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**Практическая работа 3-1. Dockerfile**

Направление подготовки/специальность

38.04.05 - Бизнес-информатика

Бизнес-аналитика и большие данные

(очная форма обучения)

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## Введение

Практическая работа нацелена на знакомство студентов с Docker, создание хорошего и плохого dockerfile, использование Docker для развертывания приложений.

## Основная часть

### 1. Написание хорошего и плохого Dockerfile.

Для начала, необходимо на виртуальной машине создать 2 директории “bad\_docker\_file” и “good\_docker\_file”.

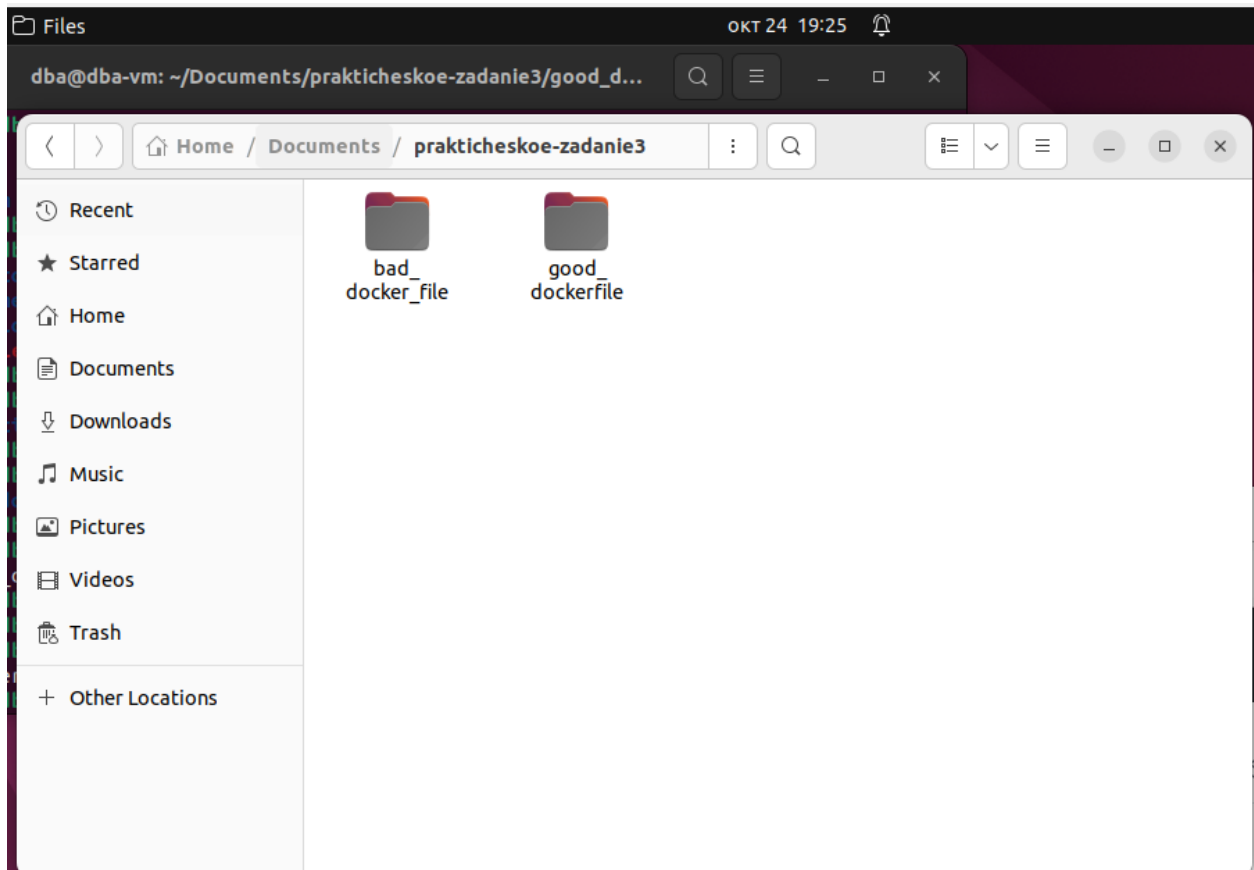


Рис.1

Внутри каждой из этих директорий создадим dockerfile.

