

Assignment 5 - Postgres, Go, and Dockers

1. **(10 points)** Download, install, and configure postgres server on your machine. The installer and instructions are available on their website i.e. <https://www.postgresql.org/download/> . While doing this setup, you may come across errors and issues, you should document/explain any such errors and their resolutions.

Postgres installed successfully in my mac os machine. However, we faced the below issue while creating new localhost server in pgadmin tool.

Issue 1: Unable to connect to server. connection failed: 1). port 5432 failed: FATAL: role 'postgres' does not exist.

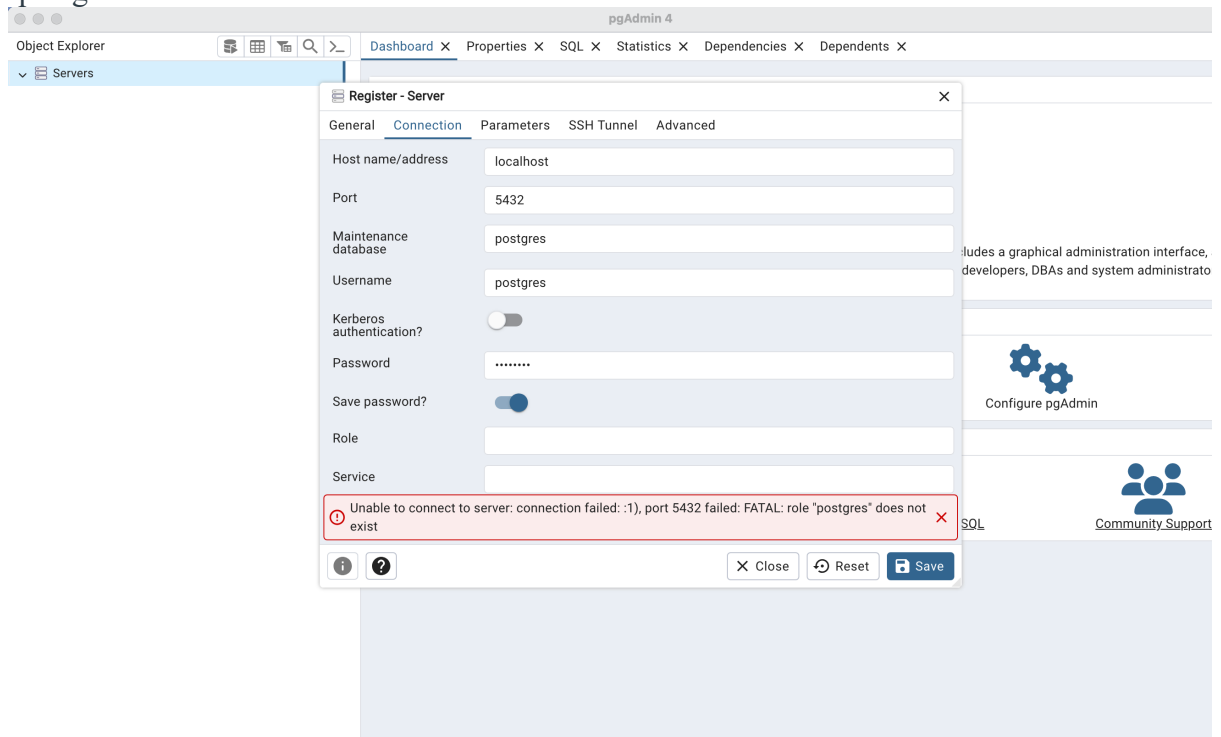


Fig 1: Error screenshot while creating new localhost server.

Solution: To solve this issue we have to execute below commands in terminal which creates **postgres** user and then restarted the postgresql service.

```
createuser -s postgres  
brew services restart postgresql
```

```
sachinsharma — -zsh — 80x28

libreoffice-still
libreoffice-still-language-pack
limitless
little-snitch@4
local@beta
lookaway
loungy
macfuse@dev
macloggerdx@beta
mailmate@beta
metarename
metavideo
mi@beta
microsoft-edge@beta

wine@devel
wine@staging
wljs-notebook
wordpresscom-studio
xampp@7
xcodpilot
xmind@beta
yandex-music
zed@preview
zotero@beta
zulu@11
zulu@17
zulu@21
zulu@8

You have 7 outdated formulae and 1 outdated cask installed.

Warning: Formula postgresql was renamed to postgresql@14.
Warning: postgresql@14 14.11_1 is already installed and up-to-date.
To reinstall 14.11_1, run:
  brew reinstall postgresql@14
[(base) sachinsharma@192 ~ % createuser -s postgres
[(base) sachinsharma@192 ~ % brew services restart postgresql
Warning: Formula postgresql was renamed to postgresql@14.
Stopping `postgresql@14`... (might take a while)
==> Successfully stopped `postgresql@14` (label: homebrew.mxcl.postgresql@14)
==> Successfully started `postgresql@14` (label: homebrew.mxcl.postgresql@14)
(base) sachinsharma@192 ~ %
```

Fig 2: Command executed on terminal to solve issue.

PostgreSQL server is working correctly after executing the commands.

