Overview of Sequences

Let us go through some of the important details related to sequences.

- For almost all the tables in relational databases we define primary key constraints.
- Primary key is nothing but unique constraint with not null and there can be only one primary key in any given table.
- Many times, we might not have appropriate column in the table which can be used as primary key. In those scenarios we will define a column which does not have any business relevant values. This is called as **surrogate key**.
- Relational Database technologies provide sequences to support these **surrogate primary keys**.
- In postgres we can define **surrogate primary key** for a given table as `SERIAL`. Internally it will create a sequence.
- We can also pre-create a sequence and use it to populate multiple tables.
- Even if we do not specify the column and value as part of the insert statement, a sequence generated number will be populated in that column.
- Typically, the sequence generated number will be incremented by 1. We can change it by specifying a constant value using `INCREMENT BY`.
- Here are some of the properties that can be set for a sequence. Most of them are self explanatory.
    - `START WITH`
    - `RESTART WITH`
    - `MINVALUE`
    - `MAXVALUE`
    - `CACHE`
- We can use functions such as `nextval` and `currval` to explicitly generate sequence numbers and also to get current sequence number in the current session.
- We might have to use `RESTART WITH` to reset the sequences after the underlying tables are populated with values in surrogate key.

```
%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_retail_db
```

> ℹ️ **Note**
>
> Let us create a sequence which start with 101 with minimum value 101 and maximum value 1000.

```
%%sql

DROP SEQUENCE IF EXISTS test_seq
```

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

```
[]
```

```
%%sql

CREATE SEQUENCE test_seq
START WITH 101
MINVALUE 101
MAXVALUE 1000
INCREMENT BY 100
```

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

```
[]
```

```
%sql SELECT currval('test_seq')
```

```
 * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
(psycopg2.errors.ObjectNotInPrerequisiteState) currval of sequence "test_seq" is not yet
defined in this session

[SQL: SELECT currval('test_seq')]
(Background on this error at: http://sqlalche.me/e/13/e3q8)
```

```
%sql SELECT nextval('test_seq')
```

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

nextval

101

```
%sql SELECT currval('test_seq')
```

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

currval

101

```
%sql SELECT nextval('test_seq')
```

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

nextval

201

```
%sql SELECT currval('test_seq')
```

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

currval

201

```
%sql SELECT nextval('test_seq')
```

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

nextval

301

```
%sql SELECT currval('test_seq')
```

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

currval

301

```
%%sql

ALTER SEQUENCE test_seq
INCREMENT BY 1
RESTART WITH 101
```

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

```
[]
```

```
%sql SELECT nextval('test_seq')
```

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

nextval

101

```
%sql SELECT currval('test_seq')
```

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

currval

101

```
%sql SELECT nextval('test_seq')
```

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

nextval

102

```
%sql SELECT currval('test_seq')
```

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

currval

102

```
%sql DROP SEQUENCE test_seq
```

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

```
[]
```

> 🛈 **Note**
>
> SERIAL will make sure user_id is populated using sequence and PRIMARY KEY will enforce not null and unique constraints.

```
%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 SERIAL PRIMARY KEY,
    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

SELECT * FROM information_schema.sequences
```

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

sequence_catalog	sequence_schema	sequence_name	data_type	numeric_precision	numeric_
itversity_retail_db	public	users_user_id_seq	integer	32	

```
%sql SELECT nextval('users_user_id_seq')
```

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

nextval

1

```
%sql SELECT currval('users_user_id_seq')
```

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

currval

1

```
%%sql

INSERT INTO users (user_first_name, user_last_name, user_email_id)
VALUES ('Donald', 'Duck', 'donald@duck.com')
```

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

```
[]
```

```
%%sql

SELECT * FROM users
```

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

user_id	user_first_name	user_last_name	user_email_id	user_email_validated	user_passwor
2	Donald	Duck	donald@duck.com	None	Non

```sql
%%sql

INSERT INTO users (user_first_name, user_last_name, user_email_id, user_role, is_active)
VALUES ('Mickey', 'Mouse', 'mickey@mouse.com', 'U', true)
```

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

```
[]
```

```sql
%%sql

SELECT * FROM users
```

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

user_id	user_first_name	user_last_name	user_email_id	user_email_validated	user_passw
2	Donald	Duck	donald@duck.com	None	N
3	Mickey	Mouse	mickey@mouse.com	None	N

```sql
%%sql

INSERT INTO users
    (user_first_name, user_last_name, user_email_id, user_password, user_role, is_active)
VALUES
    ('Gordan', 'Bradock', 'gbradock0@barnesandnoble.com', 'h9LAz7p7ub', 'U', true),
    ('Tobe', 'Lyness', 'tlyness1@paginegialle.it', 'oEofndp', 'U', true),
    ('Addie', 'Mesias', 'amesias2@twitpic.com', 'ih7Y69u56', 'U', true)
```

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

```
[]
```

```sql
%sql SELECT currval('users_user_id_seq')
```

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

currval

6

```sql
%sql SELECT * FROM users
```

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

user_id	user_first_name	user_last_name	user_email_id	user_email_validated
2	Donald	Duck	donald@duck.com	None
3	Mickey	Mouse	mickey@mouse.com	None
4	Gordan	Bradock	gbradock0@barnesandnoble.com	None
5	Tobe	Lyness	tlyness1@paginegialle.it	None
6	Addie	Mesias	amesias2@twitpic.com	None

