'
```

table_catalog	table_name	constraint_type	constraint_name
itversity_retail_db	users	PRIMARY KEY	users_pk
itversity_retail_db	users	UNIQUE	users_user_email_id_key
itversity_retail_db	users	CHECK	users_user_role_check
itversity_retail_db	users	CHECK	2200_17328_1_not_null
itversity_retail_db	users	CHECK	2200_17328_2_not_null
itversity_retail_db	users	CHECK	2200_17328_3_not_null
itversity_retail_db	users	CHECK	2200_17328_4_not_null
itversity_retail_db	users	CHECK	2200_17328_5_not_null
itversity_retail_db	users	CHECK	2200_17328_7_not_null
itversity_retail_db	users	CHECK	2200_17328_9_not_null
itversity_retail_db	users	CHECK	2200_17328_10_not_null

```
%%sql

CREATE TABLE user_logins (
    user_login_id SERIAL PRIMARY KEY,
    user_id INT,
    user_login_ts TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
    user_ip_addr VARCHAR(20)
)
```

```
[]
```

```
%%sql

SELECT table_catalog,
    table_name,
    constraint_type,
    constraint_name
FROM information_schema.table_constraints
WHERE table_name = 'user_logins'
```

table_catalog	table_name	constraint_type	constraint_name
itversity_retail_db	user_logins	PRIMARY KEY	user_logins_pkey
itversity_retail_db	user_logins	CHECK	2200_17351_1_not_null

```
%%sql

ALTER TABLE user_logins
    ADD FOREIGN KEY (user_id)
    REFERENCES users(user_id)
```

```
  * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
Done.
```

```
[]
```

```
%%sql

SELECT table_catalog,
    table_name,
    constraint_type,
    constraint_name
FROM information_schema.table_constraints
WHERE table_name = 'user_logins'
```

```
  * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
3 rows affected.
```

table_catalog	table_name	constraint_type	constraint_name
itversity_retail_db	user_logins	PRIMARY KEY	user_logins_pkey
itversity_retail_db	user_logins	FOREIGN KEY	user_logins_user_id_fkey
itversity_retail_db	user_logins	CHECK	2200_17351_1_not_null

❌ **Error**

This will fail as there is a child table user_logins for users table.

```
%%sql

DROP TABLE users
```

```
  * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
```

```
---------------------------------------------------------------------------
DependentObjectsStillExist               Traceback (most recent call last)
/opt/anaconda3/envs/beakerx/lib/python3.6/site-packages/sqlalchemy/engine/base.py in
_execute_context(self, dialect, constructor, statement, parameters, *args)
   1276                        self.dialect.do_execute(
-> 1277                            cursor, statement, parameters, context
   1278                        )

/opt/anaconda3/envs/beakerx/lib/python3.6/site-packages/sqlalchemy/engine/default.py in
do_execute(self, cursor, statement, parameters, context)
    592     def do_execute(self, cursor, statement, parameters, context=None):
--> 593         cursor.execute(statement, parameters)
    594

DependentObjectsStillExist: cannot drop table users because other objects depend on it
DETAIL:  constraint user_logins_user_id_fkey on table user_logins depends on table users
HINT:  Use DROP ... CASCADE to drop the dependent objects too.


The above exception was the direct cause of the following exception:

InternalError                            Traceback (most recent call last)
<ipython-input-60-a1fbf34721c3> in <module>
----> 1 get_ipython().run_cell_magic('sql', '', '\nDROP TABLE users\n')

/opt/anaconda3/envs/beakerx/lib/python3.6/site-packages/IPython/core/interactiveshell.py in
run_cell_magic(self, magic_name, line, cell)
   2369                with self.builtin_trap:
   2370                    args = (magic_arg_s, cell)
-> 2371                    result = fn(*args, **kwargs)
   2372                return result
   2373

<decorator-gen-135> in execute(self, line, cell, local_ns)

/opt/anaconda3/envs/beakerx/lib/python3.6/site-packages/IPython/core/magic.py in <lambda>(f,
*a, **k)
    185     # but it's overkill for just that one bit of state.
    186     def magic_deco(arg):
--> 187         call = lambda f, *a, **k: f(*a, **k)
    188
    189         if callable(arg):

<decorator-gen-134> in execute(self, line, cell, local_ns)

/opt/anaconda3/envs/beakerx/lib/python3.6/site-packages/IPython/core/magic.py in <lambda>(f,
*a, **k)
    185     # but it's overkill for just that one bit of state.
    186     def magic_deco(arg):
--> 187         call = lambda f, *a, **k: f(*a, **k)
    188
    189         if callable(arg):

