Задание семинара 4

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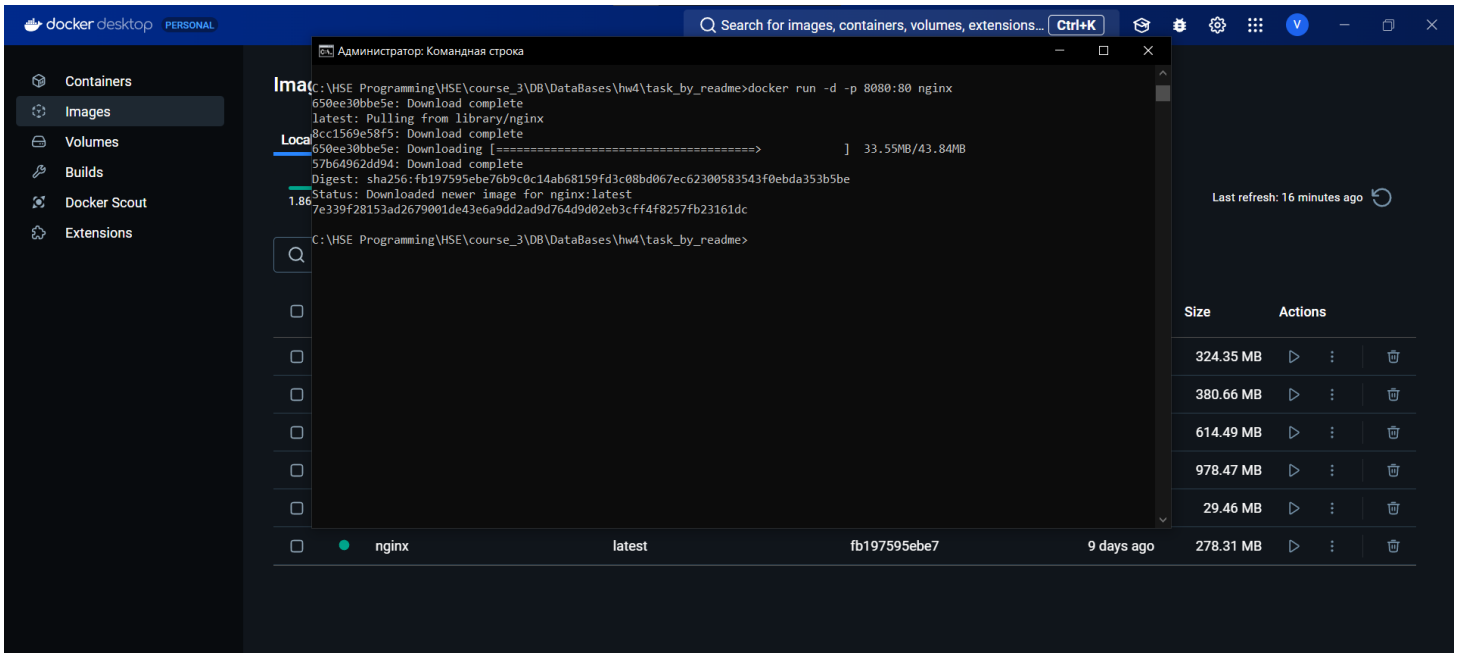
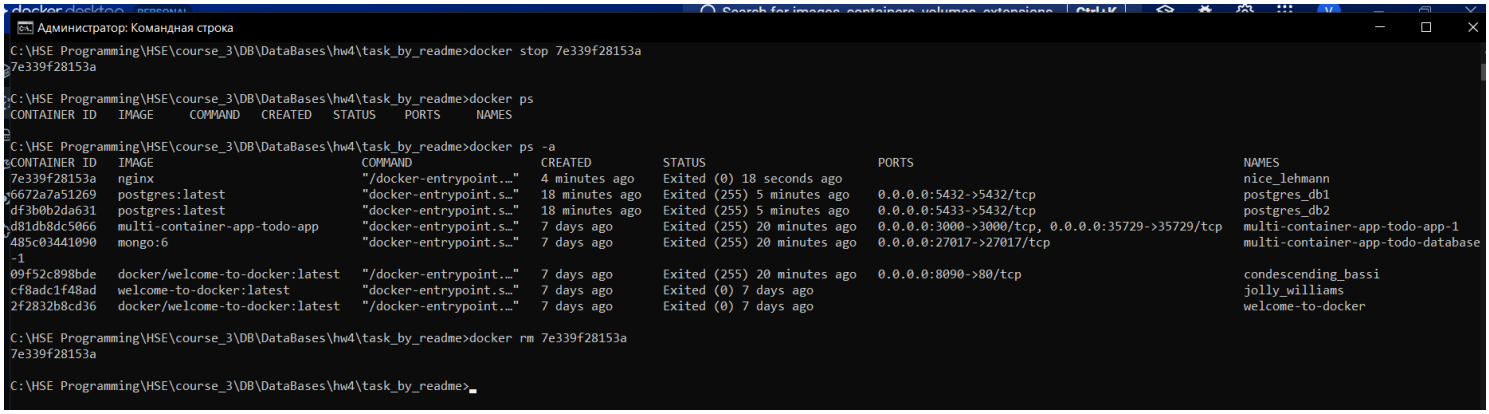
1. Основные команды Docker и типы образов

1.1 Запуск контейнера:




```
C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker ps
CONTAINER ID   IMAGE     COMMAND                  CREATED              STATUS              PORTS                   NAMES
7e339f28153a   nginx     "/docker-entrypoint.…"   About a minute ago   Up About a minute   0.0.0.0:8080->80/tcp    nice_lehm
ann

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>
```

1.2 Остановка и удаление контейнера:



1.3 Виды образов:

Alpine:

```
C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker run -d -p 5432:5432 -e "POSTGRES_PASSWORD=password" postgres:alpine
Unable to find image 'postgres:alpine' locally
alpine: Pulling from library/postgres
e51a59271ee0: Download complete
572c54261b6d: Download complete
788f9103b422: Download complete
628d1767b54a: Download complete
0ab9846b934e: Download complete
e0e32a3e0983: Download complete
af24098c3ecb: Download complete
471e062306b2: Download complete
5010a4f3c1ea: Download complete
Digest: sha256:e7897baa70dae1968d23d785adb4aeb699175e0bcaae44f98a7083ecb9668b93
Status: Downloaded newer image for postgres:alpine
496fba34c662ff3179dc9a971f2e9d63c3a66ad71debac2e1d54938c65b859cf

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>
```

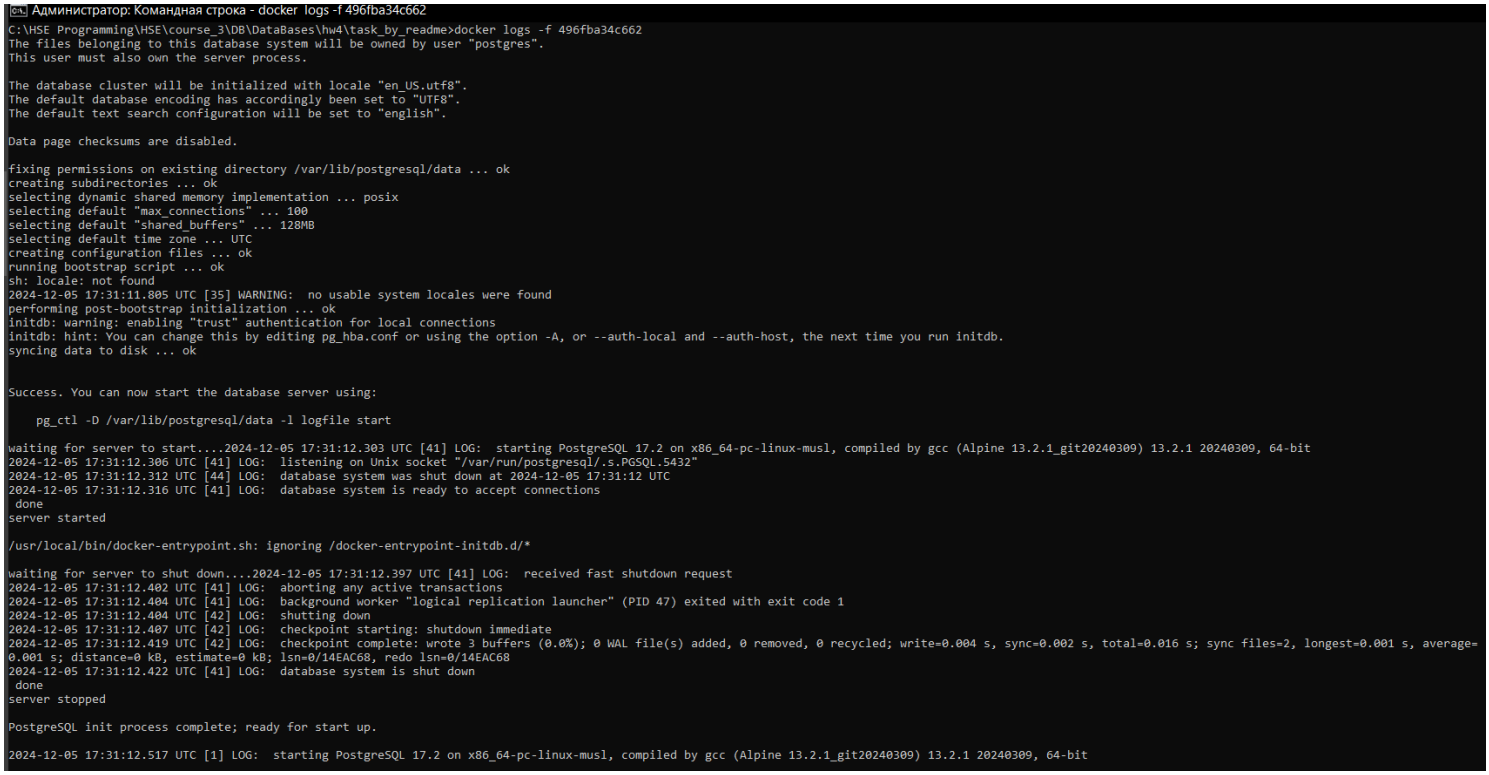
Обычный:

```
C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker run -d -p 5433:5432 -e "POSTGRES_PASSWORD=password" postgres:latest
86b1797ed94ba3ce871aa95065e536d6e9d2a8e80e5dd3eef08600f25b3d3cab

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker ps
CONTAINER ID   IMAGE             COMMAND                  CREATED              STATUS              PORTS                    NAMES
86b1797ed94b   postgres:latest   "docker-entrypoint.s…"   8 seconds ago        Up 7 seconds        0.0.0.0:5433->5432/tcp   laughing_hawking
496fba34c662   postgres:alpine   "docker-entrypoint.s…"   About a minute ago   Up About a minute   0.0.0.0:5432->5432/tcp   distracted_sanderson

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>
```