Содержание плохого dockerfile

```
from python:latest
```

```
workdir /app
```

```
copy ./requirements.txt /app/server/requirements.txt
```

```
copy ./alembic.ini /app/alembic.ini
```

```
copy ./src /app/server/src
```

```
run pip install --no-cache-dir --upgrade -r /app/server/requirements.txt
cmd ["uvicorn", "server.src.main:app", "--host", "0.0.0.0", "--port", "8000"]
volume /app/data
```

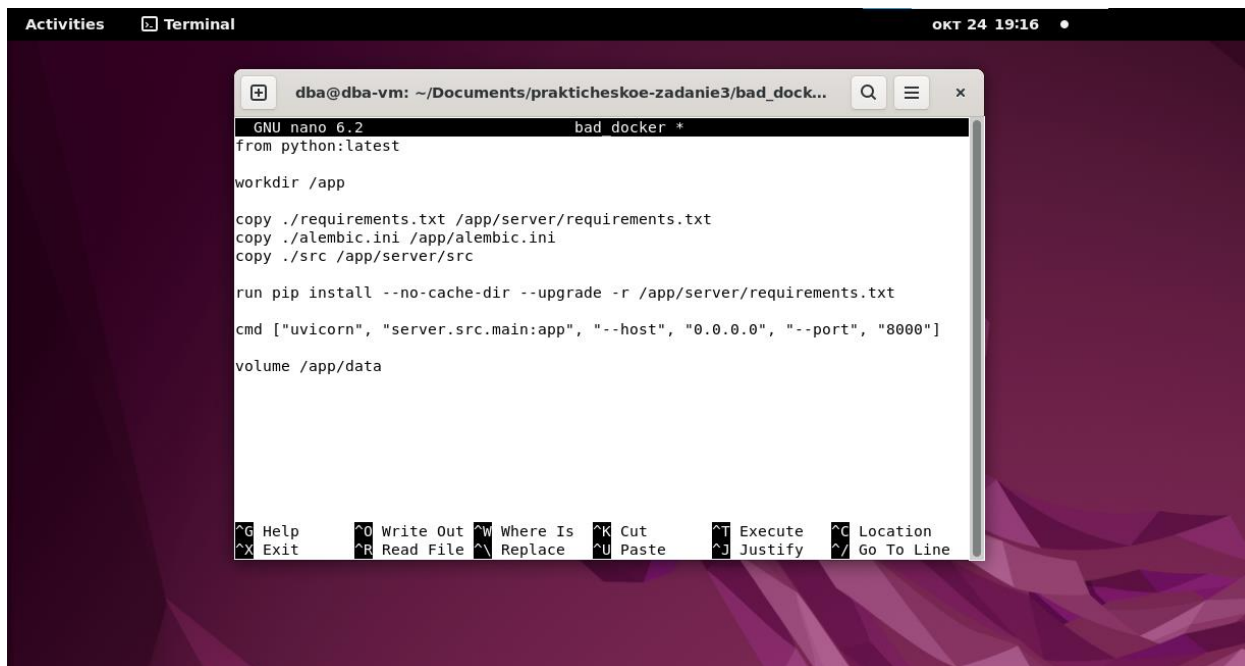


Рис.2 Содержимое плохого dockerfile

Содержание хорошего dockerfile

FROM python:3.10

WORKDIR /app

COPY ./requirements.txt /app/server/requirements.txt

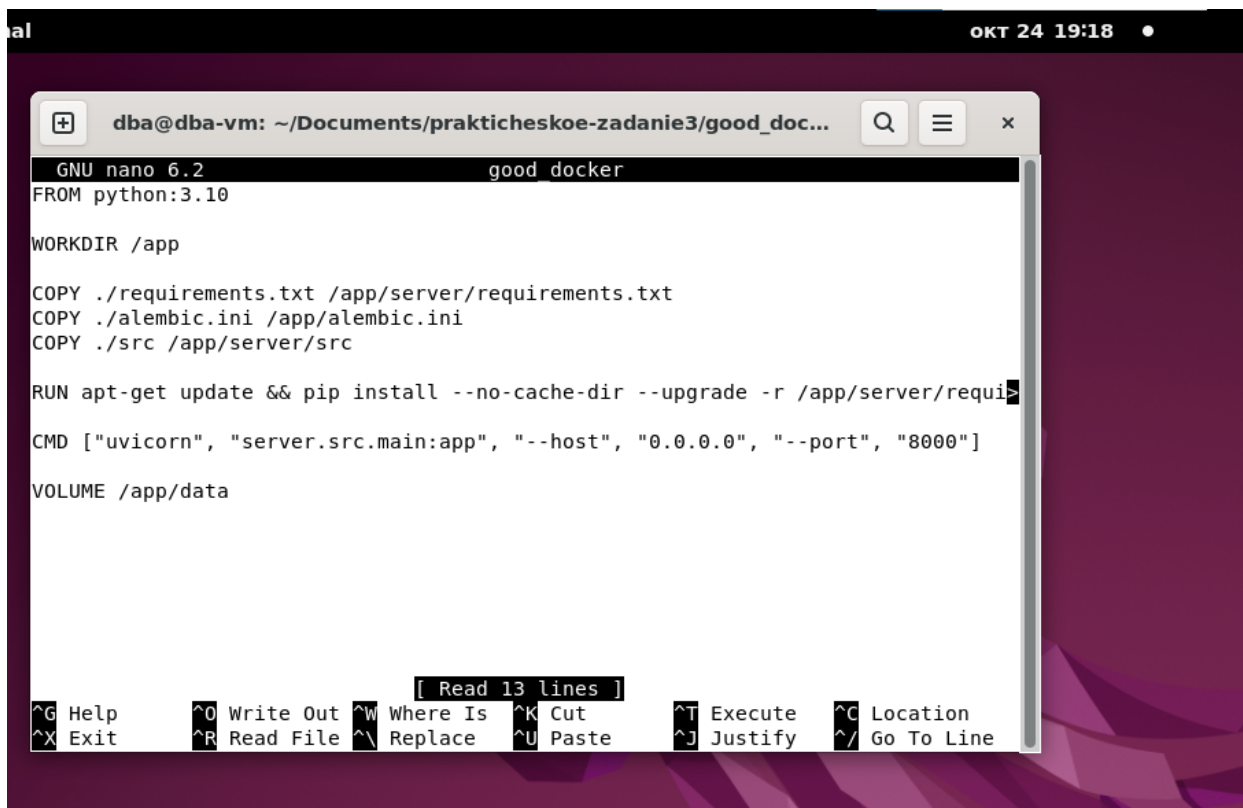
COPY ./alembic.ini /app/alembic.ini

COPY ./src /app/server/src

RUN apt-get update && pip install --no-cache-dir --upgrade -r  
/app/server/requirements.txt

CMD ["uvicorn", "server.src.main:app", "--host", "0.0.0.0", "--port", "8000"]

VOLUME /app/data

A screenshot of a terminal window with a dark purple background. At the top, a terminal title bar shows 'dba@dba-vm: ~/Documents/prakticheskoe-zadanie3/good\_doc...'