IBM Developer
SKILLS NETWORK

Hands-on Lab : Getting started with PostgreSQL command line

Estimated time needed: 20 minutes

In this lab, you will use the PostgreSQL command line interface (CLI) to create a database and to restore the structure and contents of the tables it contains. Then you will learn how to explore and query tables. Finally, you will learn how to dump/backup tables from a database.

Software Used in this Lab

In this lab, you will use a PostgreSQL Database. PostgreSQL is a Relational Database Management System (RDBMS) designed to efficiently store, manipulate, and retrieve the data.

PostgreSQL

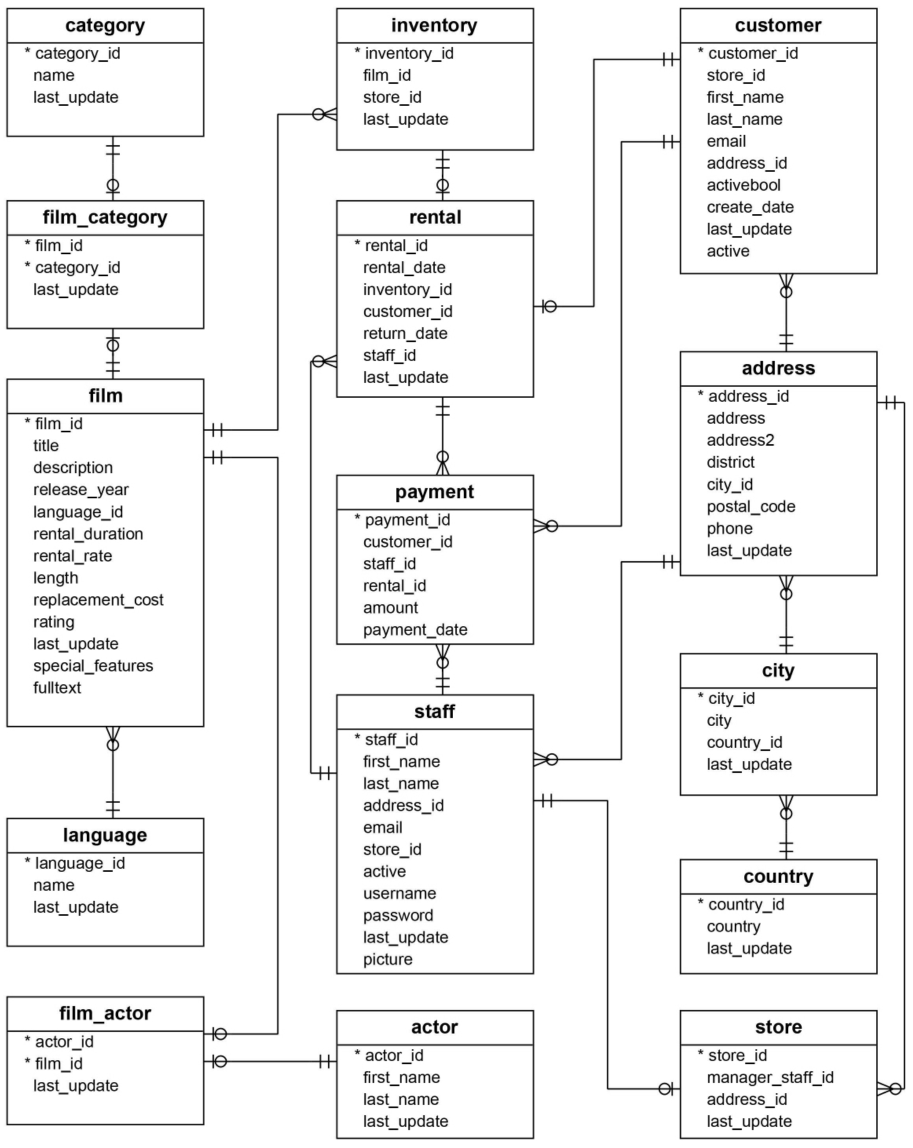
To complete this lab you will utilize the PostgreSQL relational database service available as part of IBM Skills Network Labs (SN Labs) Cloud IDE. SN Labs is a virtual lab environment used in this course.

Database Used in this Lab

The Sakila database used in this lab comes from the following source: https://dev.mysql.com/doc/sakila/en/ under New BSD license [Copyright 2021 - Oracle Corporation].

You will use a modified version of the database for the lab, so to follow the lab instructions successfully please use the database provided with the lab, rather than the database from the original source.

The following Entity Relation Diagram (ERD) diagram shows the structure of the schema of the Sakila database:



Objectives

After completing this lab, you will be able to use the PostgreSQL command line to:

- Create a database.
- Restore the structure and data of a table.
- Explore and query tables.
- Dump/backup tables from a database.

Lab Structure

In this exercise, you will go through several subtasks where you will use the PostgreSQL command line interface (CLI) to a create database and to restore the structure and contents of tables. Then you will learn how to explore and query tables. Finally, you will learn how to dump/backup tables from a database.