Логи для обычного образа:

```
C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker logs -f 86b1797ed94b
The files belonging to this database system will be owned by user "postgres".
This user must also own the server process.

The database cluster will be initialized with locale "en_US.utf8".
The default database encoding has accordingly been set to "UTF8".
The default text search configuration will be set to "english".

Data page checksums are disabled.

fixing permissions on existing directory /var/lib/postgresql/data ... ok
creating subdirectories ... ok
selecting dynamic shared memory implementation ... posix
selecting default "max_connections" ... 100
selecting default "shared_buffers" ... 128MB
selecting default time zone ... Etc/UTC
creating configuration files ... ok
running bootstrap script ... ok
performing post-bootstrap initialization ... ok
initdb: warning: enabling "trust" authentication for local connections
initdb: hint: You can change this by editing pg_hba.conf or using the option -A, or --auth-local and --auth-host, the next time you run initdb.
syncing data to disk ... ok


Success. You can now start the database server using:

    pg_ctl -D /var/lib/postgresql/data -l logfile start

waiting for server to start....2024-12-05 17:32:09.634 UTC [49] LOG:  starting PostgreSQL 17.2 (Debian 17.2-1.pgdg120+1) on x86_64-pc-linux-gnu, compiled by gcc (Debian 12.2.0-14) 12.2.0, 64-bit
2024-12-05 17:32:09.637 UTC [49] LOG:  listening on Unix socket "/var/run/postgresql/.s.PGSQL.5432"
2024-12-05 17:32:09.642 UTC [52] LOG:  database system was shut down at 2024-12-05 17:32:09 UTC
2024-12-05 17:32:09.646 UTC [49] LOG:  database system is ready to accept connections
 done
server started

/usr/local/bin/docker-entrypoint.sh: ignoring /docker-entrypoint-initdb.d/*

2024-12-05 17:32:09.777 UTC [49] LOG:  received fast shutdown request
waiting for server to shut down....2024-12-05 17:32:09.780 UTC [49] LOG:  aborting any active transactions
2024-12-05 17:32:09.781 UTC [49] LOG:  background worker "logical replication launcher" (PID 55) exited with exit code 1
2024-12-05 17:32:09.781 UTC [50] LOG:  shutting down
2024-12-05 17:32:09.783 UTC [50] LOG:  checkpoint starting: shutdown immediate
2024-12-05 17:32:09.795 UTC [50] LOG:  checkpoint complete: wrote 3 buffers (0.0%); 0 WAL file(s) added, 0 removed, 0 recycled; write=0.004 s, sync=0.002 s, total=0.014 s; sync files=2, longest=0.001 s, average=
0.001 s; distance=0 kB, estimate=0 kB; lsn=0/14E4FA0, redo lsn=0/14E4FA0
2024-12-05 17:32:09.797 UTC [49] LOG:  database system is shut down
 done
server stopped

PostgreSQL init process complete; ready for start up.
```

Логи для Alpine образа:



Сравнение образов:

```
C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker images
REPOSITORY                      TAG       IMAGE ID       CREATED         SIZE
multi-container-app-todo-app    latest    a8e76ca2c772   7 days ago      324MB
welcome-to-docker               latest    8ca3f27af9f2   7 days ago      381MB
nginx                           latest    fb197595ebe7   8 days ago      278MB
postgres                        alpine    e7897baa70da   13 days ago     363MB
postgres                        latest    fe4efc6901dd   13 days ago     614MB
mongo                           6         b77a33b3fc20   5 weeks ago     978MB
docker/welcome-to-docker        latest    eedaff45e3c7   13 months ago   29.5MB
```

Остановка и удаление:

```
C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker stop 86b1797ed94b
86b1797ed94b

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker stop 496fba34c662
496fba34c662

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker rm 496fba34c662
496fba34c662

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker rm 86b1797ed94b
86b1797ed94b
```

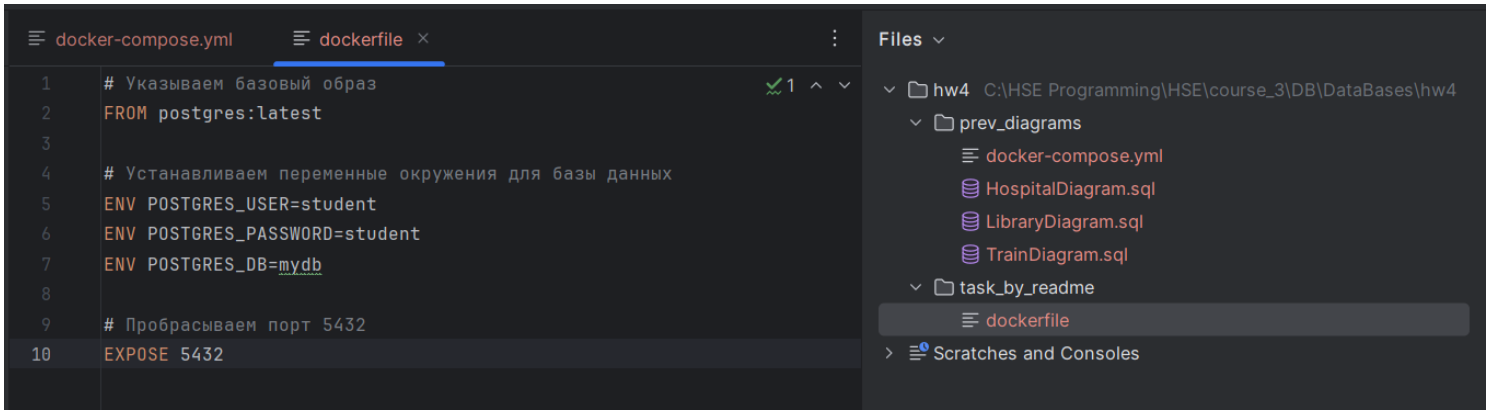
1.4 Заходим в контейнер:

```
C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker exec -it 99138b208715 bash
99138b208715:/# psql
psql: error: connection to server on socket "/var/run/postgresql/.s.PGSQL.5432" failed: FATAL:  role "root" does not exist
99138b208715:/#
What's next:
    Try Docker Debug for seamless, persistent debugging tools in any container or image → docker debug 99138b208715
    Learn more at https://docs.docker.com/go/debug-cli/
```

1.5 Выполнил выше базовые команды.