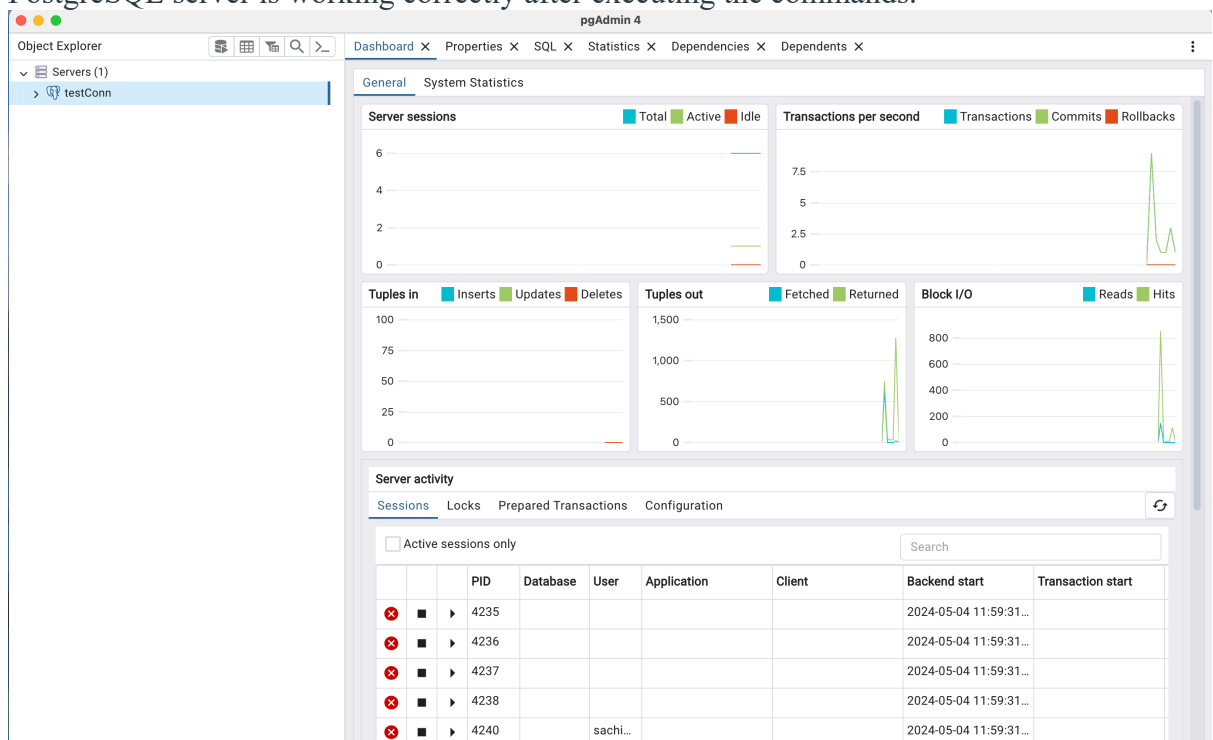
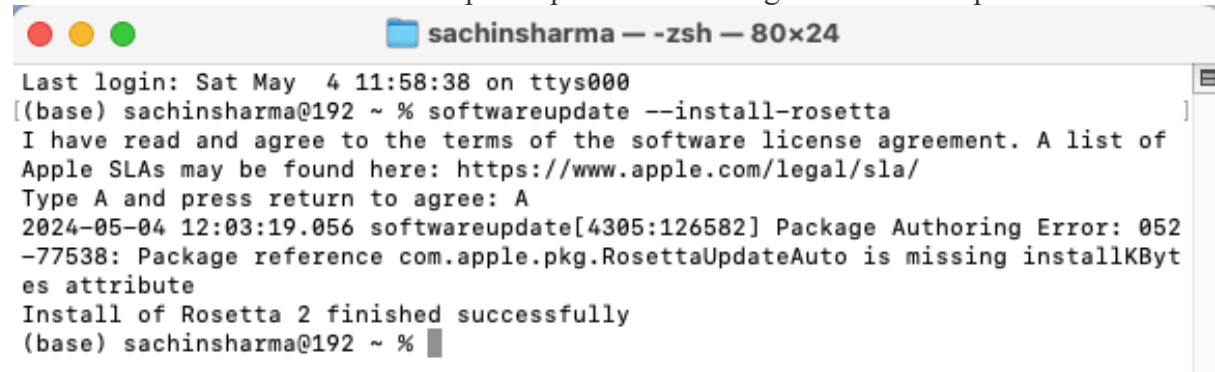


Fig 3: PostgreSQL is working correctly on pgadmin tool.

2. **(10 points)** Download, install, and configure Docker desktop on your machine. <https://docs.docker.com/> contains all the necessary information, lots of YouTube videos are also available that provide the instructions to do so. While doing this setup, you may come across errors and issues, you should document/explain any such errors and their resolutions.

We have to installed Rosetta 2 as a pre-requisite for running Docker desktop.

A terminal window titled 'sachinsharma - zsh - 80x24' showing the installation of Rosetta 2. The terminal text is as follows:

```
Last login: Sat May 4 11:58:38 on ttys000
[(base) sachinsharma@192 ~ % softwareupdate --install-rosetta
I have read and agree to the terms of the software license agreement. A list of
Apple SLAs may be found here: https://www.apple.com/legal/sla/
Type A and press return to agree: A
2024-05-04 12:03:19.056 softwareupdate[4305:126582] Package Authoring Error: 052
-77538: Package reference com.apple.pkg.RosettaUpdateAuto is missing installKByt
es attribute
Install of Rosetta 2 finished successfully
(base) sachinsharma@192 ~ %
```

Fig 4: Rosetta 2 installed successfully as a requirement for docker desktop.

Docker Desktop is running without any issue. Attaching below screenshot:

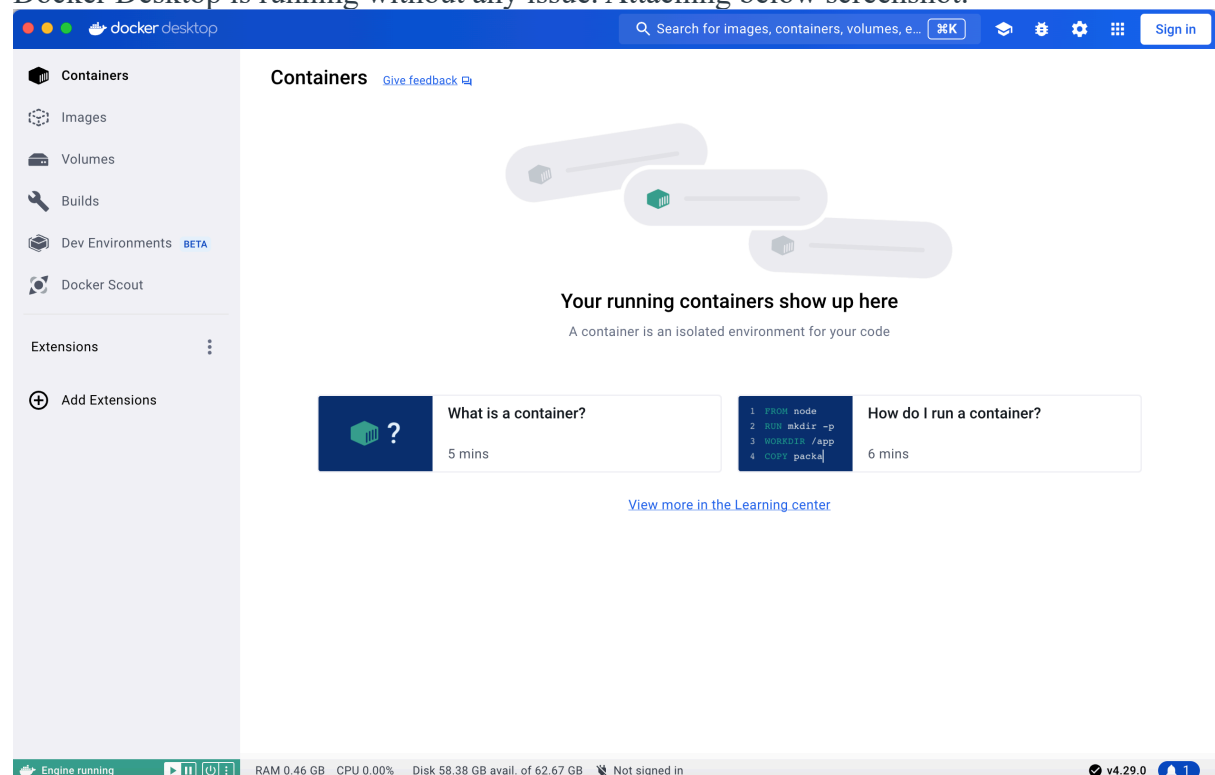


Fig 4: Docker desktop is running successfully.

3. **(5 Points)** Build Docker/Container Postgres image by executing the following command:

docker-compose up --build

We faced the below issue while running the docker-compose up command.

Issue: Error response from daemon: Ports are not available: exposing port TCP 0.0.0.0:5433 -> 0.0.0.0: listen tcp 0.0.0.0:5433: bind: address already in use.

```
source_code — -zsh — 80x37
((base) sachinsharma@192 Assignment 5 % cd source_code
((base) sachinsharma@192 source_code % docker-compose up --build
WARN[0000] /Users/sachinsharma/Downloads/432/Assignment 5/source_code/docker-com
pose.yml: `version` is obsolete
[+] Running 15/15
  ✓ postgres Pulled 33.4s
    ✓ 22d97f6a5d13 Pull complete 7.3s
    ✓ 57095a025f36 Pull complete 1.2s
    ✓ 545ff1a262fc Pull complete 3.3s
    ✓ cccf13a4d744 Pull complete 4.2s
    ✓ 0533baad3023 Pull complete 6.2s
    ✓ 760b0afee078 Pull complete 6.5s
    ✓ 8545ad4dd4d4 Pull complete 7.1s
    ✓ a41943a7475b Pull complete 7.4s
    ✓ 2a3aee5cfff18 Pull complete 26.2s
    ✓ 87cffb22d195 Pull complete 8.4s
    ✓ 50b78e752f7f Pull complete 8.6s
    ✓ b3e07fcc12d0 Pull complete 9.4s
    ✓ 5884e2123361 Pull complete 9.5s
    ✓ 6427dcf47359 Pull complete 12.3s
[+] Running 1/2
  ✓ Network source_code_psql Created 0.0s
  : Container postgres Created 0.3s
Attaching to postgres
Gracefully stopping... (press Ctrl+C again to force)
[+] Stopping 1/0kill
  ✓ Container postgres Stopped 0.0s
Error response from daemon: Ports are not available: exposing port TCP 0.0.0.0:5
433 -> 0.0.0.0:0: listen tcp 0.0.0.0:5433: bind: address already in use
(base) sachinsharma@192 source_code %
```

Fig 5: Docker build error due to port in use.