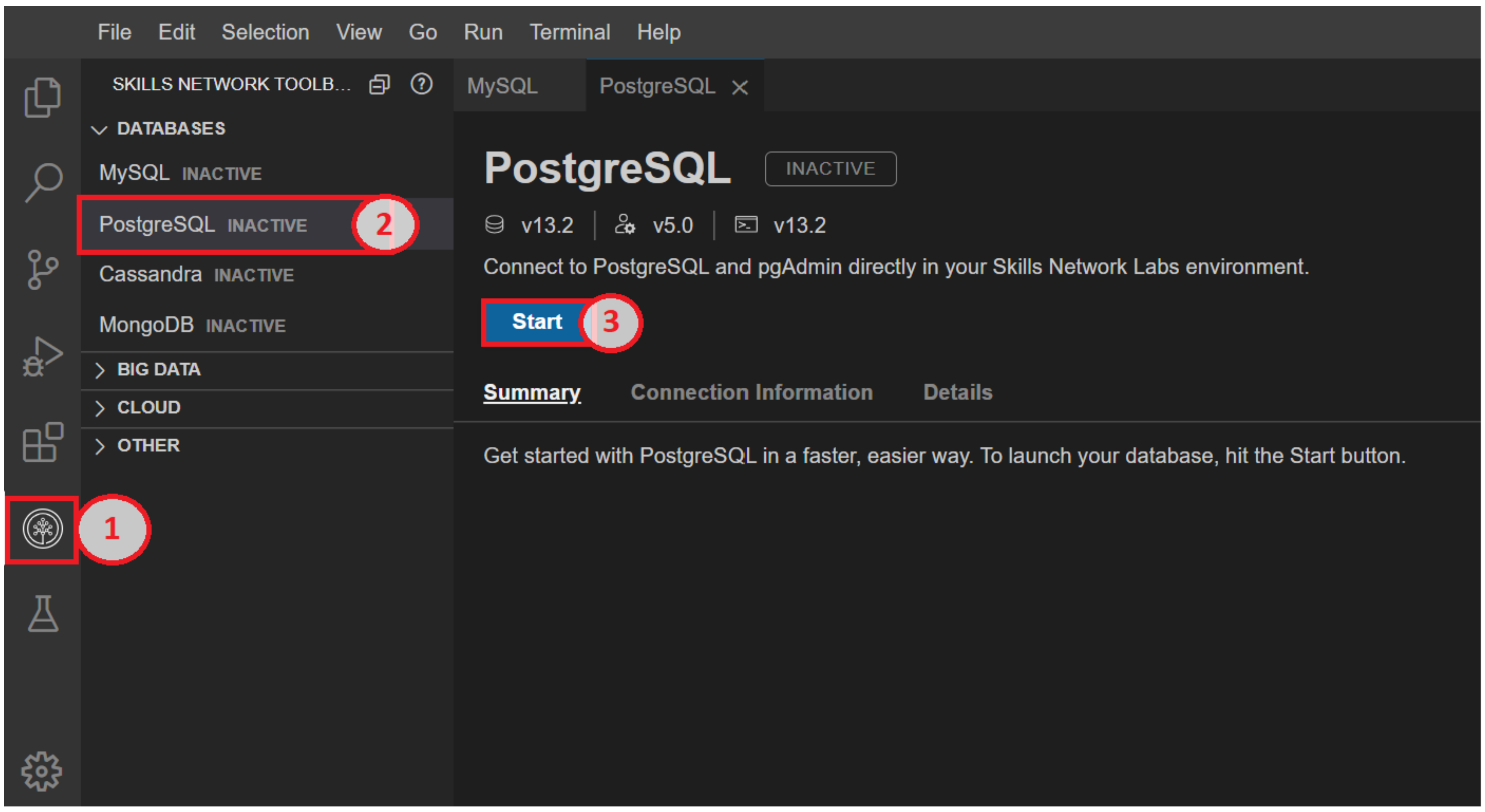
Task A: Create a database

To get started with this lab, launc`h PostgreSQL using the Cloud IDE. You can do this by following these steps:

1. Click on the Skills Network extension button on the left side of the window.

2. Open the **DATABASES** drop down menu and click on **PostgreSQL**

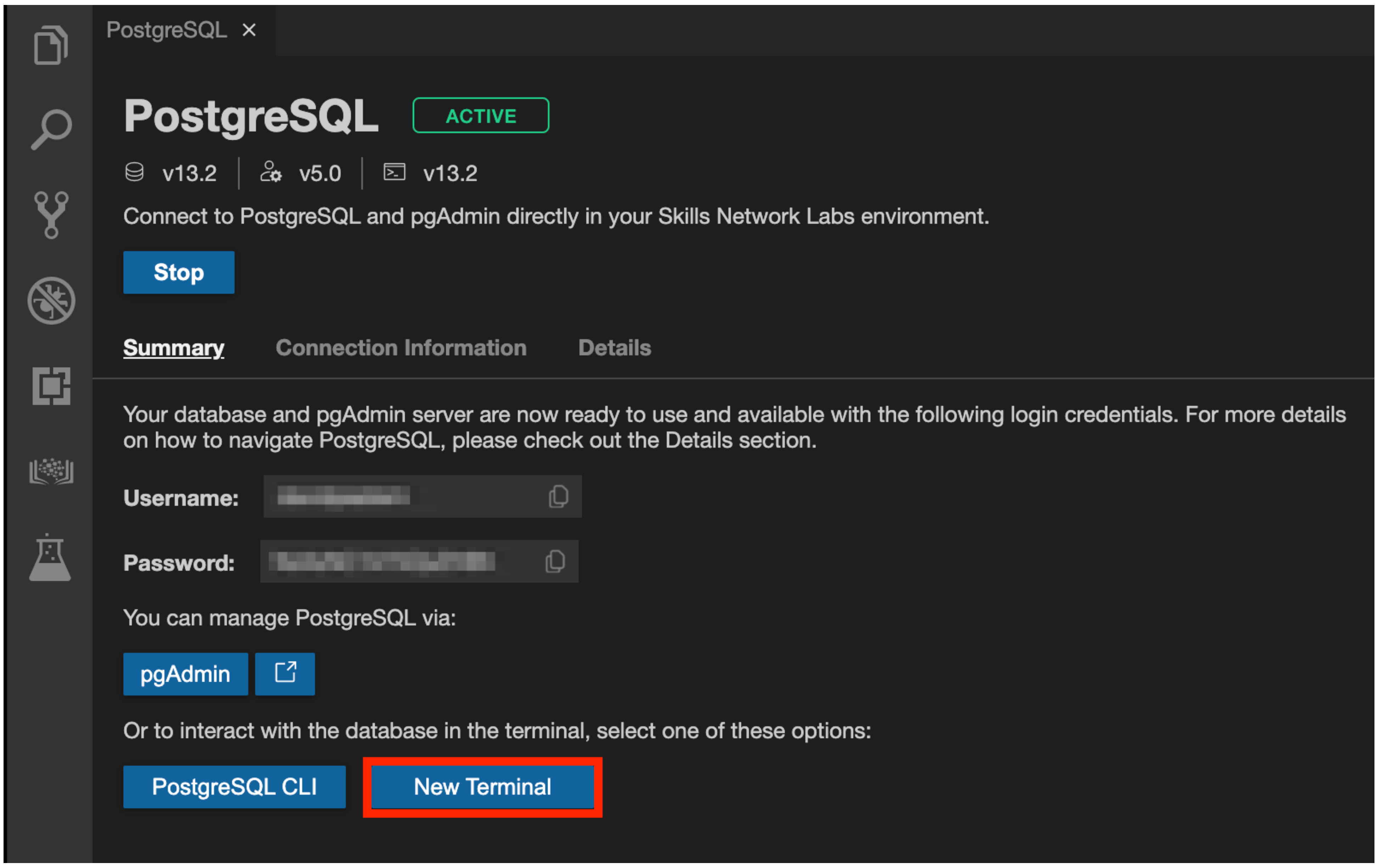
3. Click on the **Start** button. PostgreSQL may take a few moments to start.



Connect to PostgreSQL and pgAdmin directly in your Skills Network Labs environment.

Get started with PostgreSQL in a faster, easier way. To launch your database, hit the Start button.

4. Open up a new command terminal by clicking on the **New Terminal** button.



Connect to PostgreSQL and pgAdmin directly in your Skills Network Labs environment.

Your database and pgAdmin server are now ready to use and available with the following login credentials. For more details on how to navigate PostgreSQL, please check out the Details section.

Username: [redacted]

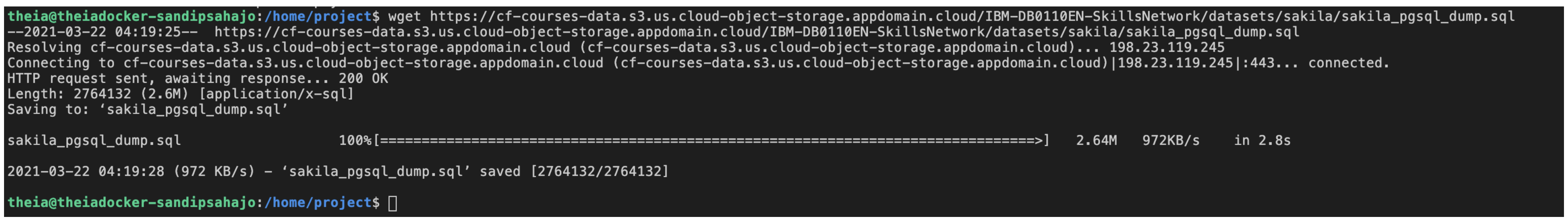
Password: [redacted]

You can manage PostgreSQL via:

Or to interact with the database in the terminal, select one of these options:

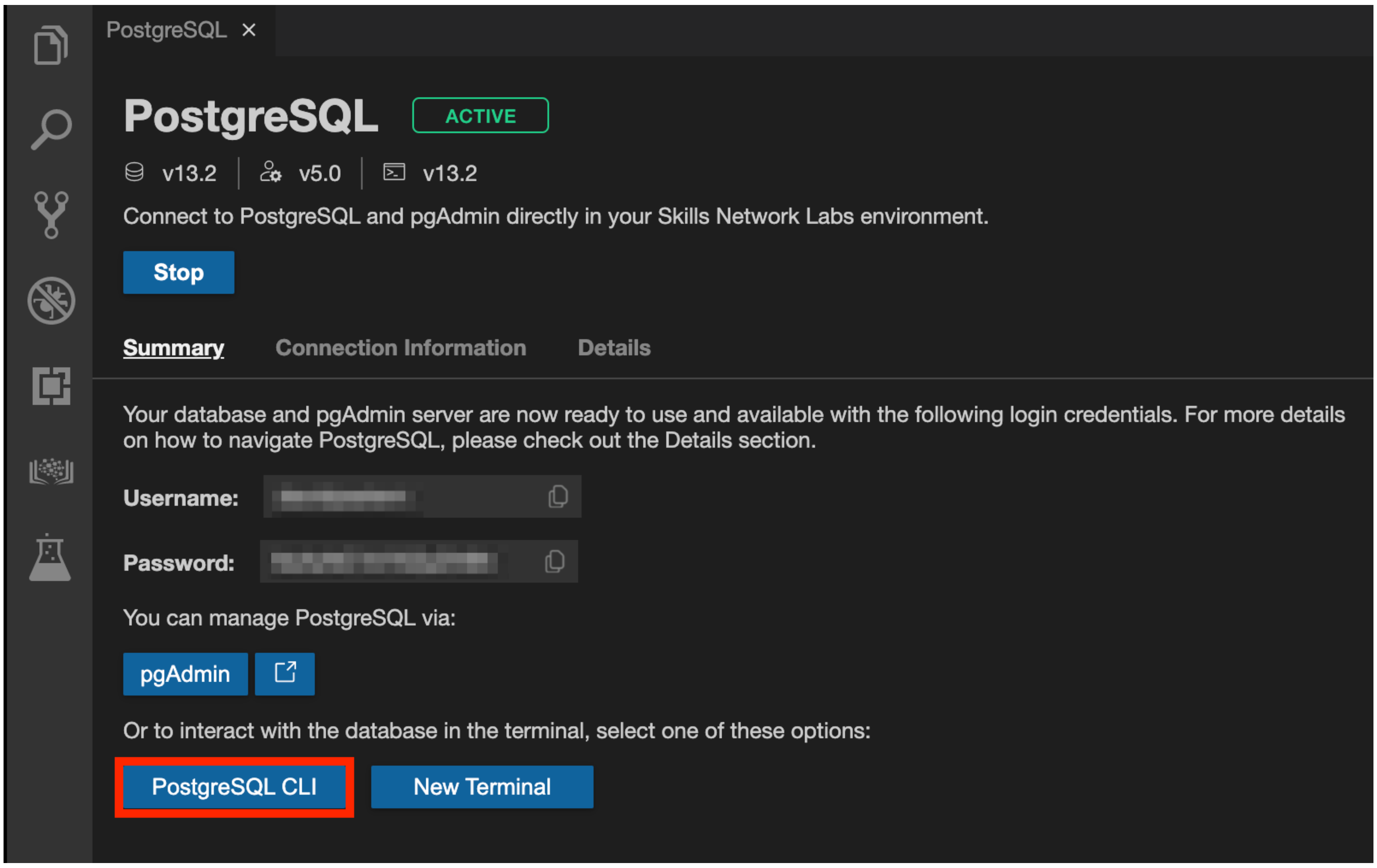
5. Copy the command below by clicking on the little copy button on the bottom right of the codeblock and then paste it into the terminal using **Ctrl + V** (Mac: ⌘ + V) to fetch the sakila_pgsql_dump.sql file to the Cloud IDE.

```
wget https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBM-DB0110EN-SkillsNetwork/datasets/sakila/sakila_pgsql_dump.sql
```



```
theia@theiadocker-sandipsahajo:/home/project$ wget https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBM-DB0110EN-SkillsNetwork/datasets/sakila/sakila_pgsql_dump.sql
--2021-03-22 04:19:25--  https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBM-DB0110EN-SkillsNetwork/datasets/sakila/sakila_pgsql_dump.sql
Resolving cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud (cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud)... 198.23.119.245
Connecting to cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud (cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud)|198.23.119.245|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 2764132 (2.6M) [application/x-sql]
Saving to: ‘sakila_pgsql_dump.sql’

sakila_pgsql_dump.sql              100%[===========================================================================>]   2.64M   972KB/s    in 2.8s

2021-03-22 04:19:28 (972 KB/s) - ‘sakila_pgsql_dump.sql’ saved [2764132/2764132]

theia@theiadocker-sandipsahajo:/home/project$ 
```

6. Now open up the PostgreSQL Command Line Interface (CLI) by clicking on the **PostgreSQL CLI** button.


PostgreSQL ×

PostgreSQL ACTIVE

v13.2 | v5.0 | v13.2

Connect to PostgreSQL and pgAdmin directly in your Skills Network Labs environment.

Stop

Summary Connection Information Details

Your database and pgAdmin server are now ready to use and available with the following login credentials. For more details on how to navigate PostgreSQL, please check out the Details section.