. Below it, a window title bar for 'good docker' contains search and menu icons. The main area shows the GNU nano 6.2 editor with a Dockerfile. The file content is: FROM python:3.10, WORKDIR /app, COPY ./requirements.txt /app/server/requirements.txt, COPY ./alembic.ini /app/alembic.ini, COPY ./src /app/server/src, RUN apt-get update && pip install --no-cache-dir --upgrade -r /app/server/requirements.txt, CMD ["uvicorn", "server.src.main:app", "--host", "0.0.0.0", "--port", "8000"], and VOLUME /app/data. At the bottom, a status bar shows '[ Read 13 lines ]' and a table of keyboard shortcuts: ^G Help, ^O Write Out, ^W Where Is, ^K Cut, ^T Execute, ^C Location, ^X Exit, ^R Read File, ^\ Replace, ^U Paste, ^J Justify, and ^\_ Go To Line.

```
GNU nano 6.2                                good docker
FROM python:3.10

WORKDIR /app

COPY ./requirements.txt /app/server/requirements.txt
COPY ./alembic.ini /app/alembic.ini
COPY ./src /app/server/src

RUN apt-get update && pip install --no-cache-dir --upgrade -r /app/server/requirements.txt

CMD ["uvicorn", "server.src.main:app", "--host", "0.0.0.0", "--port", "8000"]

VOLUME /app/data

[ Read 13 lines ]
^G Help      ^O Write Out ^W Where Is  ^K Cut       ^T Execute   ^C Location
^X Exit      ^R Read File ^\ Replace   ^U Paste     ^J Justify   ^_ Go To Line
```