We resolve this issue by changing the port to change "5433:5432" to "5434:5432" in the **ports** section of the **postgres** service in yaml file. After that we re-run the docker-compose up command and we could see our docker is now running. Attaching below screenshot:

```
source_code — docker-compose • docker compose up --build — 80x65

postgres | creating configuration files ... ok
postgres | running bootstrap script ... ok
postgres | performing post-bootstrap initialization ... ok
postgres | initdb: warning: enabling "trust" authentication for local connectio
nsView in Docker Desktop w Enable Watch
postgres | initdb: hint: You can change this by editing pg_hba.conf or using th
e option -A, or --auth-local and --auth-host, the next time you run initdb.
postgres | syncing data to disk ... ok
postgres |
postgres | Success. You can now start the database server using:
postgres |
postgres | pg_ctl -D /var/lib/postgresql/data -l logfile start
postgres |
postgres | waiting for server to start....2024-05-04 10:22:18.793 UTC [49] LOG:
starting PostgreSQL 16.2 (Debian 16.2-1.pgdg120+2) on aarch64-unknown-linux-gn
u, compiled by gcc (Debian 12.2.0-14) 12.2.0, 64-bit
postgres | 2024-05-04 10:22:18.793 UTC [49] LOG: listening on Unix socket "/va
r/run/postgresql/.s.PGSQL.5432"able Watch
postgres | 2024-05-04 10:22:18.797 UTC [52] LOG: database system was shut down
at 2024-05-04 10:22:18 UTCw Enable Watch
postgres | 2024-05-04 10:22:18.800 UTC [49] LOG: database system is ready to a
ccept connectionsDesktop w Enable Watch
postgres | done
postgres | server started
postgres | CREATE DATABASE
postgres |
postgres | /usr/local/bin/docker-entrypoint.sh: ignoring /docker-entrypoint-ini
tdb.d/*in Docker Desktop w Enable Watch
postgres |
postgres | 2024-05-04 10:22:19.088 UTC [49] LOG: received fast shutdown reques
t View in Docker Desktop w Enable Watch
postgres | waiting for server to shut down....2024-05-04 10:22:19.089 UTC [49]
LOG: aborting any active transactionstch
postgres | 2024-05-04 10:22:19.089 UTC [49] LOG: background worker "logical re
plication launcher" (PID 55) exited with exit code 1
postgres | 2024-05-04 10:22:19.090 UTC [50] LOG: shutting down
postgres | 2024-05-04 10:22:19.090 UTC [50] LOG: checkpoint starting: shutdown
immediateDesktop w Enable Watch
postgres | 2024-05-04 10:22:19.196 UTC [50] LOG: checkpoint complete: wrote 92
3 buffers (5.6%); 0 WAL file(s) added, 0 removed, 0 recycled; write=0.087 s, syn
c=0.017 s, total=0.107 s; sync files=301, longest=0.001 s, average=0.001 s; dist
ance=4257 kB, estimate=4257 kB; lsn=0/1912FE8, redo lsn=0/1912FE8
postgres | 2024-05-04 10:22:19.207 UTC [49] LOG: database system is shut down
postgres | done
postgres | server stopped
postgres |
postgres | PostgreSQL init process complete; ready for start up.
postgres |
postgres | 2024-05-04 10:22:19.309 UTC [1] LOG: starting PostgreSQL 16.2 (Debi
an 16.2-1.pgdg120+2) on aarch64-unknown-linux-gnu, compiled by gcc (Debian 12.2.
0-14) 12.2.0, 64-bit
postgres | 2024-05-04 10:22:19.309 UTC [1] LOG: listening on IPv4 address "0.0
.0.0", port 5432 Desktop w Enable Watch
postgres | 2024-05-04 10:22:19.309 UTC [1] LOG: listening on IPv6 address ":::
", port 5432ocker Desktop w Enable Watch
postgres | 2024-05-04 10:22:19.310 UTC [1] LOG: listening on Unix socket "/var
/run/postgresql/.s.PGSQL.5432"nable Watch
postgres | 2024-05-04 10:22:19.314 UTC [65] LOG: database system was shut down
at 2024-05-04 10:22:19 UTCw Enable Watch
postgres | 2024-05-04 10:22:19.319 UTC [1] LOG: database system is ready to ac
cept connections Desktop w Enable Watch
v View in Docker Desktop w Enable Watch
```

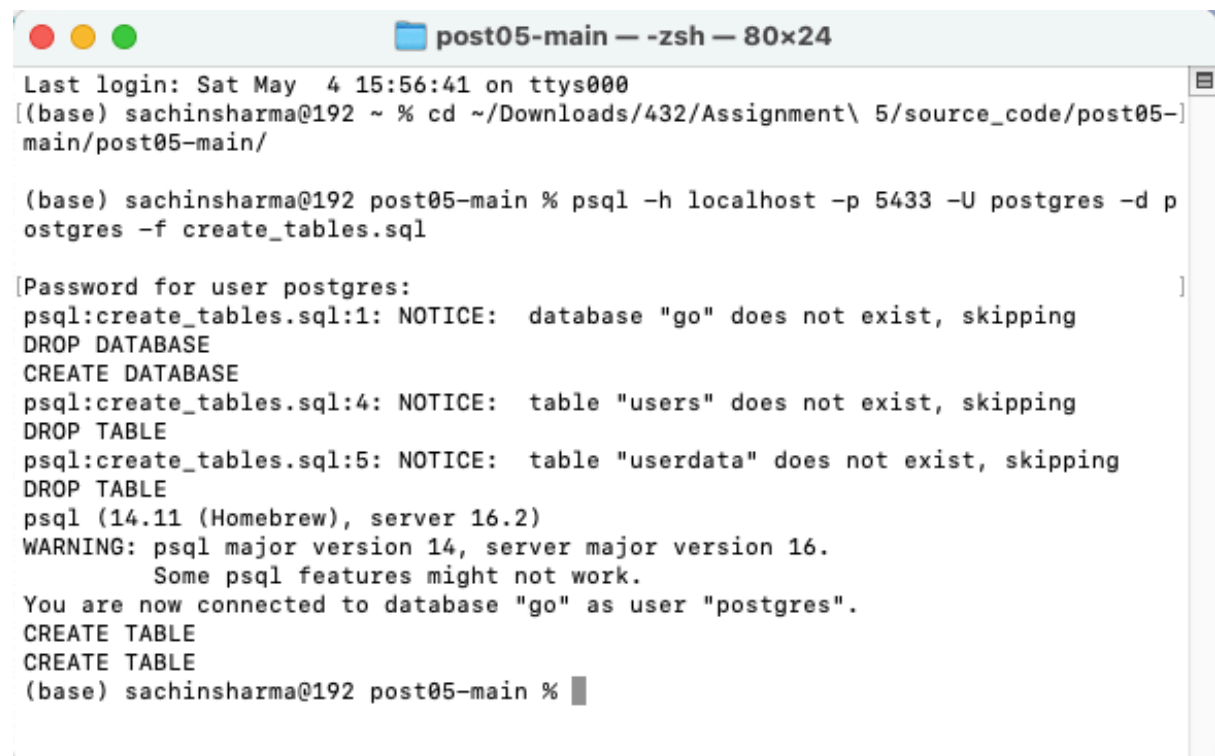
Fig 6: Docker running using docker-compose up --build

4. (5 Points) Use **psql** to execute the following command from the command window/terminal to create the go database and Users and UserData tables. Keep in mind that your local path may be different from the one given below ("**C:\Program Files\PostgreSQL\13\bin\psql**") and also depending on your operating system the command should be modified e.g. backslash to forward slash on mac etc.