2. Создание Dockerfile для PostgreSQL

2.1 Создание простого Dockerfile:



2.2 Собираем образ:

```
C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker build -t my_postgres .
[+] Building 2.2s (6/6) FINISHED
 => [internal] load build definition from dockerfile
 => => transferring dockerfile: 345B
 => WARN: SecretsUsedInArgOrEnv: Do not use ARG or ENV instructions for sensitive data (ENV "POSTGRES_PASSWORD") (line 6)
 => [internal] load metadata for docker.io/library/postgres:latest
 => [internal] load .dockerignore
 => => transferring context: 2B
 => [1/1] FROM docker.io/library/postgres:latest@sha256:fe4efc6901dda0d952306fd962643d8022d7bb773ffe13fe8a21551b9276e50c
 => => resolve docker.io/library/postgres:latest@sha256:fe4efc6901dda0d952306fd962643d8022d7bb773ffe13fe8a21551b9276e50c
 => [auth] library/postgres:pull token for registry-1.docker.io
 => exporting to image
 => => exporting layers
 => => exporting manifest sha256:2aefd25013d9154e462d67e86df8eee51e1a63c206b387870b99b19552f52409
 => => exporting config sha256:fd20431f79ce39ddd65de5878655e0eee414320d3d81426a69075ff3c793adb9
 => => exporting attestation manifest sha256:bb733590b53e12f029be7a824a4e83b36ecb555bc3f7e30e560b0d2975cb7b74
 => => exporting manifest list sha256:e2081150f17adbcb31be00a385638303c7fbb9fa638f5aac1b92503be2bbf44b
 => => naming to docker.io/library/my_postgres:latest
 => => unpacking to docker.io/library/my_postgres:latest

 1 warning found (use docker --debug to expand):
 - SecretsUsedInArgOrEnv: Do not use ARG or ENV instructions for sensitive data (ENV "POSTGRES_PASSWORD") (line 6)

What's next:
    View a summary of image vulnerabilities and recommendations → docker scout quickview

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>
```

2.3 Запускаем контейнер:

```
C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker run -d -p 5432:5432 my_postgres
33f91833490821adc7af37f712587ce2e5533d8291a92eed07213f5118905810
```

2.4 Тегируем образ и пушим его на Docker Hub:

```
C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker tag my_postgres vladlim/my_postgres:latest

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker login
Authenticating with existing credentials...
Login Succeeded

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker push vladlim/my_postgres
Using default tag: latest
The push refers to repository [docker.io/vladlim/my_postgres]
a24f300391ed: Waiting
8f152c4aceed: Waiting
8d4265d09d9c: Waiting
bc0965b23a04: Waiting
e3a8293e92fd: Waiting
67c5fe618f0c: Waiting
5a1745295c1f: Waiting
002e1a8eb6f9: Waiting
2cb801c39436: Waiting
2cd360f3b7db: Waiting
9e592465b243: Waiting
cfb3c2203f88: Waiting
c9cdd1fe82e4: Waiting
c5fdb20d8658: Waiting
627f580b7ad7: Waiting
server message: insufficient_scope: authorization failed

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>
```

Name	Tag	Image ID	Created	Size	Actions
multi-container-app-todo-app	latest	a8e76ca2c772	7 days ago	324.35 MB	
welcome-to-docker	latest	8ca3f27af9f2	7 days ago	380.66 MB	
postgres	latest	fe4efc6901dd	14 days ago	614.49 MB	
mongo	6	b77a33b3fc20	1 month ago	978.47 MB	
docker/welcome-to-docker	latest	eedaff45e3c7	1 year ago	29.46 MB	
nginx	latest	fb197595ebe7	9 days ago	278.31 MB	
postgres	alpine	e7897baa70da	14 days ago	362.99 MB	
my_postgres	latest	e2081150f17a	14 days ago	614.49 MB	
vladlim/my_postgres	latest	e2081150f17a	14 days ago	614.49 MB	

3. Multi-stage build

3.1 Создание Dockerfile с multi-stage build:

docker-compose.yml | dockerfile

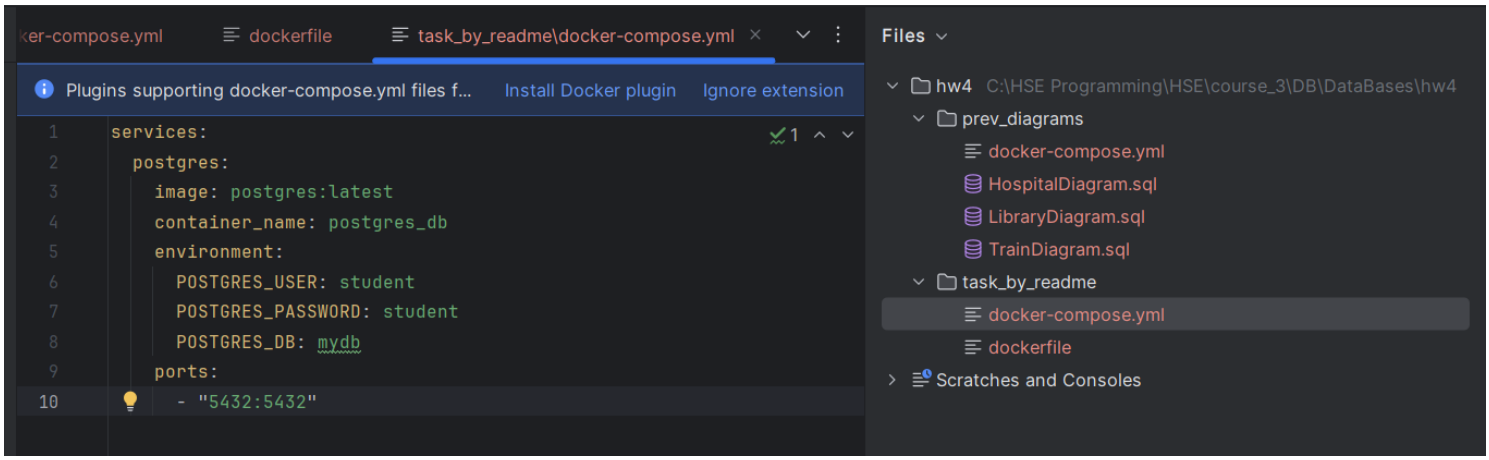
```
1  # Этап 1: сборка приложения
2  FROM node:alpine as builder
3  WORKDIR /app
4  COPY . .
5  RUN npm install && npm run build
6
7  # Этап 2: финальный минимальный образ
8  FROM nginx:alpine
9  COPY --from=builder /app/build /usr/share/nginx/html
10 EXPOSE 80
```

Files

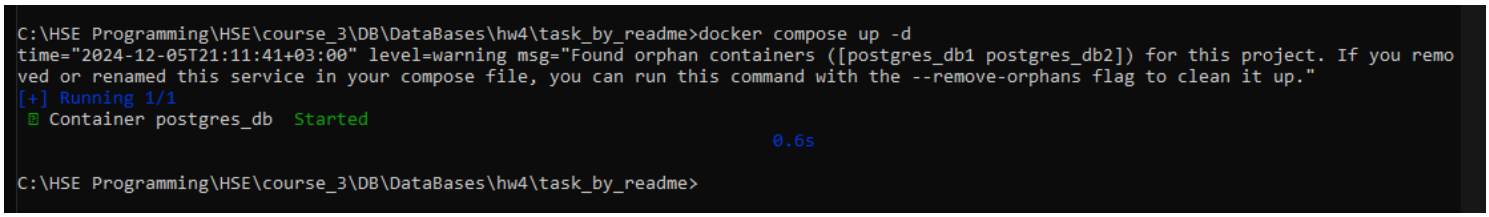
- hw4 C:\HSE Programming\HSE\course_3\DB\DataBases\hw4
  - prev_diagrams
    - docker-compose.yml
    - HospitalDiagram.sql
    - LibraryDiagram.sql
    - TrainDiagram.sql
  - task_by_readme
    - dockerfile
- Scratches and Consoles

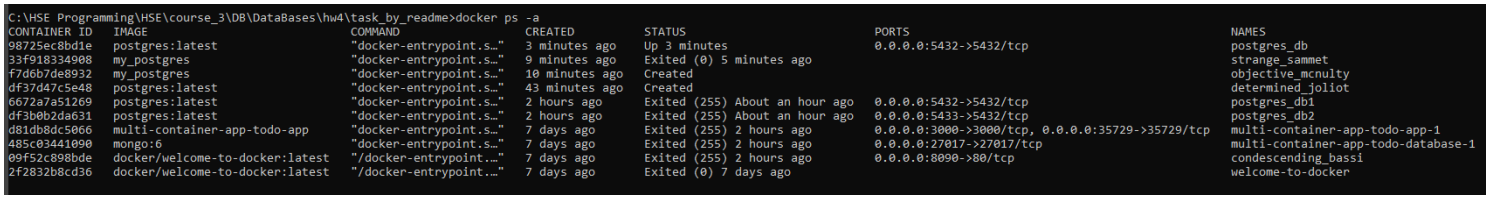
4. Работа с Docker Compose

4.1 Создание docker-compose.yml:

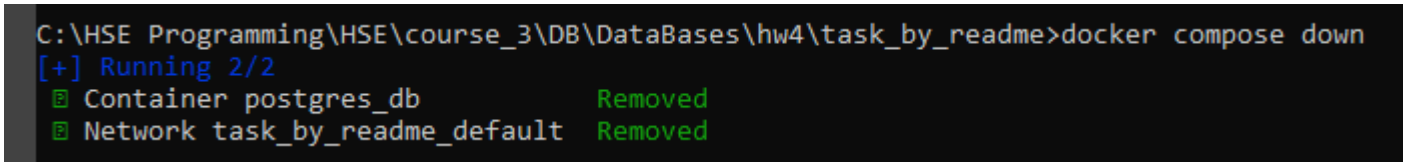


4.2 Запуск контейнеров:

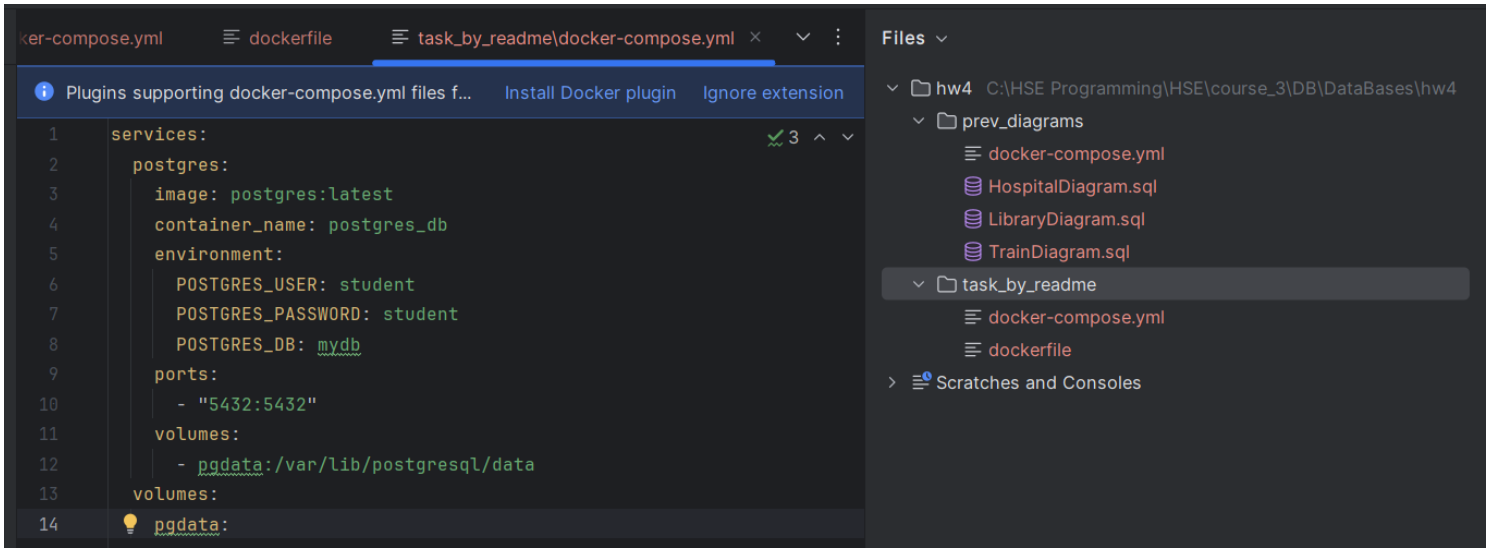




4.3 Остановка и удаление контейнеров:



4.4 Управление volume:



4.5 Volume:

```
C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker volume ls
DRIVER    VOLUME NAME
local     3e2078de06293086315dcf7b2061800566d0c584c66e9f4a80289e41694cb4b3
local     6b932ccba60ae98a3422e3f923acb83c708e6fc1064d455f88eae0934403f9ce
local     53a3f9e6d4f10f9eeb9a8599303e51d739704a654d2c75216a894cf2d867210a
local     80b5c8a49c0fb006198c8a1b7fd4fd9c550c567f94c7aa8ddc239a32700b18bc
local     00822f17c518ee285cbbd2e6dd2faa5c95efcc25d4c0536aab31476efc929db6
local     888baf46aec8f8646c8d01d8e2b9949f36814fb4ac02eddca67bd81db767b14e
local     ac947a8df09ee57b5844bcfe7e3fd791b0e9d968f696fcad057bc9c8cd893963
local     b39692cdeacdca0253ec423e0d4731548518c9113b22f44330d1f9f902b34b75
local     db5834506b8be936062b360bb65db75e03e7ae21fe91482a12a3361210984580
local     f5bf2b652397779e6830b56970a93a218e27174d300cf7b79664ebaddc7c15df
local     task_by_readme_postgres_data
local     task_by_readme_postgres_data2

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>
```

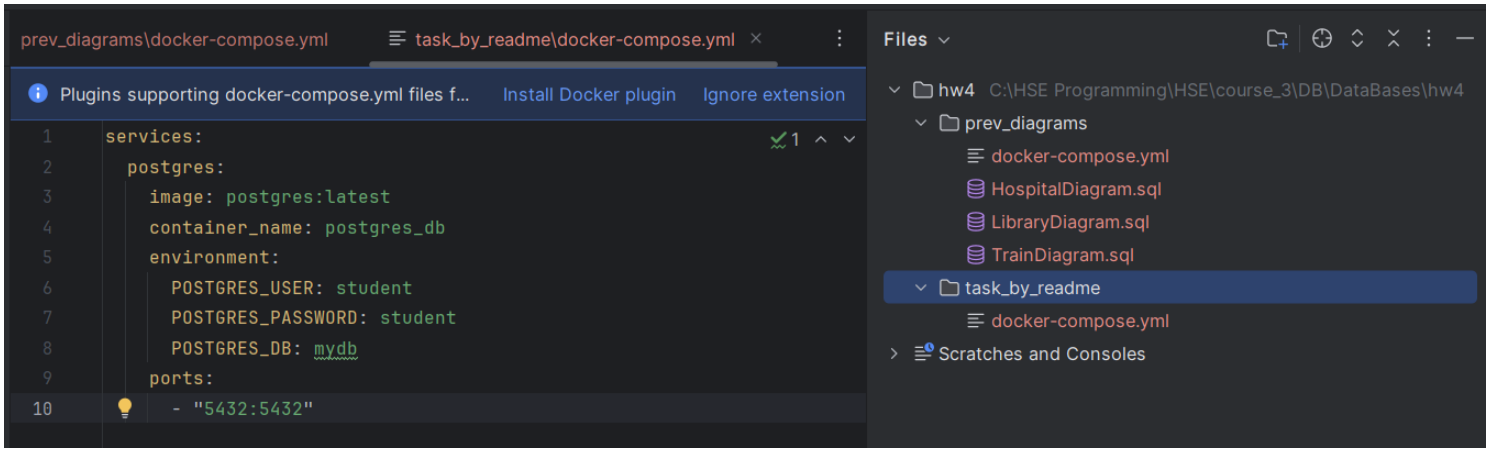
4.6 Управление сетями:

```
C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker compose up -d
time="2024-12-05T21:20:55+03:00" level=warning msg="Found orphan containers ([postgres_db1 postgres_db2]) for this project. If you removed
or renamed this service in your compose file, you can run this command with the --remove-orphans flag to clean it up."
[+] Running 2/2
 ✔ Network task_by_readme_app_network   Created                                                                    0.0s
 ✔ Container task_by_readme-postgres-1  Started                                                                    0.5s

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker network ls
NETWORK ID     NAME                          DRIVER    SCOPE
efd39e9e196c   bridge                        bridge    local
7eba7b63ce2b   host                          host      local
89c1c9a0d90e   multi-container-app_default   bridge    local
b16f24dc88b2   none                          null      local
7e7653dab204   task_by_readme_app_network    bridge    local

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>
```

5. Подключение к PostgreSQL через DataGrip

5.1 Подключение к PostgreSQL через DataGrip:

Создаем docker-compose.yml



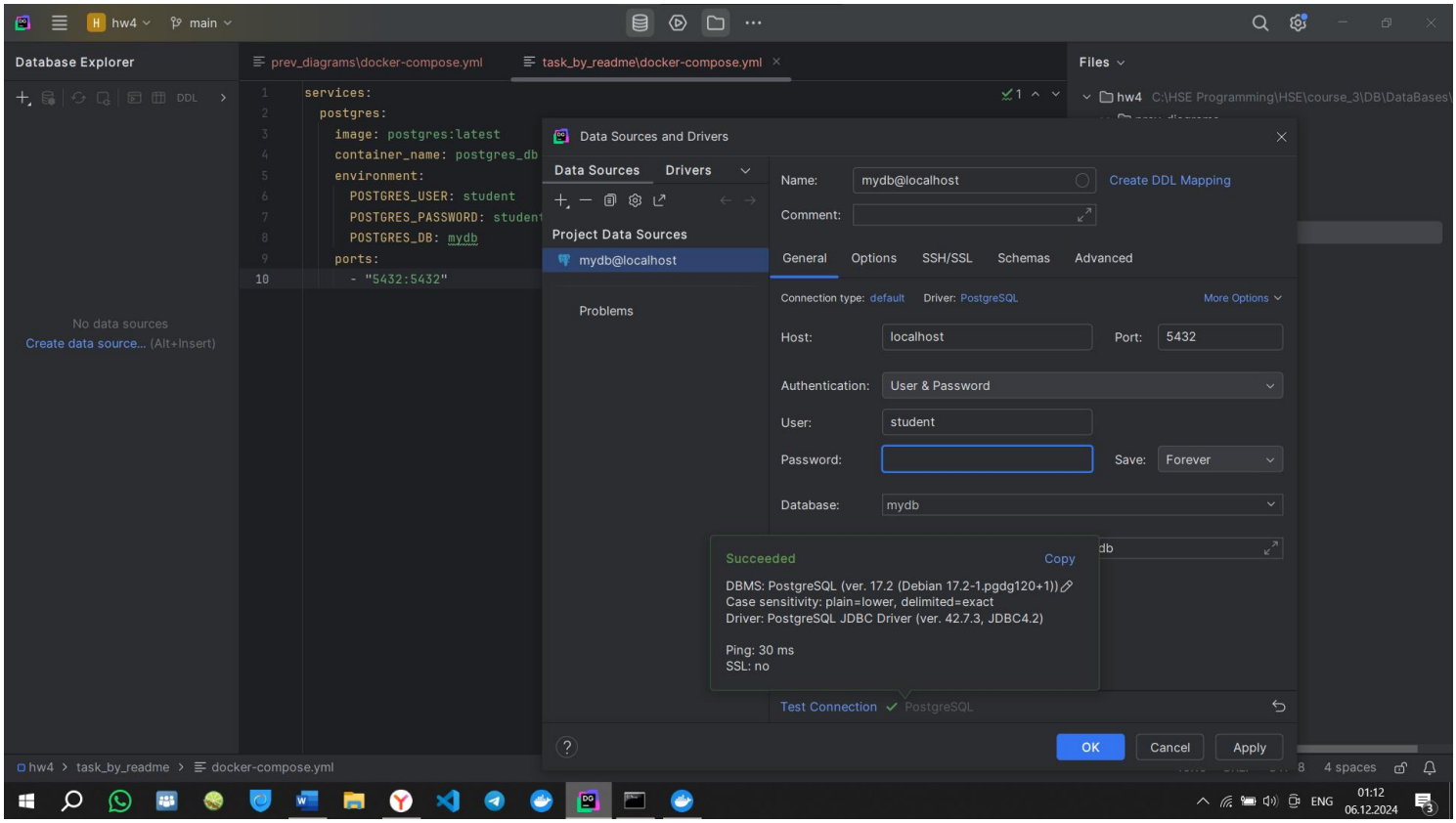
Запускаем контейнер:

```
C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker-compose up -d
time="2024-12-05T21:22:45+03:00" level=warning msg="Found orphan containers ([postgres_db1 postgres_db2]) for this project. If you removed
or renamed this service in your compose file, you can run this command with the --remove-orphans flag to clean it up."
[+] Running 3/3
 ✔ Network task_by_readme_default       Created                                                                                    0.0s
 ✔ Container task_by_readme-postgres-1  Recreated                                                                                  0.1s
 ✔ Container postgres_db                Started                                                                                    0.3s

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>
```

Создаю в DataGrip новое подключение с типом PostgreSQL:

С датагрипом получились проблемы, он просто не хочет подключаться. Поэтому подключился через psql

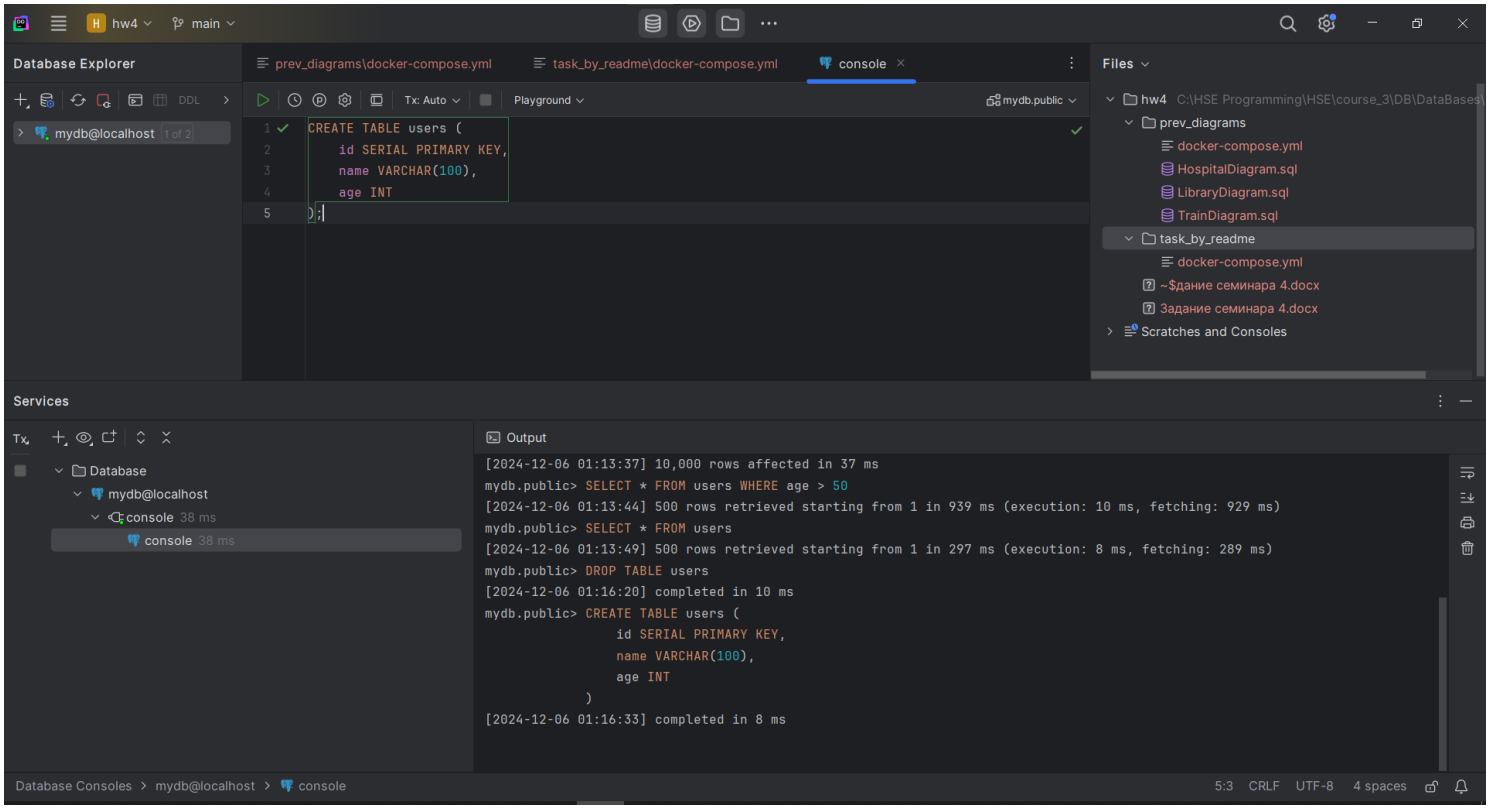
```
C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>docker-compose up -d
[+] Running 2/2
 ✔ Network task_by_readme_default  Created
 ✔ Container postgres_db           Started

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>psql -h localhost -U student -d mydb
Password for user student:
psql (17.2)
Type "help" for help.

mydb=# exit

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\task_by_readme>
```