Username: [redacted]

Password: [redacted]

You can manage PostgreSQL via:

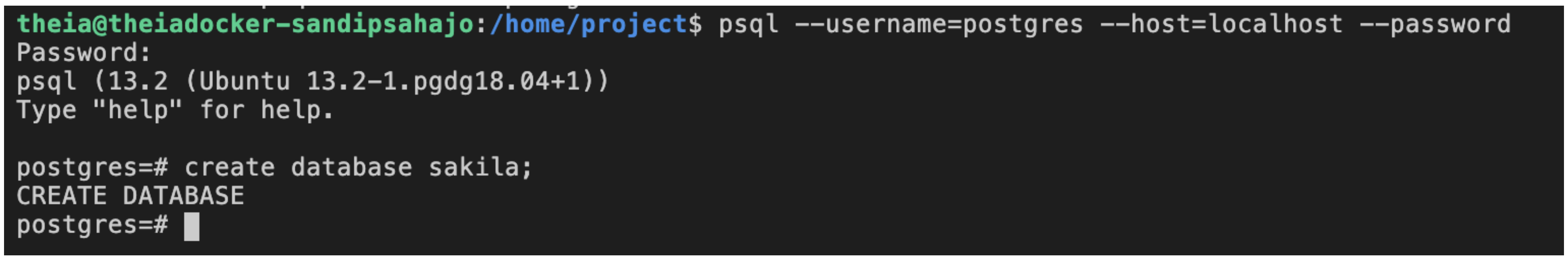
pgAdmin

Or to interact with the database in the terminal, select one of these options:

PostgreSQL CLI New Terminal

7. Create a new database **sakila** using the command below in the terminal and proceed to Task B:

```
create database sakila;
```

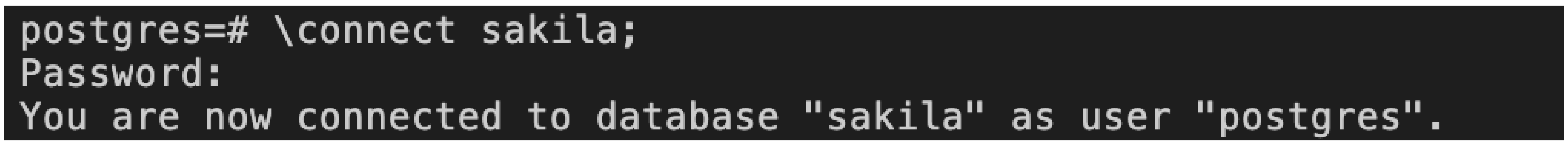

```
theia@theiadocker-sandipsahajo:/home/project$ psql --username=postgres --host=localhost --password
Password:
psql (13.2 (Ubuntu 13.2-1.pgdg18.04+1))
Type "help" for help.

postgres=# create database sakila;
CREATE DATABASE
postgres=#
```

> **Note:** You are using **create database** command to create a new database within the PostgreSQL CLI. To create a new database named sakila outside the command line interface, you can use the following command command directly in a terminal window: `createdb --username=postgres --host=localhost --password sakila` after quitting the psql command prompt session with command `\q`.

Task B: Restore the structure and data of a table

1. To connect to the newly created empty sakila database, use the command below in the terminal and enter your PostgreSQL service session password:

```
\connect sakila;
```


```
postgres=# \connect sakila;
Password:
You are now connected to database "sakila" as user "postgres".
```

2. Restore the sakila PostgreSQL dump file (containing the sakila database table definitions and data) to the newly created empty sakila database using the command below in the terminal:

```
\include sakila_pgsql_dump.sql;
```

```
sakila=# \include sakila_pgsql_dump.sql;
```