"C:\Program Files\PostgreSQL\13\bin\psql" -h localhost -p 5433 -U postgres < create_tables.sql

We executed the command on our mac os by changing the local path and created go database and created Users and UserData tables. Attaching below commands and screenshot:

```
cd ~/Downloads/432/Assignment\ 5/source_code/post05-main/post05-main/  
psql -h localhost -p 5433 -U postgres -d postgres -f create_tables.sql
```



```
post05-main — -zsh — 80x24  
Last login: Sat May  4 15:56:41 on ttys000  
[(base) sachinsharma@192 ~ % cd ~/Downloads/432/Assignment\ 5/source_code/post05-main/post05-main/  
main/post05-main/  
  
(base) sachinsharma@192 post05-main % psql -h localhost -p 5433 -U postgres -d postgres -f create_tables.sql  
  
[Password for user postgres:  
psql:create_tables.sql:1: NOTICE:  database "go" does not exist, skipping  
DROP DATABASE  
CREATE DATABASE  
psql:create_tables.sql:4: NOTICE:  table "users" does not exist, skipping  
DROP TABLE  
psql:create_tables.sql:5: NOTICE:  table "userdata" does not exist, skipping  
DROP TABLE  
psql (14.11 (Homebrew), server 16.2)  
WARNING: psql major version 14, server major version 16.  
        Some psql features might not work.  
You are now connected to database "go" as user "postgres".  
CREATE TABLE  
CREATE TABLE  
(base) sachinsharma@192 post05-main % █
```

Fig 7: Database and Tables created by executing psql command on create_tables.sql file.

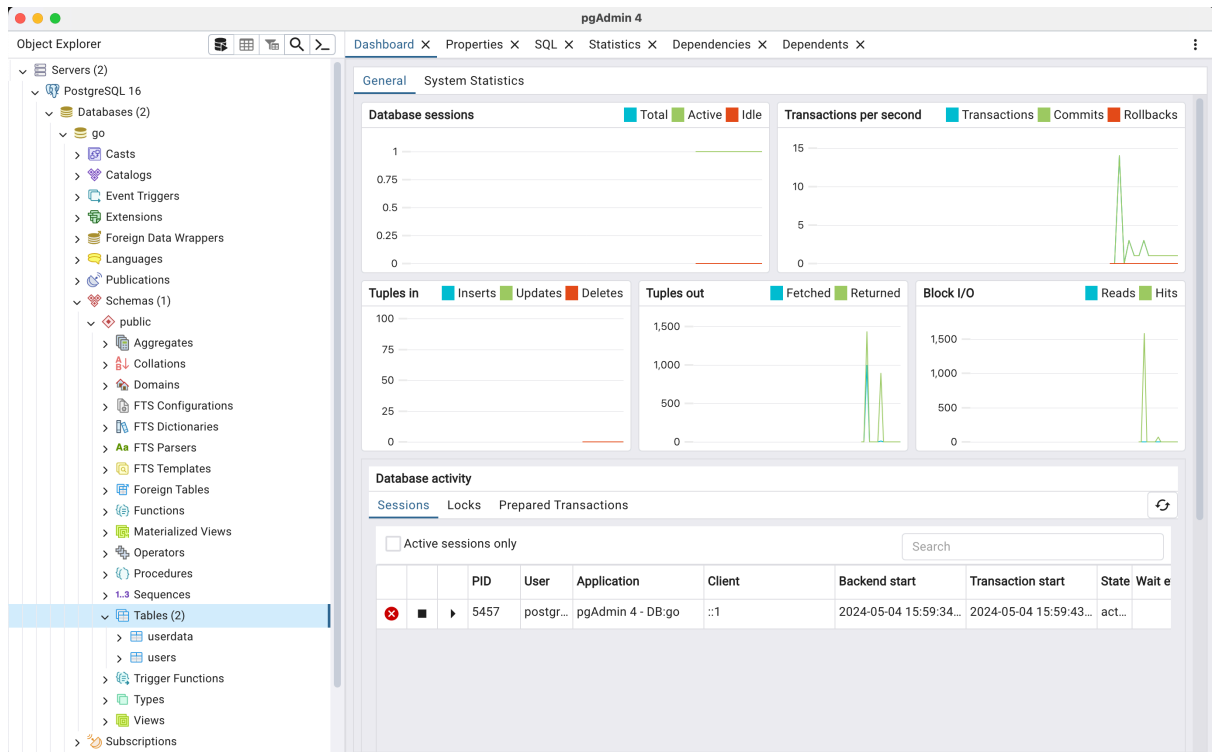


Fig 8: pgAdmin tool screenshot where we can see go database and 2 tables.

5. (5 Points) Run the following Go program 5 times:

go run postGO.go

We faced the below issue while running the postGo.go program.

Issue: Dial tcp: lookup port=2345 does not exist while, executing the go run postGo.go.

```

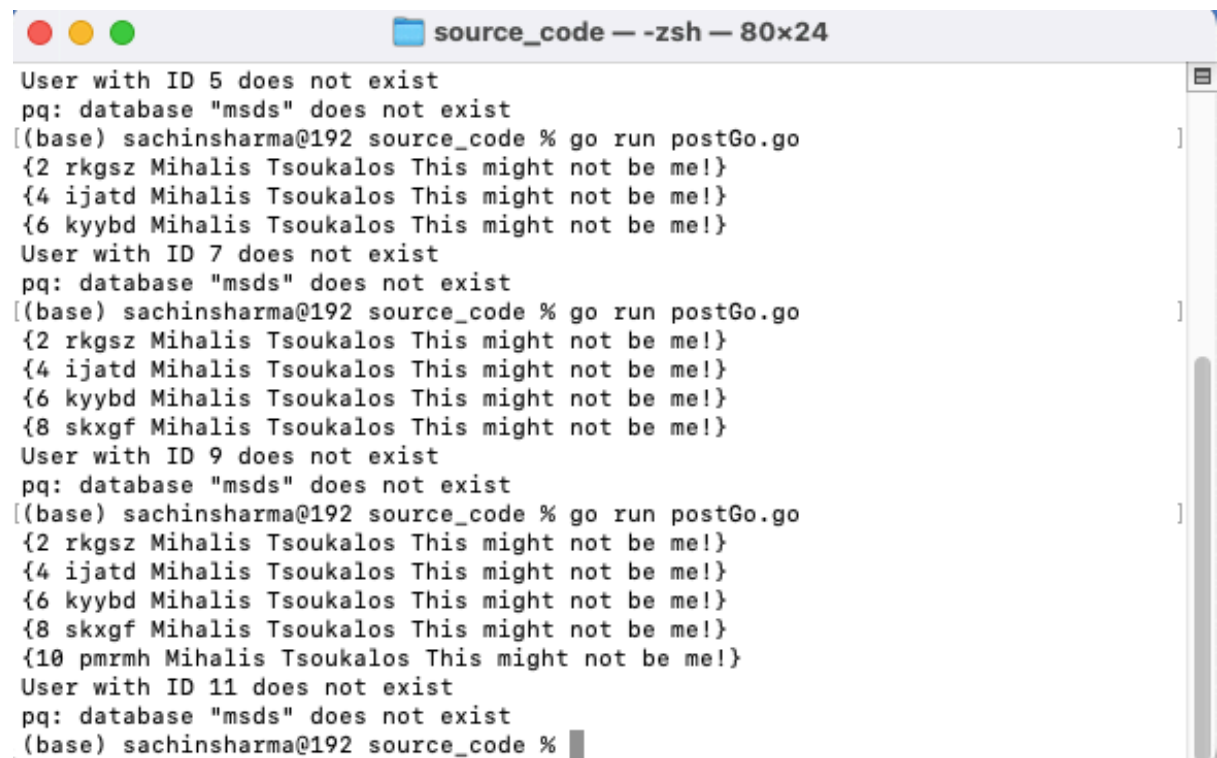
source_code — -zsh — 80x24
Last login: Sat May  4 16:02:06 on ttys004
[(base) sachinsharma@192 ~ % cd ~/Downloads/432/Assignment\ 5/source_code/

[(base) sachinsharma@192 source_code % go run postGo.go
go: downloading github.com/mactsouk/post05 v0.0.0-20210707111726-e78445111bbb
go: downloading github.com/lib/pq v1.10.5
User with ID 1 does not exist
dial tcp: lookup port=2345: no such host
(base) sachinsharma@192 source_code %