Рис.3 Содержимое хорошего dockerfile

После чего, перенесем содержимое репозитория

“[https://github.com/BosenkoTM/DevOps-Technologies/tree/main/Lesson%203%20Containerizing%20Applications/lab3\\_1#%D0%B7%D0%B0%D0%BF%D1%83%D1%81%D0%BA](https://github.com/BosenkoTM/DevOps-Technologies/tree/main/Lesson%203%20Containerizing%20Applications/lab3_1#%D0%B7%D0%B0%D0%BF%D1%83%D1%81%D0%BA)”

в обе директории и внутрь их перенесем и заменим Dockerfile.

Далее, начнем построение Docker-образа.

Сначала, перейдем под администратором.

**Sudo su**

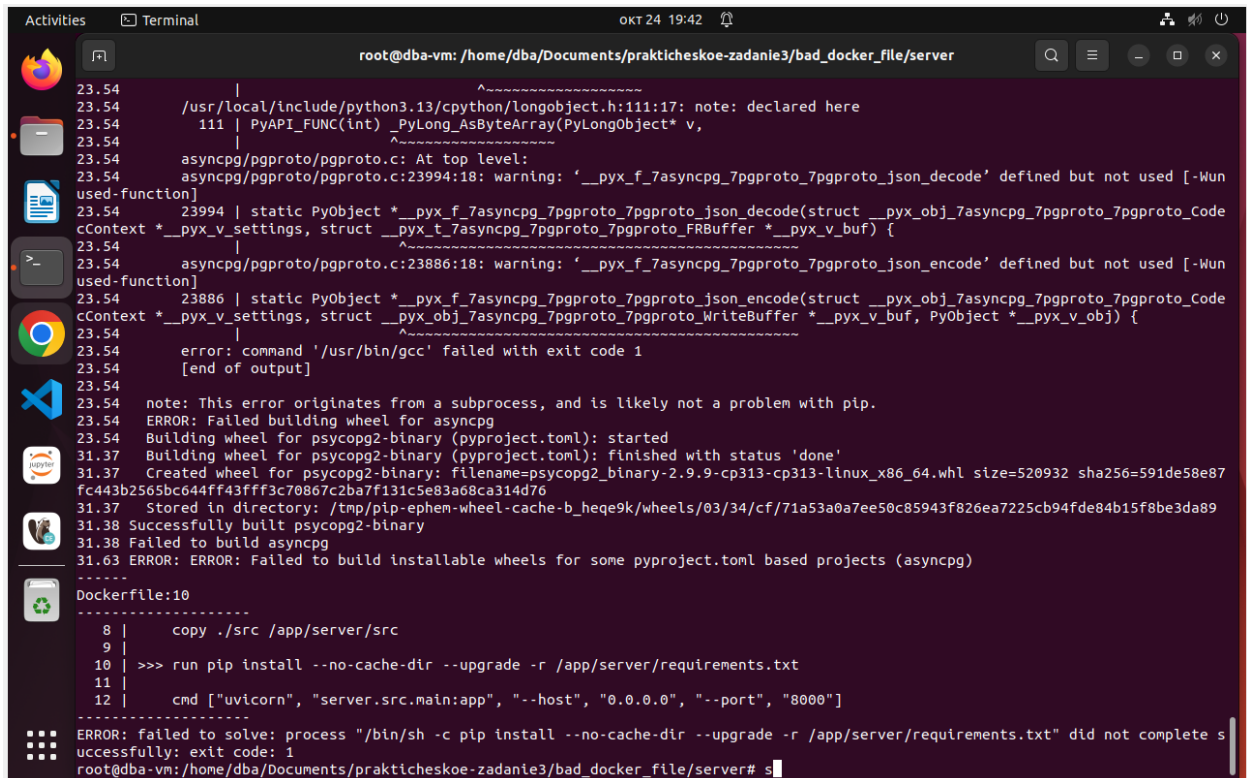
**docker build -t test\_bad .**

```
root@dba-vm: /home/dba/Documents/prakticheskoe-zadanie3/bad_docker_file/server
dba@dba-vm:~/Documents/prakticheskoe-zadanie3/bad_docker_file/server$ docker build -t test_bad .
ERROR: permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Head "http://%2Fvar%2Frun%2Fdocker.sock/_ping": dial unix /var/run/docker.sock: connect: permission denied
dba@dba-vm:~/Documents/prakticheskoe-zadanie3/bad_docker_file/server$ sudo su
[sudo] password for dba:
root@dba-vm: /home/dba/Documents/prakticheskoe-zadanie3/bad_docker_file/server# docker build -t test_bad .
[+] Building 99.9s (10/10) FINISHED
=> [internal] load build definition from Dockerfile                                docker:default
=> [internal] load build definition from Dockerfile                                0.8s
=> => transferring dockerfile: 361B                                              0.2s
=> [internal] load metadata for docker.io/library/python:latest                  3.0s
=> [internal] load .dockerignore                                                  0.0s
=> => transferring context: 2B                                                    0.0s
=> [1/6] FROM docker.io/library/python:latest@sha256:a31cbb4db18c6f09e3300fa85b77fd56702501fcb9bdb8792ec702a39ba6200 58.6s
=> resolve docker.io/library/python:latest@sha256:a31cbb4db18c6f09e3300fa85b77fd56702501fcb9bdb8792ec702a39ba6200 0.1s
=> sha256:a4cb00e84832fc88a38893b00b15826ac0dc444e9874fe0353e2d73674477d1c 6.05kB / 6.05kB 0.0s
=> sha256:7d98d813d54f6207a57721008a4081378343ad8f1b2db66c121406019171805b 49.56MB / 49.56MB 11.1s