> ⚠️ **Warning**
>
> It is not a good idea to populate surrogate key fields by passing the values. Either we should specify sequence generated number or let database take care of populating the field.

```sql
%%sql

INSERT INTO users (user_id, user_first_name, user_last_name, user_email_id)
VALUES (7, 'Scott', 'Tiger', 'scott@tiger.com')
```

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

```
[]
```

```sql
%sql SELECT currval('users_user_id_seq')
```

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

currval

6

> ℹ️ **Note**
>
> When data is loaded with surrogate key values into the table from external sources, it is recommended to create sequence with maximum + 1 value using `START WITH`

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

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

```
[]
```

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

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

```
[]
```

> ℹ️ **Note**
>
> `SERIAL` will make sure user_id is populated using sequence and `PRIMARY KEY` will enforce not null and unique constraints.

```sql
%%sql

CREATE TABLE users (
    user_id SERIAL PRIMARY KEY,
    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
%%sql

INSERT INTO users (user_id, user_first_name, user_last_name, user_email_id)
VALUES (1, 'Donald', 'Duck', 'donald@duck.com')
```

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

```
[]
```

```sql
%%sql

INSERT INTO users (user_id, user_first_name, user_last_name, user_email_id, user_role,
is_active)
VALUES (2, 'Mickey', 'Mouse', 'mickey@mouse.com', 'U', true)
```

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

```
[]
```

```sql
%%sql

INSERT INTO users
    (user_id, user_first_name, user_last_name, user_email_id, user_password, user_role,
is_active)
VALUES
    (3, 'Gordan', 'Bradock', 'gbradock0@barnesandnoble.com', 'h9LAz7p7ub', 'U', true),
    (4, 'Tobe', 'Lyness', 'tlyness1@paginegialle.it', 'oEofndp', 'U', true),
    (5, 'Addie', 'Mesias', 'amesias2@twitpic.com', 'ih7Y69u56', 'U', true)
```

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

```
[]
```

```sql
%sql SELECT * FROM users
```

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

user_id	user_first_name	user_last_name	user_email_id	user_email_validated
1	Donald	Duck	donald@duck.com	None
2	Mickey	Mouse	mickey@mouse.com	None
3	Gordan	Bradock	gbradock0@barnesandnoble.com	None
4	Tobe	Lyness	tlyness1@paginegialle.it	None
5	Addie	Mesias	amesias2@twitpic.com	None

```
%sql SELECT nextval('users_user_id_seq')
```

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

nextval

1

```
%sql SELECT currval('users_user_id_seq')
```

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

currval

1

```
%sql ALTER SEQUENCE users_user_id_seq RESTART WITH 5
```

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

```
[]
```

```
%sql SELECT currval('users_user_id_seq')
```

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

currval

1

```
%sql SELECT nextval('users_user_id_seq')
```

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

nextval

5

```
%sql SELECT currval('users_user_id_seq')
```

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

currval

5

```
%%sql

INSERT INTO users (user_first_name, user_last_name, user_email_id)
VALUES ('Scott', 'Tiger', 'scott@tiger.com')
```

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

```
[]
```

%**sql** SELECT currval('users_user_id_seq')

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

currval

6

%**sql** SELECT * FROM users

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

user_id	user_first_name	user_last_name	user_email_id	user_email_validated
1	Donald	Duck	donald@duck.com	None
2	Mickey	Mouse	mickey@mouse.com	None
3	Gordan	Bradock	gbradock0@barnesandnoble.com	None
4	Tobe	Lyness	tlyness1@paginegialle.it	None
5	Addie	Mesias	amesias2@twitpic.com	None
6	Scott	Tiger	scott@tiger.com	None

%**sql** DROP SEQUENCE users_user_id_seq CASCADE

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

```
[]
```

%**sql** SELECT * FROM users

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

user_id	user_first_name	user_last_name	user_email_id	user_email_validated
1	Donald	Duck	donald@duck.com	None
2	Mickey	Mouse	mickey@mouse.com	None
3	Gordan	Bradock	gbradock0@barnesandnoble.com	None
4	Tobe	Lyness	tlyness1@paginegialle.it	None
5	Addie	Mesias	amesias2@twitpic.com	None
6	Scott	Tiger	scott@tiger.com	None

```sql
%%sql

CREATE SEQUENCE users_user_id_seq
    START WITH 7
    MINVALUE 1
```

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

```
[]
```

```sql
%%sql

ALTER SEQUENCE users_user_id_seq
    OWNED BY users.user_id
```

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

```
[]
```

```sql
%%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
%%sql

INSERT INTO users (user_first_name, user_last_name, user_email_id)
VALUES ('Matt', 'Clarke', 'matt@clarke.com')
```

```
 * postgresql://itversity_retail_user:***@localhost:5432/itversity_retail_db
1 rows affected.
```
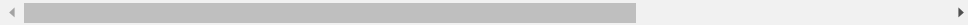
```
[]
```

```sql
%sql SELECT * FROM users
```

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

user_id	user_first_name	user_last_name	user_email_id	user_email_validated
1	Donald	Duck	donald@duck.com	None
2	Mickey	Mouse	mickey@mouse.com	None
3	Gordan	Bradock	gbradock0@barnesandnoble.com	None
4	Tobe	Lyness	tlyness1@paginegialle.it	None
5	Addie	Mesias	amesias2@twitpic.com	None
6	Scott	Tiger	scott@tiger.com	None
7	Matt	Clarke	matt@clarke.com	None

```
%sql SELECT currval('users_user_id_seq')
```

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

currval

7