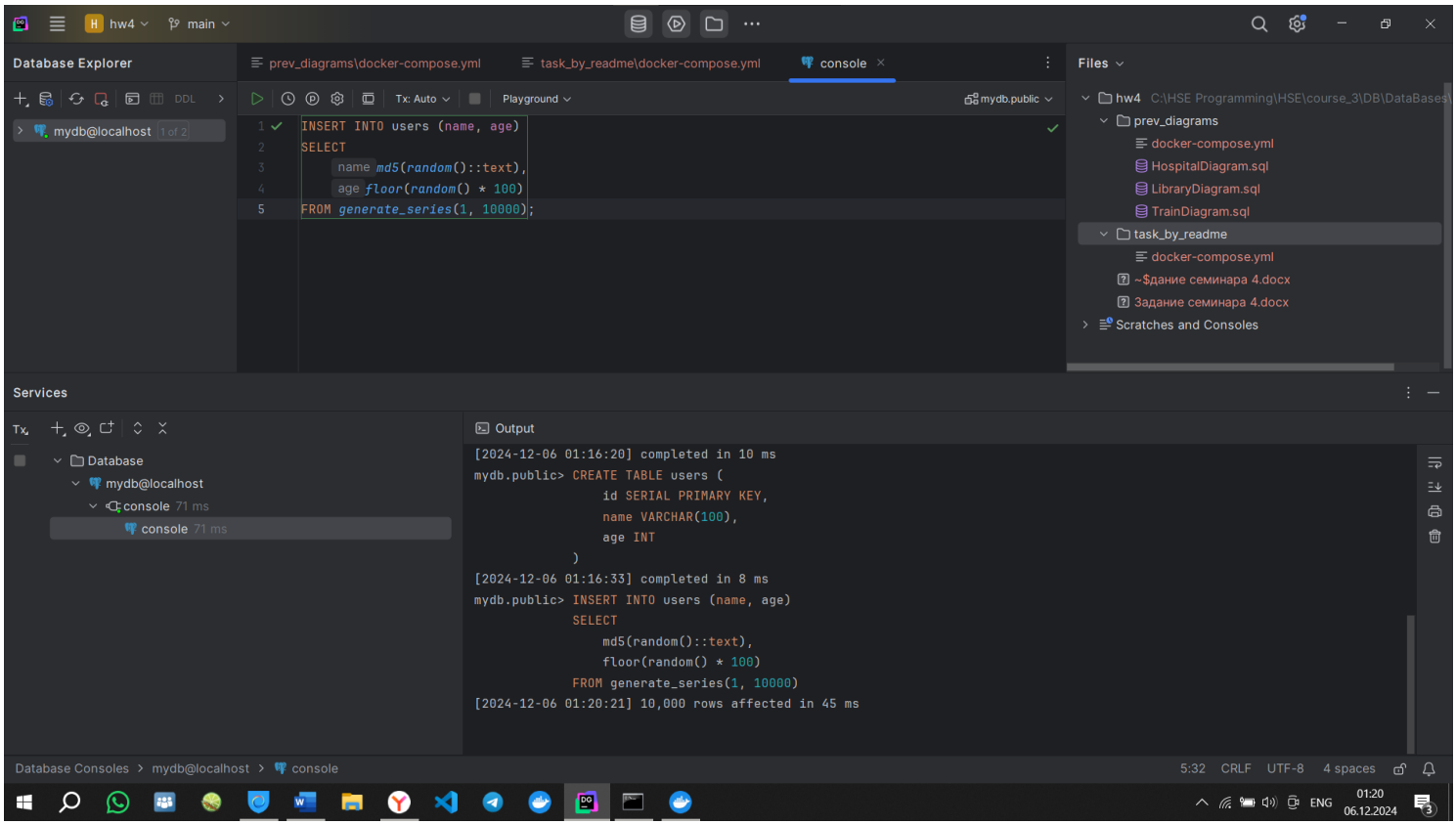
6. Тестовые SQL-запросы

6.1 Тестовые SQL-запросы:

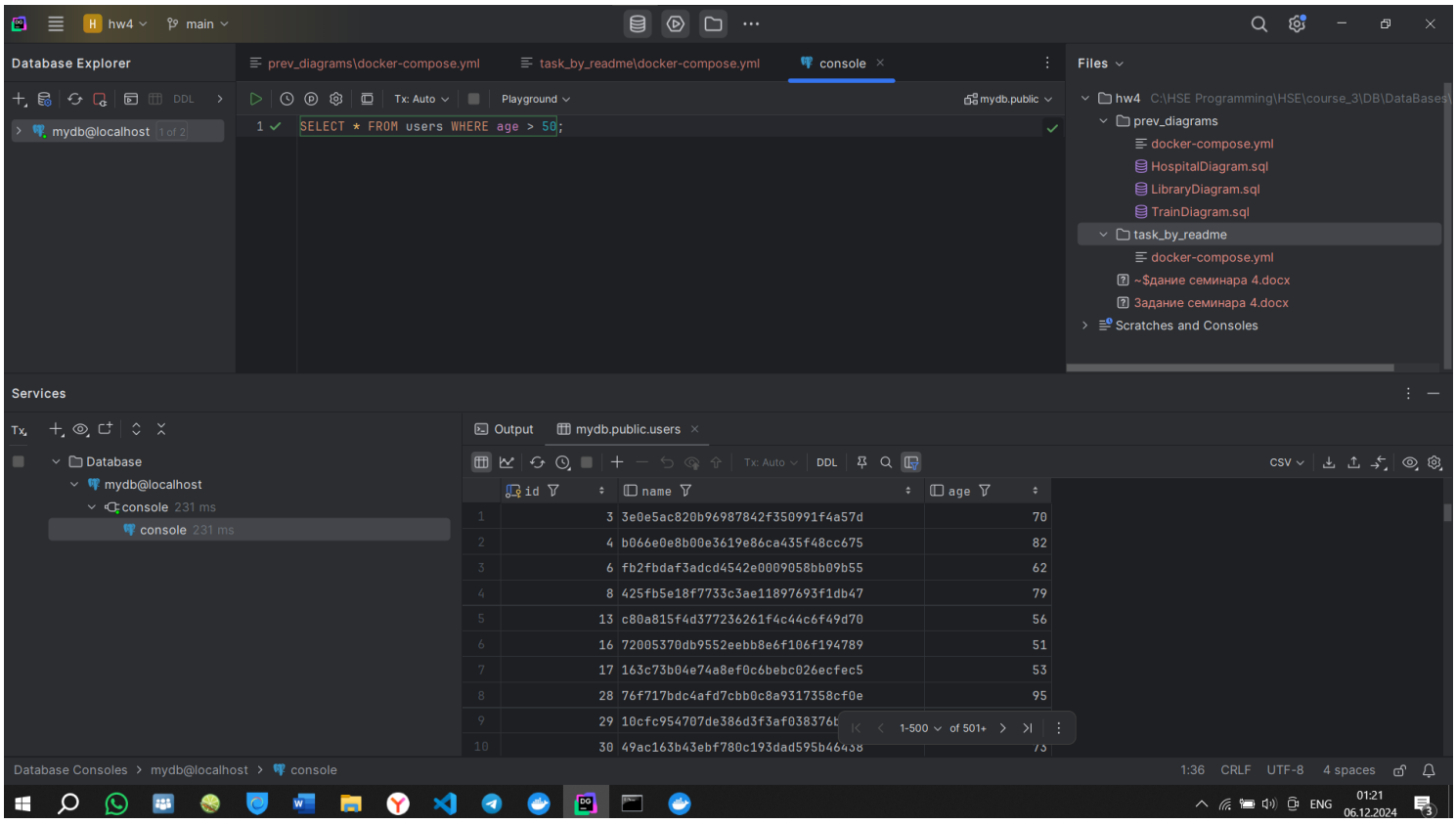
Создаем табличку с пользователями



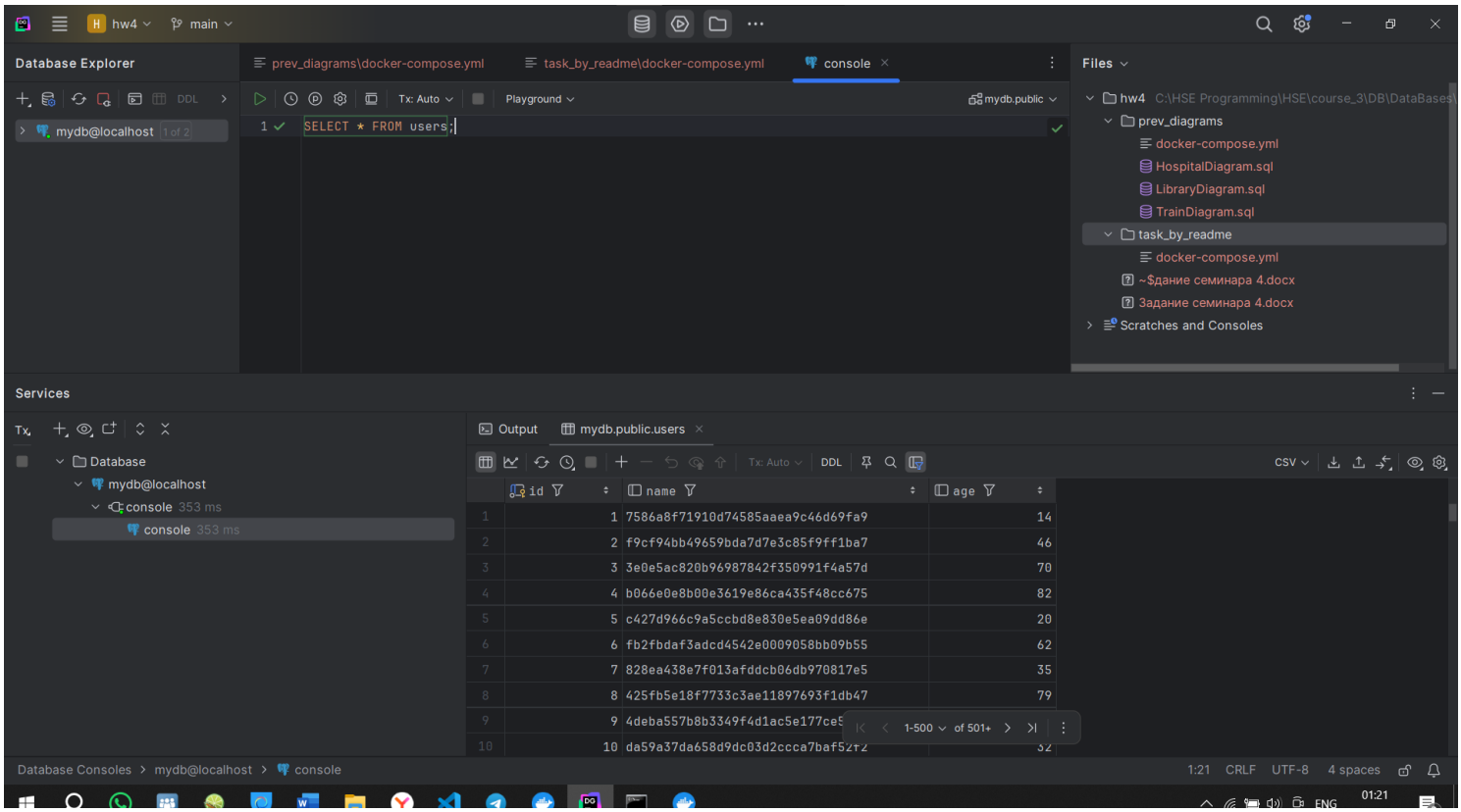
Сгенерируем 10000 записей:



Выберем всех пользователей страше 50 лет:

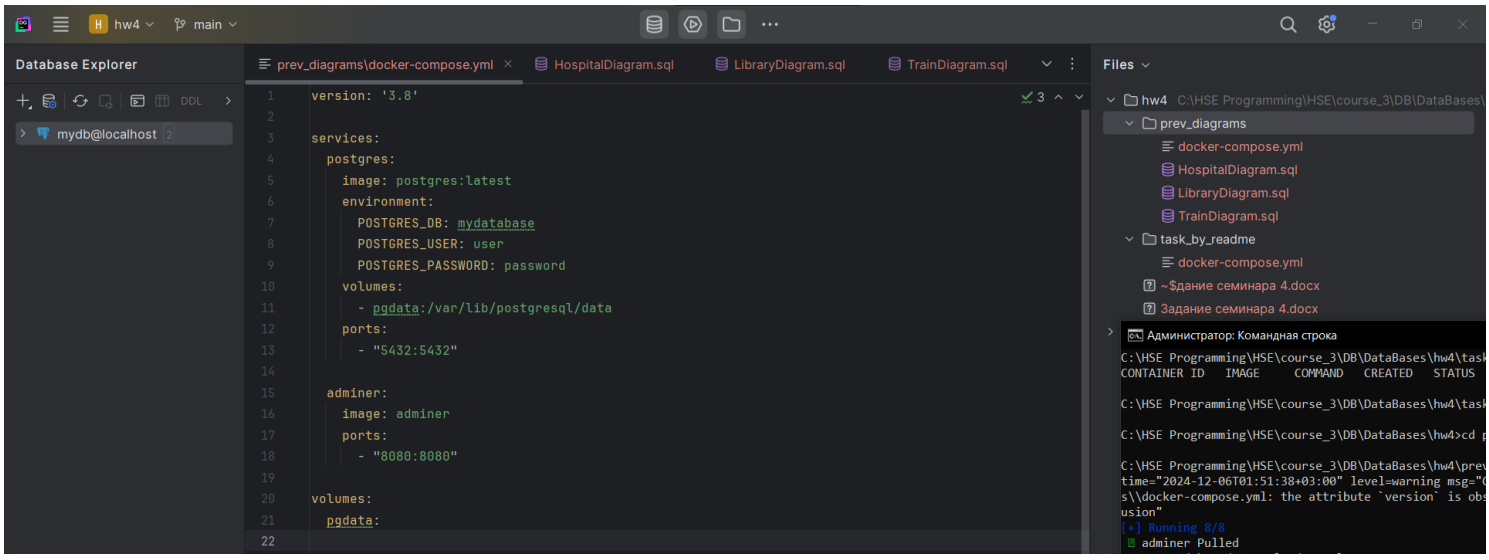


Получаем данные:

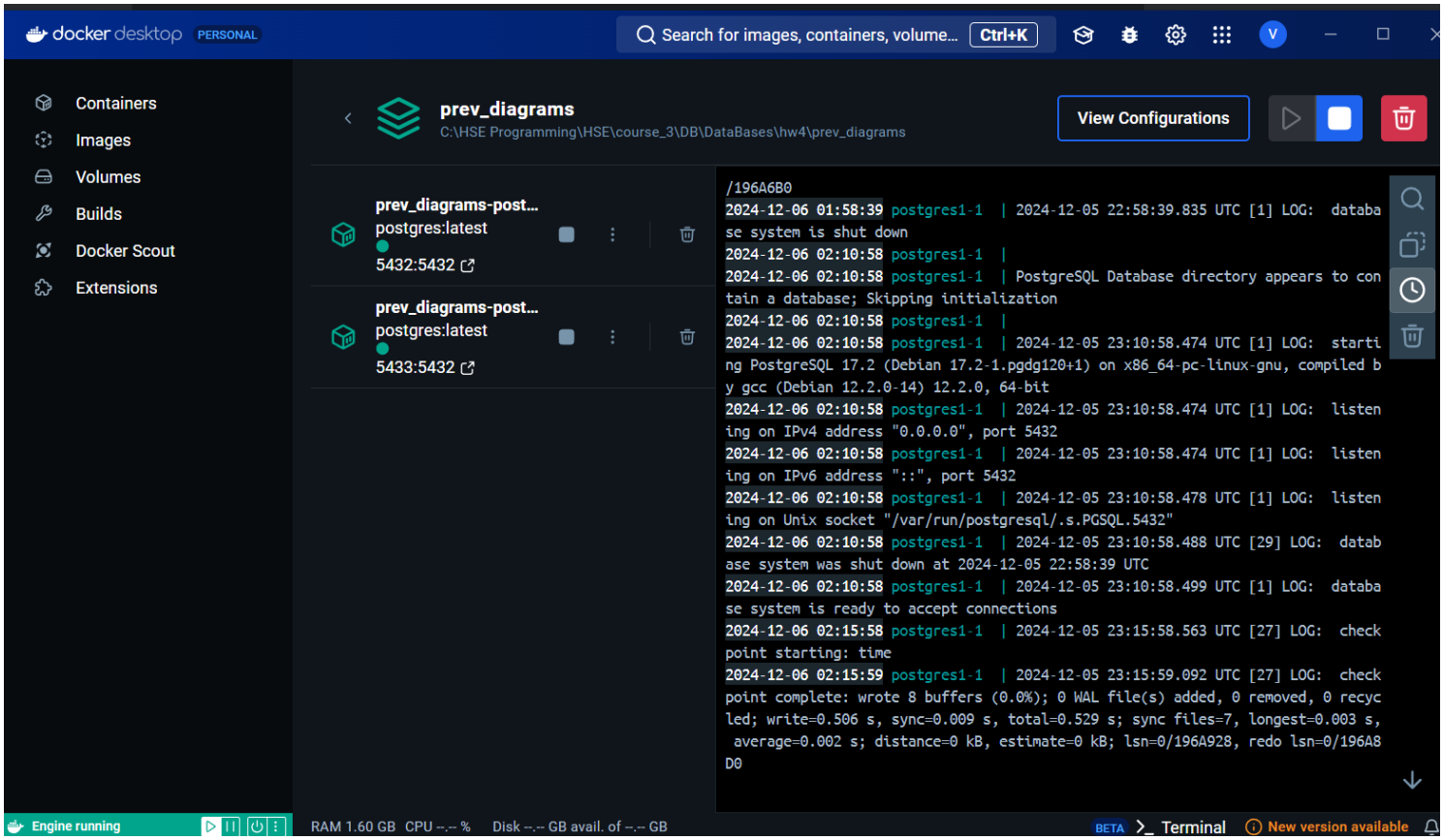


7. Самостоятельное выполнение

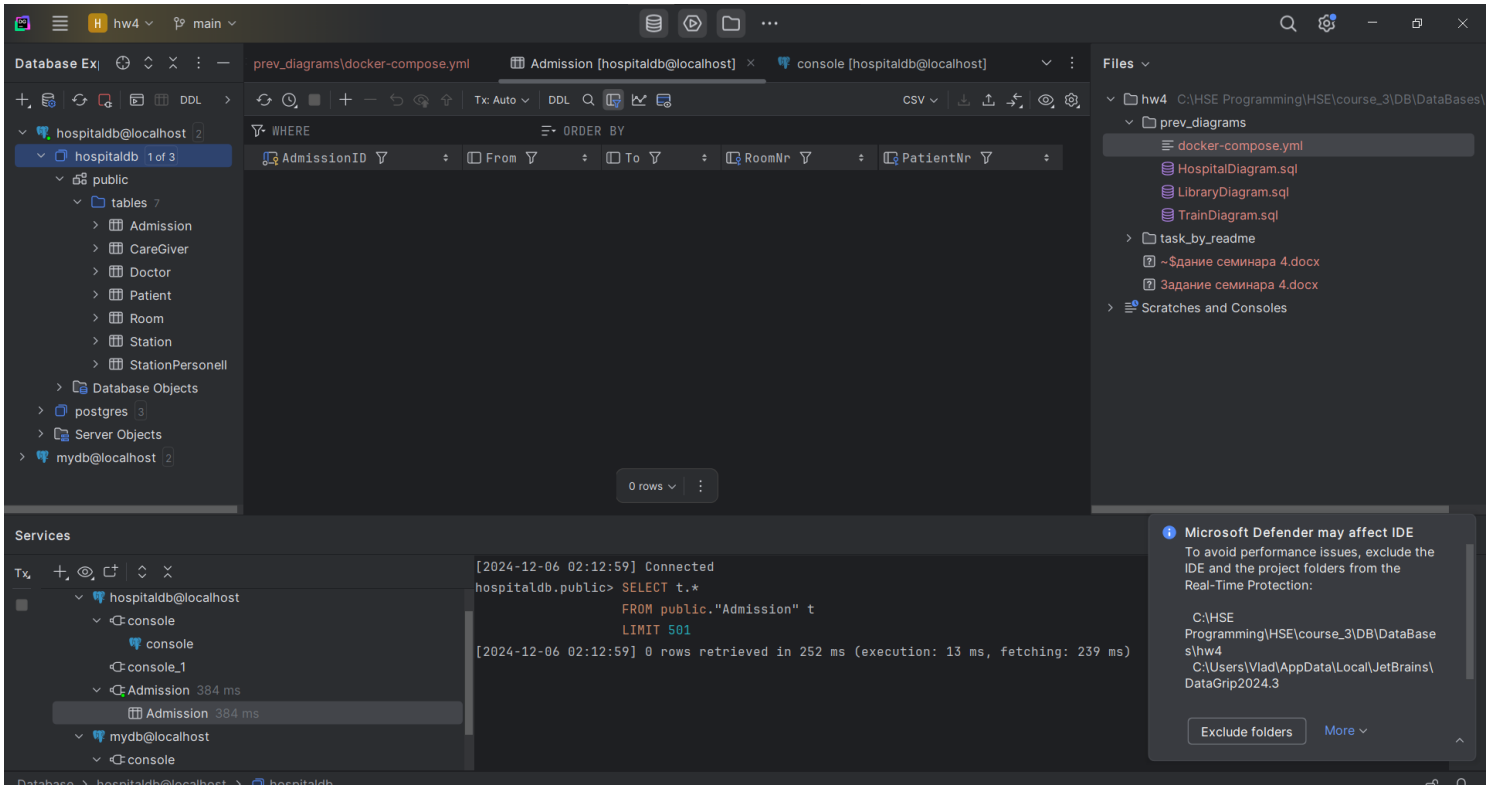
Создал docker-compose.yml с двумя сервисами: PostgreSQL



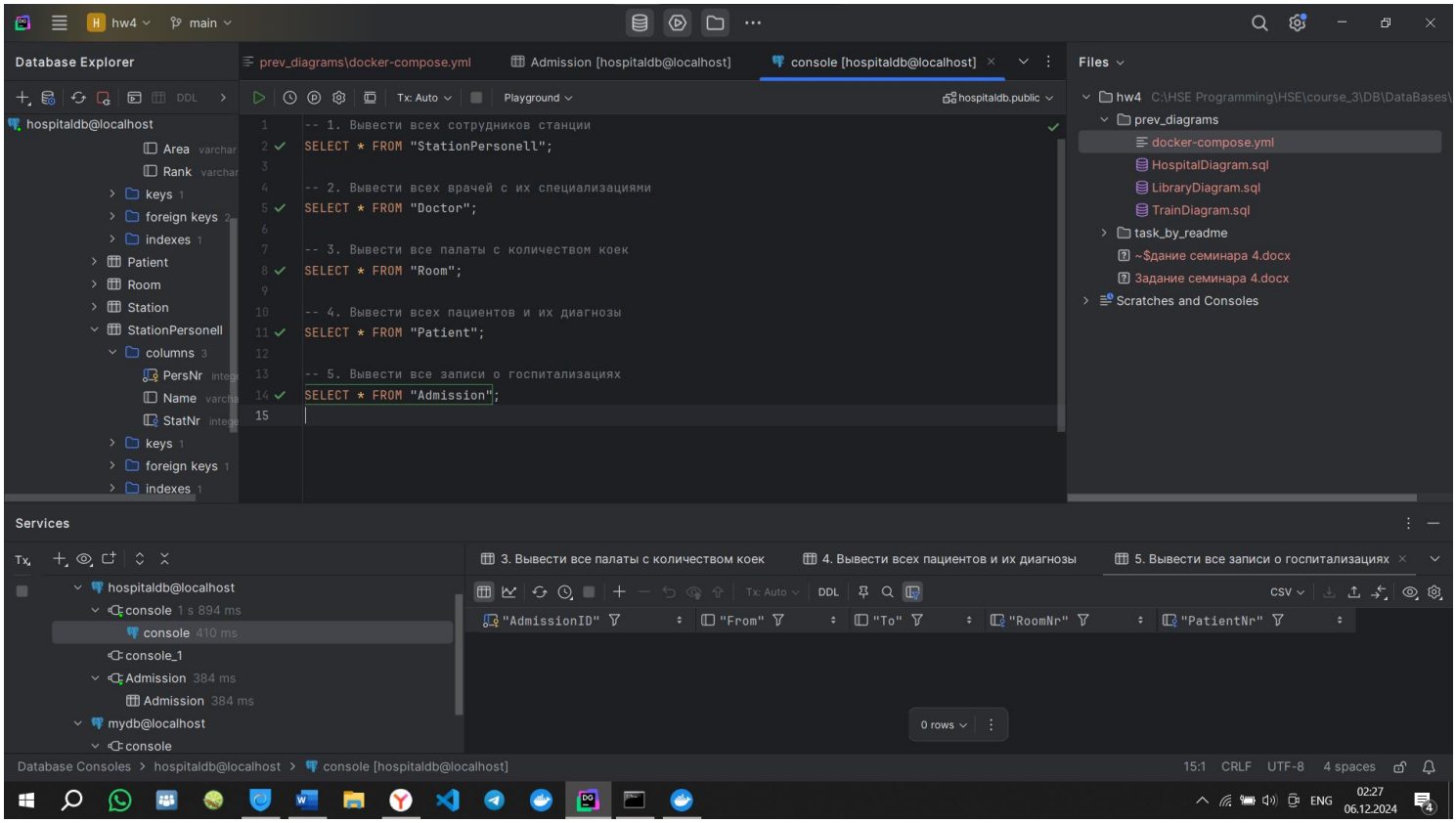
Подключение в DataGrip



Запустил диаграммы прошлого задания (видно, что таблицы создались)



SQL-запросы



Остановил и удалил контейнеры

```
C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\prev_diagrams>docker ps
CONTAINER ID   IMAGE             COMMAND                  CREATED         STATUS         PORTS
    NAMES
a4b6c3245c56   postgres:latest   "docker-entrypoint.s…"   3 minutes ago   Up 3 minutes   5432/tcp, 0.0.0.0:5433->5433/tc
p   prev_diagrams-postgres2-1
7d6b7302f191   postgres:latest   "docker-entrypoint.s…"   3 minutes ago   Up 3 minutes   0.0.0.0:5432->5432/tcp
    prev_diagrams-postgres1-1

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\prev_diagrams>docker rm a4b6c3245c56 7d6b7302f191
Error response from daemon: cannot remove container "/prev_diagrams-postgres2-1": container is running: stop the contain
er before removing or force remove
Error response from daemon: cannot remove container "/prev_diagrams-postgres1-1": container is running: stop the contain
er before removing or force remove

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\prev_diagrams>docker stop a4b6c3245c56 7d6b7302f191
a4b6c3245c56
7d6b7302f191

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\prev_diagrams>docker rm a4b6c3245c56 7d6b7302f191
a4b6c3245c56
7d6b7302f191

C:\HSE Programming\HSE\course_3\DB\DataBases\hw4\prev_diagrams>
```