=> sha256:7aad5092c3b7a865666b14bef3d4d038282b19b124542f1a158c98ea8c1ed1b 64.39MB / 64.39MB 12.8s
=> sha256:a31cbb4db18c6f09e3300fa85b77fd56702501fcb9bdb8792ec702a39ba6200 9.72kB / 9.72kB 0.0s
=> sha256:6bb74b8212b18a54d1a3cc03811becf5497e87d13c2796ce23de76944494829 2.32kB / 2.32kB 0.0s
=> sha256:da802df85c965baeca9d39869f9e2cbb3dc844d4627f413bfbb2f2c3d6055988 24.05MB / 24.05MB 10.8s
=> sha256:ad1c7cfc347f5c86fc2678b58f6a8fb6c6003471405760532fc3240b9eb1b343 211.27MB / 211.27MB 35.8s
=> extracting sha256:7d98d813d54f6207a57721008a4081378343ad8f1b2db66c121406019171805b 2.4s
=> sha256:3cb0c7824817bde4058e057808e77b85920ece131b8b029694b8a8a7111cae89 6.16MB / 6.16MB 13.8s
=> sha256:6d4976a28162c998f3da26ceffa75571f438c186e483e75fe9eecd2ad80d36a9 27.20MB / 27.20MB 17.9s
=> sha256:7fd1c94ea9ec389256b94dcfaa2196ddf2834f6caa69cfb1c281ec0173454c0 250B / 250B 15.2s
=> extracting sha256:da802df85c965baeca9d39869f9e2cbb3dc844d4627f413bfbb2f2c3d6055988 0.5s
=> extracting sha256:7aad5092c3b7a865666b14bef3d4d038282b19b124542f1a158c98ea8c1ed1b 4.9s
=> extracting sha256:ad1c7cfc347f5c86fc2678b58f6a8fb6c6003471405760532fc3240b9eb1b343 15.6s
=> extracting sha256:3cb0c7824817bde4058e057808e77b85920ece131b8b029694b8a8a7111cae89 0.5s
=> extracting sha256:6d4976a28162c998f3da26ceffa75571f438c186e483e75fe9eecd2ad80d36a9 5.2s
=> extracting sha256:7fd1c94ea9ec389256b94dcfaa2196ddf2834f6caa69cfb1c281ec0173454c0 0.0s
=> [internal] load build context                                                  0.1s
=> => transferring context: 35.49kB                                              0.0s
=> [2/6] WORKDIR /app                                                            2.6s
=> [3/6] COPY ./requirements.txt /app/server/requirements.txt                  0.5s
=> [4/6] COPY ./alembic.ini /app/alembic.ini                                    0.4s
=> [5/6] COPY ./src/app/server/src                                              0.2s
=> ERROR [6/6] RUN pip install --no-cache-dir --upgrade -r /app/server/requirements.txt 32.8s
-----
> [6/6] RUN pip install --no-cache-dir --upgrade -r /app/server/requirements.txt:
```