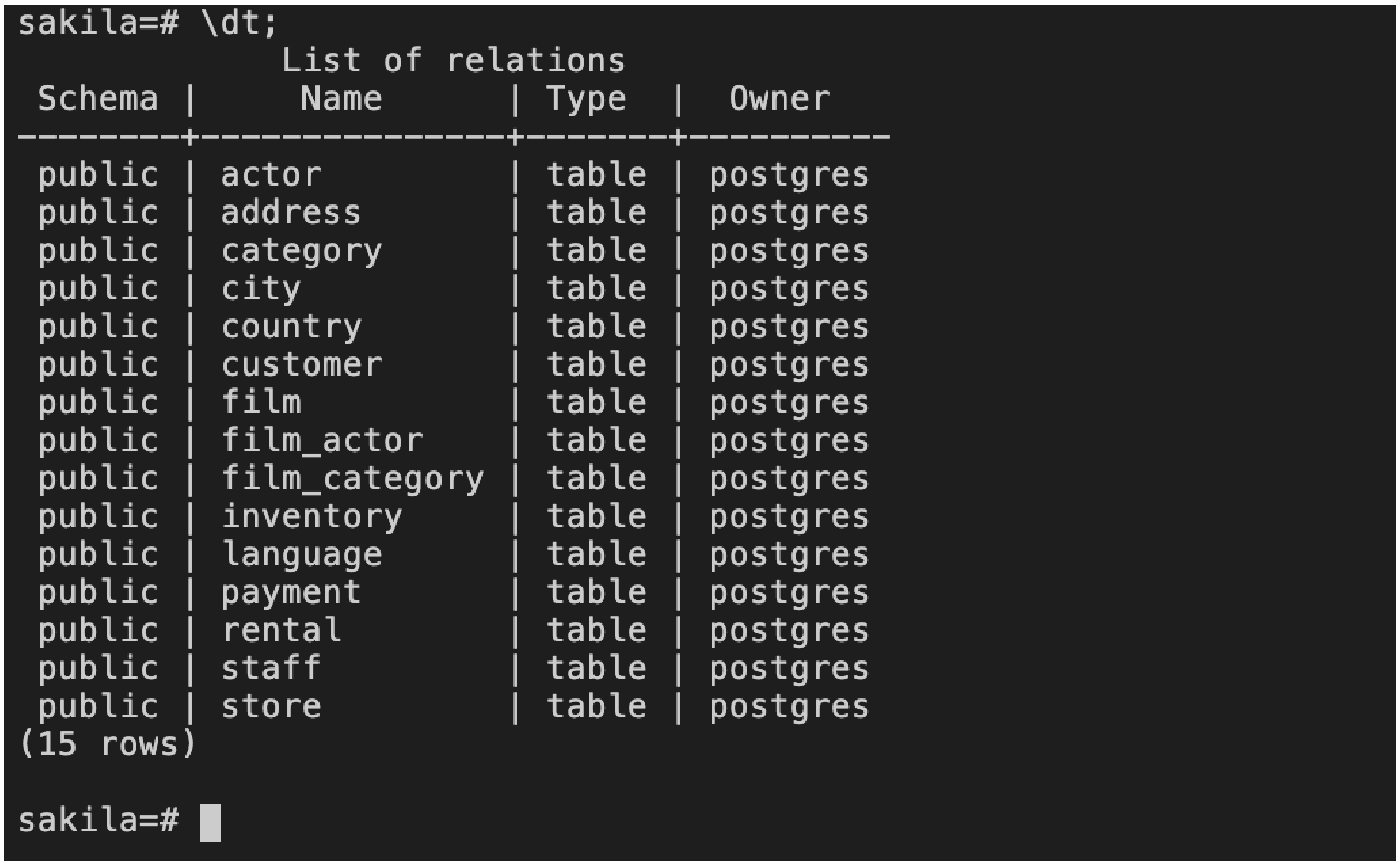
> **Note:** You are using the **\include** command to restore the database dump file within the PostgreSQL CLI. To restore the database dump file outside of the Command Line Interface, you can use the command `pg_restore --username=postgres --host=localhost --password --dbname=sakila < sakila_pgsql_dump.tar` after quitting the CLI prompt session with command `\q`. Non-text format **.tar** dumps are restored using the **pg_restore** command. So, before the using mentioned **pg_restore** command, first fetch the .tar version of this dump file using the command `wget https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBM-DB0110EN-SkillsNetwork/datasets/sakila/sakila_pgsql_dump.tar`

3. Repeat Step 1 to reconnect to the sakila database after restoring the dump file. Proceed to Task C.

Task C: Explore and query tables

1. To list all the tables names from the sakila database, use the command below in the terminal:

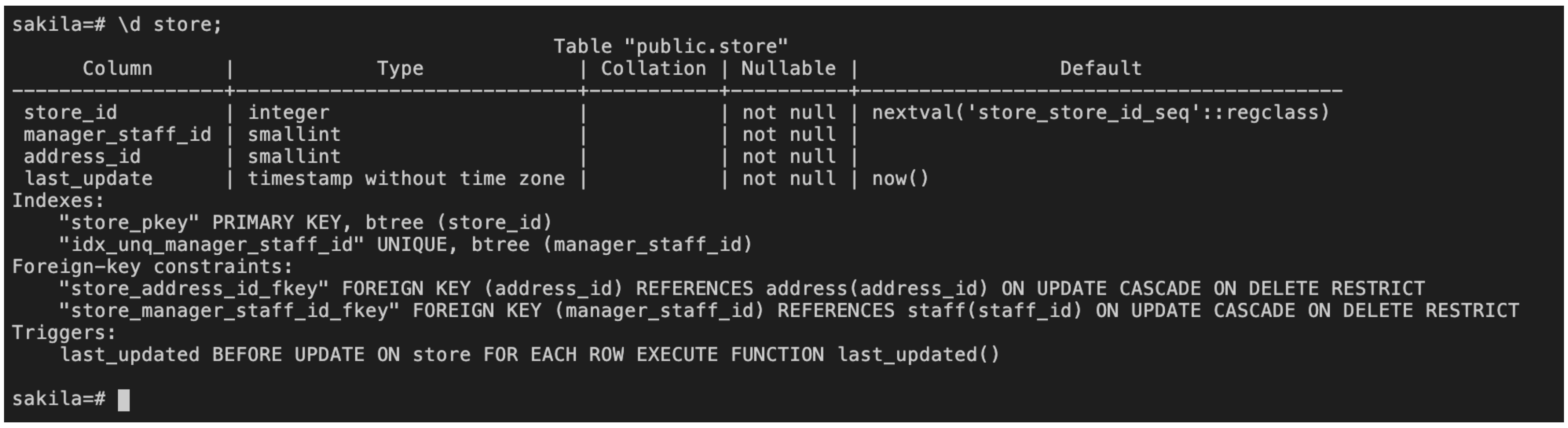
```
\dt
```



```
sakila=# \dt;
             List of relations
 Schema |     Name      | Type  |  Owner
--------+---------------+-------+----------
 public | actor         | table | postgres
 public | address       | table | postgres
 public | category      | table | postgres
 public | city          | table | postgres
 public | country       | table | postgres
 public | customer      | table | postgres
 public | film          | table | postgres
 public | film_actor    | table | postgres
 public | film_category | table | postgres
 public | inventory     | table | postgres
 public | language      | table | postgres
 public | payment       | table | postgres
 public | rental        | table | postgres
 public | staff         | table | postgres
 public | store         | table | postgres
(15 rows)

sakila=# 
```