```

Fig 9: Error screenshot contains no such host while executing postGo.go file.

We solve this issue by correcting the port no and other connection details in simpleex.go file which is inside utils folder.

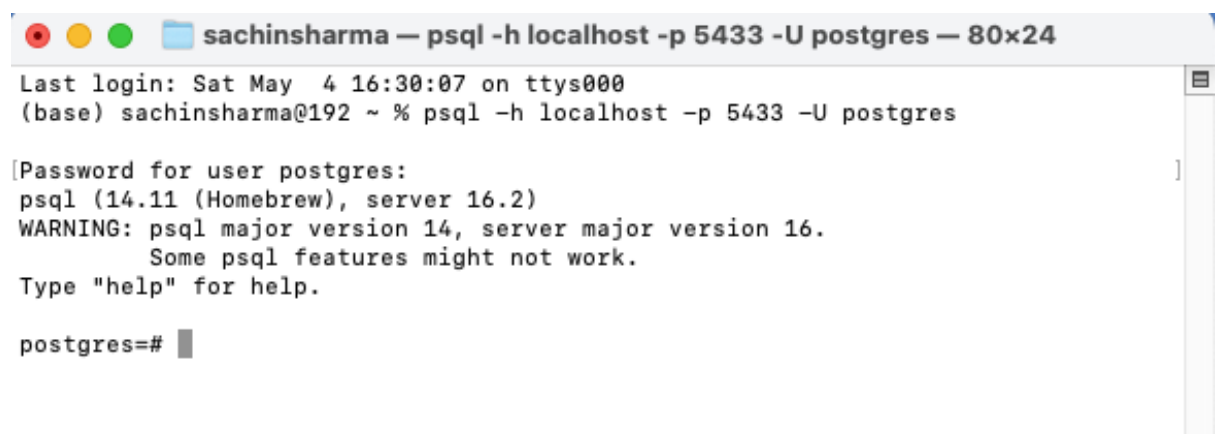


```
source_code — zsh — 80x24
User with ID 5 does not exist
pq: database "msds" does not exist
[(base) sachinsharma@192 source_code % go run postGo.go
{2 rkgsz Mihalis Tsoukalos This might not be me!}
{4 ijatd Mihalis Tsoukalos This might not be me!}
{6 kyybd Mihalis Tsoukalos This might not be me!}
User with ID 7 does not exist
pq: database "msds" does not exist
[(base) sachinsharma@192 source_code % go run postGo.go
{2 rkgsz Mihalis Tsoukalos This might not be me!}
{4 ijatd Mihalis Tsoukalos This might not be me!}
{6 kyybd Mihalis Tsoukalos This might not be me!}
{8 skxgf Mihalis Tsoukalos This might not be me!}
User with ID 9 does not exist
pq: database "msds" does not exist
[(base) sachinsharma@192 source_code % go run postGo.go
{2 rkgsz Mihalis Tsoukalos This might not be me!}
{4 ijatd Mihalis Tsoukalos This might not be me!}
{6 kyybd Mihalis Tsoukalos This might not be me!}
{8 skxgf Mihalis Tsoukalos This might not be me!}
{10 pmrmh Mihalis Tsoukalos This might not be me!}
User with ID 11 does not exist
pq: database "msds" does not exist
[(base) sachinsharma@192 source_code %
```

Fig 10: Executed the postGo.go program 5 times.

6. (5 Points) Use **psql** to execute the following commands from the command prompt to inspect the tables in the go database and Users and UserData tables:

- a. "C:\Program Files\PostgreSQL\13\bin\psql" -h localhost -p 5433 -U postgres



```
sachinsharma — psql -h localhost -p 5433 -U postgres — 80x24
Last login: Sat May  4 16:30:07 on ttys000
(base) sachinsharma@192 ~ % psql -h localhost -p 5433 -U postgres

[Password for user postgres:
psql (14.11 (Homebrew), server 16.2)
WARNING: psql major version 14, server major version 16.
         Some psql features might not work.
Type "help" for help.

postgres=#
```

Fig 11: Screenshot of connecting postgresql server using terminal.