/opt/anaconda3/envs/beakerx/lib/python3.6/site-packages/sql/magic.py in execute(self, line,
cell, local_ns)
    215
    216         try:
--> 217             result = sql.run.run(conn, parsed["sql"], self, user_ns)
    218
    219             if (

/opt/anaconda3/envs/beakerx/lib/python3.6/site-packages/sql/run.py in run(conn, sql, config,
user_namespace)
    365                else:
    366                    txt = sqlalchemy.sql.text(statement)
--> 367                    result = conn.session.execute(txt, user_namespace)
    368                _commit(conn=conn, config=config)
    369                if result and config.feedback:

/opt/anaconda3/envs/beakerx/lib/python3.6/site-packages/sqlalchemy/engine/base.py in
execute(self, object_, *multiparams, **params)
   1009                    )
   1010            else:
-> 1011                return meth(self, multiparams, params)
   1012
   1013        def _execute_function(self, func, multiparams, params):

/opt/anaconda3/envs/beakerx/lib/python3.6/site-packages/sqlalchemy/sql/elements.py in
_execute_on_connection(self, connection, multiparams, params)
    296     def _execute_on_connection(self, connection, multiparams, params):
    297         if self.supports_execution:
--> 298             return connection._execute_clauseelement(self, multiparams, params)
    299         else:
    300             raise exc.ObjectNotExecutableError(self)

/opt/anaconda3/envs/beakerx/lib/python3.6/site-packages/sqlalchemy/engine/base.py in
_execute_clauseelement(self, elem, multiparams, params)
   1128                distilled_params,
```

```
   1129              compiled_sql,
-> 1130              distilled_params,
   1131          )
   1132          if self._has_events or self.engine._has_events:
```

/opt/anaconda3/envs/beakerx/lib/python3.6/site-packages/sqlalchemy/engine/base.py in **_execute_context**(self, dialect, constructor, statement, parameters, *args)

```
   1315          except BaseException as e:
   1316              self._handle_dbapi_exception(
-> 1317                  e, statement, parameters, cursor, context
   1318              )
   1319
```

/opt/anaconda3/envs/beakerx/lib/python3.6/site-packages/sqlalchemy/engine/base.py in **_handle_dbapi_exception**(self, e, statement, parameters, cursor, context)

```
   1509          elif should_wrap:
   1510              util.raise_(
-> 1511                  sqlalchemy_exception, with_traceback=exc_info[2], from_=e
   1512              )
   1513          else:
```

/opt/anaconda3/envs/beakerx/lib/python3.6/site-packages/sqlalchemy/util/compat.py in **raise_(***failed resolving arguments***)**

```
    180
    181      try:
--> 182          raise exception
    183      finally:
    184          # credit to
```

/opt/anaconda3/envs/beakerx/lib/python3.6/site-packages/sqlalchemy/engine/base.py in **_execute_context**(self, dialect, constructor, statement, parameters, *args)

```
   1275                  if not evt_handled:
   1276                      self.dialect.do_execute(
-> 1277                          cursor, statement, parameters, context
   1278                      )
   1279
```

/opt/anaconda3/envs/beakerx/lib/python3.6/site-packages/sqlalchemy/engine/default.py in **do_execute**(self, cursor, statement, parameters, context)

```
    591
    592      def do_execute(self, cursor, statement, parameters, context=None):
--> 593          cursor.execute(statement, parameters)
    594
    595      def do_execute_no_params(self, cursor, statement, context=None):
```

```
InternalError: (psycopg2.errors.DependentObjectsStillExist) cannot drop table users because
other objects depend on it
DETAIL:  constraint user_logins_user_id_fkey on table user_logins depends on table users
HINT:  Use DROP ... CASCADE to drop the dependent objects too.

[SQL: DROP TABLE users]
(Background on this error at: http://sqlalche.me/e/13/2j85)
```

> ℹ️ **Note**
>
> You can use CASCADE to drop foreign key constraints from child tables before dropping the table users.

```
%%sql

DROP TABLE users CASCADE
```

```
 * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
Done.
```

```
[]
```

```
%%sql

SELECT table_catalog,
    table_name,
    constraint_type,
    constraint_name
FROM information_schema.table_constraints
WHERE table_name = 'user_logins'
```

```
 * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
2 rows affected.
```

table_catalog	table_name	constraint_type	constraint_name
itversity_retail_db	user_logins	PRIMARY KEY	user_logins_pkey
itversity_retail_db	user_logins	CHECK	2200_17351_1_not_null

```
%sql DROP TABLE IF EXISTS user_logins
```

 * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
Done.

```
[]
```