2. Explore the structure of the **store** table using the command below in the terminal:

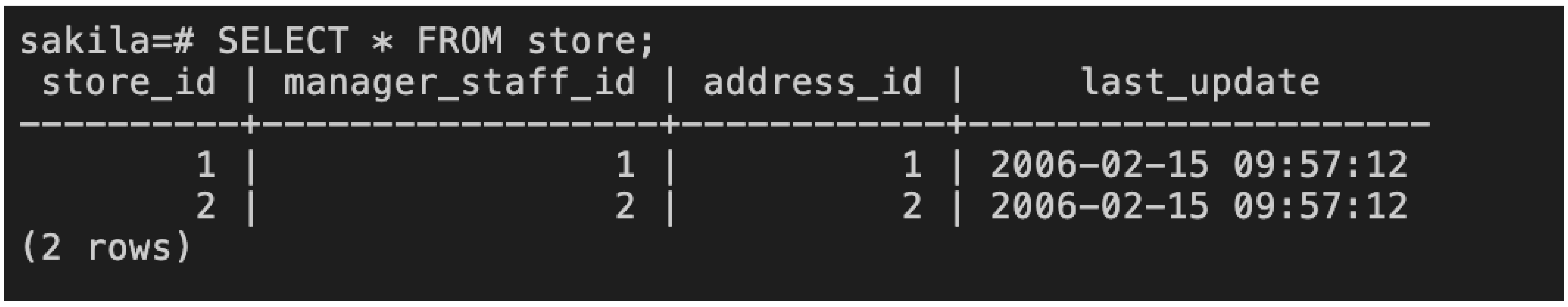
```
\d store;
```



```
sakila=# \d store;
                                         Table "public.store"
      Column      |            Type             | Collation | Nullable |                 Default
------------------+-----------------------------+-----------+----------+-----------------------------------------
 store_id         | integer                     |           | not null | nextval('store_store_id_seq'::regclass)
 manager_staff_id | smallint                    |           | not null |
 address_id       | smallint                    |           | not null |
 last_update      | timestamp without time zone |           | not null | now()
Indexes:
    "store_pkey" PRIMARY KEY, btree (store_id)
    "idx_unq_manager_staff_id" UNIQUE, btree (manager_staff_id)
Foreign-key constraints:
    "store_address_id_fkey" FOREIGN KEY (address_id) REFERENCES address(address_id) ON UPDATE CASCADE ON DELETE RESTRICT
    "store_manager_staff_id_fkey" FOREIGN KEY (manager_staff_id) REFERENCES staff(staff_id) ON UPDATE CASCADE ON DELETE RESTRICT
Triggers:
    last_updated BEFORE UPDATE ON store FOR EACH ROW EXECUTE FUNCTION last_updated()

sakila=# 
```

3. Retrieve all the records from the **store** table using the command below in the terminal:

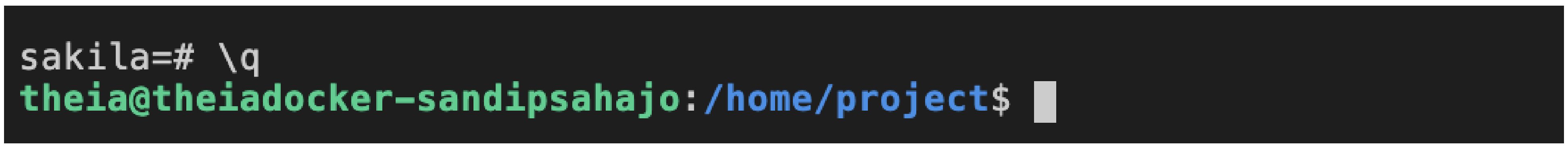
```
SELECT * FROM store;
```



```
sakila=# SELECT * FROM store;
 store_id | manager_staff_id | address_id |     last_update
----------+------------------+------------+---------------------
        1 |                1 |          1 | 2006-02-15 09:57:12
        2 |                2 |          2 | 2006-02-15 09:57:12
(2 rows)
```

4. Quit the PostgreSQL command prompt session using the command below in the terminal and proceed to Task D:

```
\q
```



```
sakila=# \q
theia@theiadocker-sandipsahajo:/home/project$
```