- b. \l


```
sachinsharma — psql -h localhost -p 5433 -U postgres — 80x24
Last login: Sat May 4 16:30:07 on ttys000
(base) sachinsharma@192 ~ % psql -h localhost -p 5433 -U postgres

[Password for user postgres:
psql (14.11 (Homebrew), server 16.2)
WARNING: psql major version 14, server major version 16.
        Some psql features might not work.
Type "help" for help.

[postgres=# \l

                                List of databases
   Name   | Owner   | Encoding | Collate | Ctype |           Access privileges
-----+-----+-----+-----+-----+-----
 go       | postgres | UTF8     | C       | C     |
 postgres | postgres | UTF8     | C       | C     |
 template0 | postgres | UTF8     | C       | C     | =c/postgres +
          |          |          |          |          | postgres=CTc/postgres
 template1 | postgres | UTF8     | C       | C     | =c/postgres +
          |          |          |          |          | postgres=CTc/postgres
(4 rows)

postgres=#
```

Fig 12: Screenshot of terminal where we list all databases in PostgreSQL.

c. \c go

```
sachinsharma — psql -h localhost -p 5433 -U postgres — 80x24
[Password for user postgres:
psql (14.11 (Homebrew), server 16.2)
WARNING: psql major version 14, server major version 16.
        Some psql features might not work.
Type "help" for help.

[postgres=# \l

                                List of databases
   Name   | Owner   | Encoding | Collate | Ctype |           Access privileges
-----+-----+-----+-----+-----+-----
 go       | postgres | UTF8     | C       | C     |
 postgres | postgres | UTF8     | C       | C     |
 template0 | postgres | UTF8     | C       | C     | =c/postgres +
          |          |          |          |          | postgres=CTc/postgres
 template1 | postgres | UTF8     | C       | C     | =c/postgres +
          |          |          |          |          | postgres=CTc/postgres
(4 rows)

[postgres=# \c go
psql (14.11 (Homebrew), server 16.2)
WARNING: psql major version 14, server major version 16.
        Some psql features might not work.
You are now connected to database "go" as user "postgres".
go=#
```

Fig 13: Screenshot of terminal where we selected go database.

d. \dt

```
sachinsharma — psql -h localhost -p 5433 -U postgres — 80x24
```

Name	Owner	Encoding	Collate	Ctype	Access privileges
go	postgres	UTF8	C	C	
postgres	postgres	UTF8	C	C	
template0	postgres	UTF8	C	C	=c/postgres + postgres=Ctc/postgres
template1	postgres	UTF8	C	C	=c/postgres + postgres=Ctc/postgres

(4 rows)

```
[postgres=# \c go
psql (14.11 (Homebrew), server 16.2)
WARNING: psql major version 14, server major version 16.
        Some psql features might not work.
You are now connected to database "go" as user "postgres".
[go=# \dt
          List of relations
 Schema |   Name   | Type  | Owner
-----+-----+-----+-----
 public | userdata | table | postgres
 public | users    | table | postgres
(2 rows)

[go=# ]
```

Fig 14: Screenshot of terminal where we listed all tables for go database.

e. `select * from userdata;`

```
sachinsharma — psql -h localhost -p 5433 -U postgres — 80x24
```

```
[postgres=# \c go
psql (14.11 (Homebrew), server 16.2)
WARNING: psql major version 14, server major version 16.
        Some psql features might not work.
You are now connected to database "go" as user "postgres".
[go=# \dt
          List of relations
 Schema |   Name   | Type  | Owner
-----+-----+-----+-----
 public | userdata | table | postgres
 public | users    | table | postgres
(2 rows)

[go=# select * from userdata;
  userid | name    | surname | description
-----+-----+-----+-----
      14 | Mihalis | Tsoukalos | This might not be me!
      16 | Mihalis | Tsoukalos | This might not be me!
      18 | Mihalis | Tsoukalos | This might not be me!
      20 | Mihalis | Tsoukalos | This might not be me!
      22 | Mihalis | Tsoukalos | This might not be me!
(5 rows)

[go=# ]
```

Fig 15: All records of userdata table.

7. (5 Points) Modify the provided Go programs as follows.

- a. Create a **database** with the name **MSDS**

```
sachinsharma — psql -h localhost -p 5433 -U postgres — 80x24
psql (14.11 (Homebrew), server 16.2)
WARNING: psql major version 14, server major version 16.
Some psql features might not work.
Type "help" for help.

[postgres=# \l
               List of databases
   Name      | Owner   | Encoding | Collate | Ctype   | Access privileges
-----+-----+-----+-----+-----+-----
 go          | postgres | UTF8      | C       | C       |
 msds        | postgres | UTF8      | C       | C       |
 postgres    | postgres | UTF8      | C       | C       |
 template0   | postgres | UTF8      | C       | C       | =c/postgres +
              |          |           |         |         | postgres=CTc/postgres
 template1   | postgres | UTF8      | C       | C       | =c/postgres +
              |          |           |         |         | postgres=CTc/postgres
(5 rows)

[postgres=# \c msds
psql (14.11 (Homebrew), server 16.2)
WARNING: psql major version 14, server major version 16.
Some psql features might not work.
You are now connected to database "msds" as user "postgres".
msds=#
```

Fig 16: We created a database named **MSDS**.