Рис.4 Запуск плохого файла

```
root@dba-vm: /home/dba/Documents/prakticheskoe-zadanie3/bad_docker_file/server
=> [5/6] COPY ./src/app/server/src                                              0.2s
=> ERROR [6/6] RUN pip install --no-cache-dir --upgrade -r /app/server/requirements.txt 32.8s
-----
> [6/6] RUN pip install --no-cache-dir --upgrade -r /app/server/requirements.txt:
7.234 Collecting alembic==1.12.1 (from -r /app/server/requirements.txt (line 1))
7.363 Downloading alembic-1.12.1-py3-none-any.whl.metadata (7.3 kB)
7.475 Collecting asyncpg==0.29.0 (from -r /app/server/requirements.txt (line 2))
7.503 Downloading asyncpg-0.29.0.tar.gz (820 kB)
7.603 ----- 820.5/820.5 kB 19.6 MB/s eta 0:00:00
7.684 Installing build dependencies: started
11.40 Installing build dependencies: finished with status 'done'
11.41 Getting requirements to build wheel: started
11.77 Getting requirements to build wheel: finished with status 'done'
11.77 Preparing metadata (pyproject.toml): started
12.11 Preparing metadata (pyproject.toml): finished with status 'done'
12.15 Collecting email-validator==2.1.0.post1 (from -r /app/server/requirements.txt (line 3))
12.17 Downloading email_validator-2.1.0.post1-py3-none-any.whl.metadata (25 kB)
12.29 Collecting fastapi==0.104.1 (from -r /app/server/requirements.txt (line 4))
12.31 Downloading fastapi-0.104.1-py3-none-any.whl.metadata (24 kB)
12.35 Collecting passlib==1.7.4 (from -r /app/server/requirements.txt (line 5))
12.37 Downloading passlib-1.7.4-py2.py3-none-any.whl.metadata (1.7 kB)
12.46 Collecting pre-commit==3.5.0 (from -r /app/server/requirements.txt (line 6))
12.49 Downloading pre_commit-3.5.0-py2.py3-none-any.whl.metadata (1.3 kB)
12.62 Collecting pycpg2-binary==2.9.9 (from -r /app/server/requirements.txt (line 7))
12.64 Downloading pycpg2-binary-2.9.9.tar.gz (384 kB)
12.71 Installing build dependencies: started
14.48 Installing build dependencies: finished with status 'done'
14.48 Getting requirements to build wheel: started
14.85 Getting requirements to build wheel: finished with status 'done'
14.85 Preparing metadata (pyproject.toml): started
15.11 Preparing metadata (pyproject.toml): finished with status 'done'
15.15 Collecting pydantic-settings==2.1.0 (from -r /app/server/requirements.txt (line 8))
15.18 Downloading pydantic_settings-2.1.0-py3-none-any.whl.metadata (2.9 kB)
15.21 Collecting python-jose==3.3.0 (from -r /app/server/requirements.txt (line 9))
15.24 Downloading python_jose-3.3.0-py2.py3-none-any.whl.metadata (5.4 kB)
15.77 Collecting sqlalchemy==2.0.23 (from -r /app/server/requirements.txt (line 10))
15.80 Downloading SQLAlchemy-2.0.23-py3-none-any.whl.metadata (9.6 kB)
15.87 Collecting uvicorn==0.23.2 (from -r /app/server/requirements.txt (line 11))
15.89 Downloading uvicorn-0.23.2-py3-none-any.whl.metadata (6.2 kB)
15.93 Collecting python-dotenv==1.0.0 (from -r /app/server/requirements.txt (line 12))
```