Task D: Dump/backup tables from a database

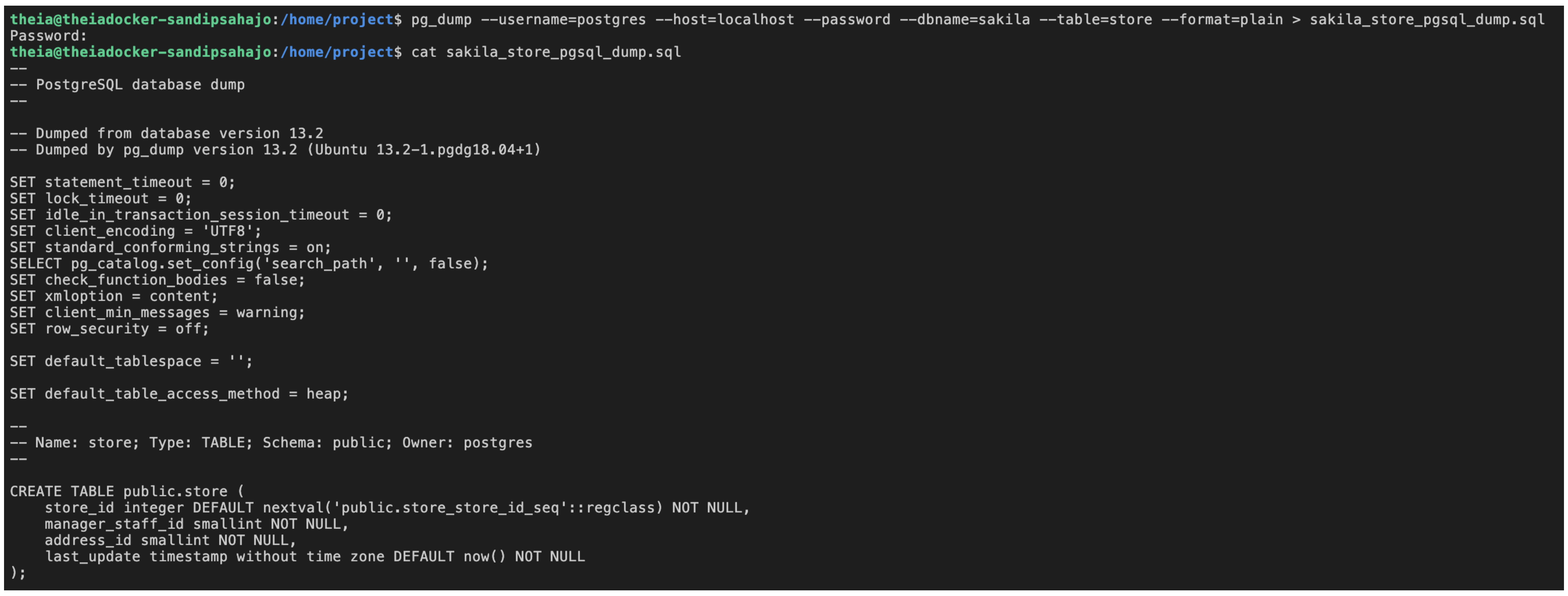
1. Finally, to dump/backup the **store** table from the database, use the command below in the terminal and enter your PostgreSQL service session password:

```
pg_dump --username=postgres --host=localhost --password --dbname=sakila --table=store --format=plain >
sakila_store_pgsql_dump.sql
```

> **Note:** To only dump/backup the table **store** from the database in non-text format **.tar**, you can use command `pg_dump --username=postgres --host=localhost --password --dbname=sakila --table=store --format=tar > sakila_store_pgsql_dump.tar`

2. To view the dump file within the terminal, use the command below in the terminal:

```
cat sakila_store_pgsql_dump.sql
```



```
theia@theiadocker-sandipsahajo:/home/project$ pg_dump --username=postgres --host=localhost --password --dbname=sakila --table=store --format=plain > sakila_store_pgsql_dump.sql
Password:
theia@theiadocker-sandipsahajo:/home/project$ cat sakila_store_pgsql_dump.sql
--
-- PostgreSQL database dump
--

-- Dumped from database version 13.2
-- Dumped by pg_dump version 13.2 (Ubuntu 13.2-1.pgdg18.04+1)

SET statement_timeout = 0;
SET lock_timeout = 0;
SET idle_in_transaction_session_timeout = 0;
SET client_encoding = 'UTF8';
SET standard_conforming_strings = on;
SELECT pg_catalog.set_config('search_path', '', false);
SET check_function_bodies = false;
SET xmloption = content;
SET client_min_messages = warning;
SET row_security = off;

SET default_tablespace = '';

SET default_table_access_method = heap;

--
-- Name: store; Type: TABLE; Schema: public; Owner: postgres
--

CREATE TABLE public.store (
    store_id integer DEFAULT nextval('public.store_store_id_seq'::regclass) NOT NULL,
    manager_staff_id smallint NOT NULL,
    address_id smallint NOT NULL,
    last_update timestamp without time zone DEFAULT now() NOT NULL
);
```

Conclusion

Congratulations! You have completed this lab, and you are ready for the next topic.

Author

- Sandip Saha Joy

Other Contributors

- David Pasternak

Changelog

Date	Version	Changed by	Change Description
2021-03-15	1.0	Sandip Saha Joy	Created initial version
2021-10-18	1.1	David Pasternak	Updated lab instructions