- b. Create a table in this database, name it **MSDSCourseCatalog**

```
sachinsharma — psql -h localhost -p 5433 -U postgres — 80x24
   Name      | Owner   | Encoding | Collate | Ctype   | Access privileges
-----+-----+-----+-----+-----+-----
 go          | postgres | UTF8      | C       | C       |
 msds        | postgres | UTF8      | C       | C       |
 postgres    | postgres | UTF8      | C       | C       |
 template0   | postgres | UTF8      | C       | C       | =c/postgres +
              |          |           |         |         | postgres=CTc/postgres
 template1   | postgres | UTF8      | C       | C       | =c/postgres +
              |          |           |         |         | postgres=CTc/postgres
(5 rows)

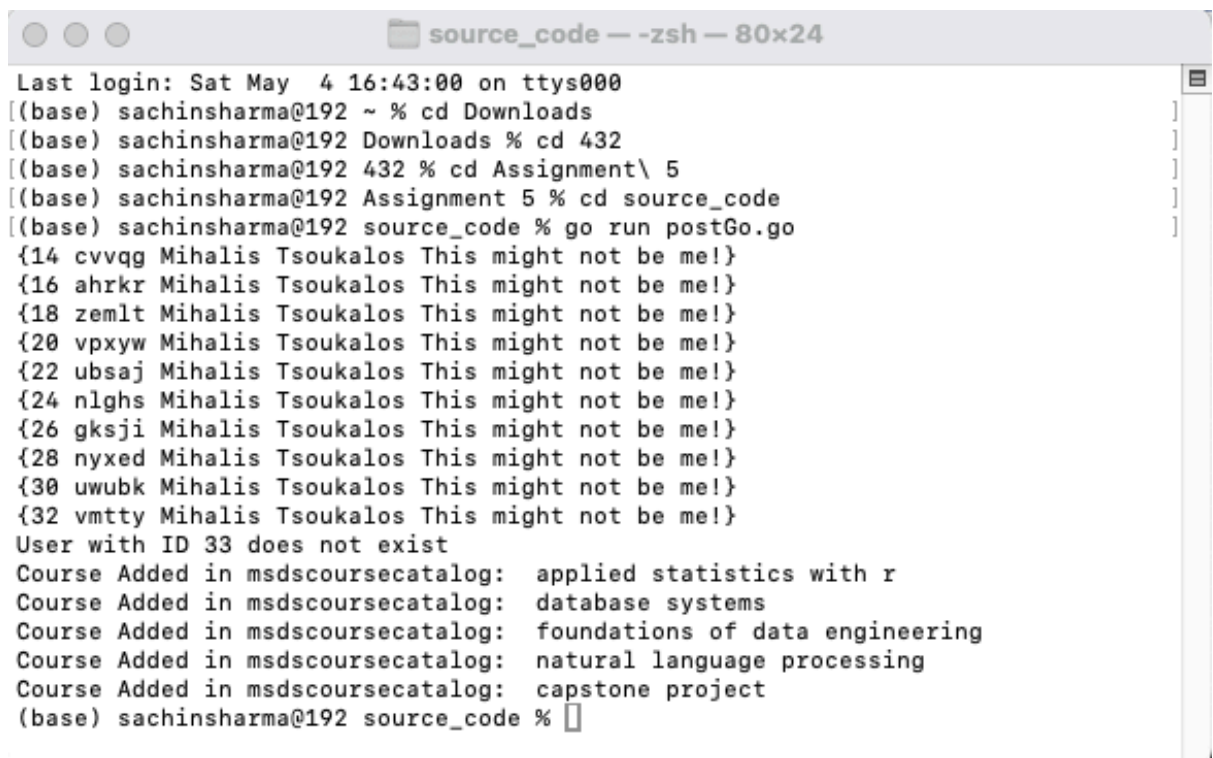
[postgres=# \c msds
psql (14.11 (Homebrew), server 16.2)
WARNING: psql major version 14, server major version 16.
Some psql features might not work.
You are now connected to database "msds" as user "postgres".
[msds=# \dt
               List of relations
 Schema |      Name      | Type  | Owner
-----+-----+-----+-----
 public | msdscoursecatalog | table | postgres
(1 row)

[msds=#
```

Fig 17: Created a table **msdscoursecatalog** inside **msds** database.

- c. Insert **5 MSDS courses entries** that have the following MSDSCourse structure:

```
type MSDSCourse struct {  
    CID string `json:"courseI_D`  
    CNAME string `json:"course_name"`  
    CPREREQ string `json:"prerequisite"`  
}
```



```
source_code — -zsh — 80x24  
Last login: Sat May  4 16:43:00 on ttys000  
[(base) sachinsharma@192 ~ % cd Downloads  
[(base) sachinsharma@192 Downloads % cd 432  
[(base) sachinsharma@192 432 % cd Assignment\ 5  
[(base) sachinsharma@192 Assignment 5 % cd source_code  
[(base) sachinsharma@192 source_code % go run postGo.go  
{14 cvvqg Mihalis Tsoukalos This might not be me!}  
{16 ahrkr Mihalis Tsoukalos This might not be me!}  
{18 zemlt Mihalis Tsoukalos This might not be me!}  
{20 vpxyw Mihalis Tsoukalos This might not be me!}  
{22 ubsaj Mihalis Tsoukalos This might not be me!}  
{24 nlghs Mihalis Tsoukalos This might not be me!}  
{26 gksji Mihalis Tsoukalos This might not be me!}  
{28 nyxed Mihalis Tsoukalos This might not be me!}  
{30 uwubk Mihalis Tsoukalos This might not be me!}  
{32 vmtty Mihalis Tsoukalos This might not be me!}  
User with ID 33 does not exist  
Course Added in msdscoursecatalog: applied statistics with r  
Course Added in msdscoursecatalog: database systems  
Course Added in msdscoursecatalog: foundations of data engineering  
Course Added in msdscoursecatalog: natural language processing  
Course Added in msdscoursecatalog: capstone project  
(base) sachinsharma@192 source_code %
```

Fig 18: Inserted 5 courses records as per the MSDSCourse struct into database.

8. **(5 Points)** Use **psql** commands to demonstrate the content of the MSDSCourseCatalog table after your run.

```
sachinsharma — psql -h localhost -p 5433 -U postgres — 80x24

[postgres=# \c msds
psql (14.11 (Homebrew), server 16.2)
WARNING: psql major version 14, server major version 16.
        Some psql features might not work.
You are now connected to database "msds" as user "postgres".
[msds=# \dt
               List of relations
 Schema |          Name          | Type  | Owner
-----+-----+-----+-----
 public | msdscoursecatalog      | table | postgres
(1 row)

[msds=# select * from msdscoursecatalog;
   cid   |                                cname                                | cprereq
-----+-----+-----
MSDS401 | applied statistics with r                                          | MSDS400
MSDS420 | database systems                                                  | MSDS402
MSDS432 | foundations of data engineering                                    | MSDS420
MSDS453 | natural language processing                                        | MSDS422
MSDS498 | capstone project                                                  | MSDS453
(5 rows)

[msds=#
```

Fig 19: Selected all records of msdscoursecatalog table inside msds database.