Рис.5 Запуск плохого файла



```
root@dba-vm: /home/dba/Documents/prakticheskoe-zadanie3/bad_docker_file/server

23.54 |
23.54 | /usr/local/include/python3.13/cpython/longobject.h:111:17: note: declared here
23.54 | 111 | PyAPI_FUNC(int) _PyLong_AsByteArray(PyLongObject* v,
23.54 |
23.54 | asyncpg/pgproto/pgproto.c: At top level:
23.54 | asyncpg/pgproto/pgproto.c:23994:18: warning: '__pyx_f_7asyncpg_7pgproto_7pgproto_json_decode' defined but not used [-Wunused-function]
23.54 | 23994 | static PyObject * __pyx_f_7asyncpg_7pgproto_7pgproto_json_decode(struct __pyx_obj_7asyncpg_7pgproto_7pgproto_Code
23.54 | cContext * __pyx_v_settings, struct __pyx_t_7asyncpg_7pgproto_7pgproto_FRBuffer * __pyx_v_buf) {
23.54 |
23.54 | asyncpg/pgproto/pgproto.c:23886:18: warning: '__pyx_f_7asyncpg_7pgproto_7pgproto_json_encode' defined but not used [-Wunused-function]
23.54 | 23886 | static PyObject * __pyx_f_7asyncpg_7pgproto_7pgproto_json_encode(struct __pyx_obj_7asyncpg_7pgproto_7pgproto_Code
23.54 | cContext * __pyx_v_settings, struct __pyx_obj_7asyncpg_7pgproto_7pgproto_WriteBuffer * __pyx_v_buf, PyObject * __pyx_v_obj) {
23.54 |
23.54 | error: command '/usr/bin/gcc' failed with exit code 1
23.54 | [end of output]
23.54 |
23.54 | note: This error originates from a subprocess, and is likely not a problem with pip.
23.54 | ERROR: Failed building wheel for asyncpg
23.54 | Building wheel for psycopg2-binary (pyproject.toml): started
23.54 | Building wheel for psycopg2-binary (pyproject.toml): finished with status 'done'
23.54 | Created wheel for psycopg2-binary: filename=psycopg2_binary-2.9.9-cp313-cp313-linux_x86_64.whl size=520932 sha256=591de58e87
23.54 | fc443b2565bc644ff43fff3c70867c2ba7f131c5e83a68ca314d76
23.54 | Stored in directory: /tmp/pip-ephem-wheel-cache-b_hqe9k/wheels/03/34/cf/71a53a0a7ee50c85943f826ea7225cb94fde84b15f8be3da89
23.54 | Successfully built psycopg2-binary
23.54 | Failed to build asyncpg
23.54 | ERROR: ERROR: Failed to build installable wheels for some pyproject.toml based projects (asyncpg)

Dockerfile:10
-----
8 |     copy ./src /app/server/src
9 |
10 | >>> run pip install --no-cache-dir --upgrade -r /app/server/requirements.txt
11 |
12 | cmd ["uvicorn", "server.src.main:app", "--host", "0.0.0.0", "--port", "8000"]
-----
ERROR: failed to solve: process "/bin/sh -c pip install --no-cache-dir --upgrade -r /app/server/requirements.txt" did not complete s
uccessfully: exit code: 1
root@dba-vm: /home/dba/Documents/prakticheskoe-zadanie3/bad_docker_file/server# s
```

Рис.6 Запуск плохого файла

После запуска плохого файла получим ошибки, связанные с недостаточными зависимостями.

Запустим хороший dockerfile.

**docker build -t test\_good .**

**docker run -d --name test\_good -p 8000:8000 test\_good**

```
Activities Terminal
root@dba-vm: /home/dba/Documents/prakticheskoe-zadanie3/good_dockerfile/server
12 | cmd ["uvicorn", "server.src.main:app", "--host", "0.0.0.0", "--port", "8000"]
-----
ERROR: failed to solve: process "/bin/sh -c pip install --no-cache-dir --upgrade -r /app/server/requirements.txt" did not complete successfully: exit code: 1
root@dba-vm: /home/dba/Documents/prakticheskoe-zadanie3/bad_docker_file/server# cd ~
root@dba-vm:~# ls
snap
root@dba-vm:~# cd /home/dba/Documents/prakticheskoe-zadanie3/good_dockerfile/server/
root@dba-vm: /home/dba/Documents/prakticheskoe-zadanie3/good_dockerfile/server# docker build -t test_good .
[+] Building 30.7s (11/11) FINISHED
=> [internal] load build definition from Dockerfile
=> => transferring dockerfile: 377B
=> [internal] load metadata for docker.io/library/python:3.10
=> [internal] load .dockerignore
=> => transferring context: 2B
=> [1/6] FROM docker.io/library/python:3.10@sha256:fd0fa50d997eb56ce560c6e5ca6a1f5cf8fdff87572a16ac07fb1f5ca01eb608
=> => resolve docker.io/library/python:3.10@sha256:fd0fa50d997eb56ce560c6e5ca6a1f5cf8fdff87572a16ac07fb1f5ca01eb608
=> => sha256:fd0fa50d997eb56ce560c6e5ca6a1f5cf8fdff87572a16ac07fb1f5ca01eb608 9.08kB / 9.08kB
=> => sha256:3b9d6bd35f8ef7d0697e7b08d1f5c781e488d3c8d1df3338b03bc22be44514d6 2.33kB / 2.33kB
=> => sha256:9ec1cdbafe6e73e1c44c39ee914db2553cc367cbfd215429bac3133b2c11778 6.32kB / 6.32kB
=> => sha256:60ed5086cc45cf232728d1d4f1d59871dbf5e98b2f622b2918d6ab45c88de5c8 21.38MB / 21.38MB
=> => sha256:4d508a9407359de608ead2a7e385506c4cb83d0e6937bc10caabb98da682c7c 6.16MB / 6.16MB
=> => sha256:0a52f5c07e30cf04c0209bdd45963b9b55d65e569d2bb91ab5cfe772ae63f87 250B / 250B
=> => extracting sha256:4d508a9407359de608ead2a7e385506c4cb83d0e6937bc10caabb98da682c7c
=> => extracting sha256:60ed5086cc45cf232728d1d4f1d59871dbf5e98b2f622b2918d6ab45c88de5c8
=> => extracting sha256:0a52f5c07e30cf04c0209bdd45963b9b55d65e569d2bb91ab5cfe772ae63f87
=> [internal] load build context
=> => transferring context: 1.49kB
=> [2/6] WORKDIR /app
=> [3/6] COPY ./requirements.txt /app/server/requirements.txt
=> [4/6] COPY ./alembic.ini /app/alembic.ini
=> [5/6] COPY ./src /app/server/src
=> [6/6] RUN apt-get update && pip install --no-cache-dir --upgrade -r /app/server/requirements.txt
=> => exporting to image
=> => exporting layers
=> => writing image sha256:b19d8a99eb60b5073dc13aa38a42b2c604273118b997eb87fab22dcc261b212
=> => naming to docker.io/library/test_good
root@dba-vm: /home/dba/Documents/prakticheskoe-zadanie3/good_dockerfile/server#
```

Рис.7 Запуск хорошего файла

```
Activities Terminal
root@dba-vm: /home/dba/Documents/prakticheskoe-zadanie3/good_dockerfile/server
12 | cmd ["uvicorn", "server.src.main:app", "--host", "0.0.0.0", "--port", "8000"]
-----
ERROR: failed to solve: process "/bin/sh -c pip install --no-cache-dir --upgrade -r /app/server/requirements.txt" did not complete successfully: exit code: 1
root@dba-vm: /home/dba/Documents/prakticheskoe-zadanie3/bad_docker_file/server# cd ~
root@dba-vm:~# ls
snap
root@dba-vm:~# cd /home/dba/Documents/prakticheskoe-zadanie3/good_dockerfile/server/
root@dba-vm: /home/dba/Documents/prakticheskoe-zadanie3/good_dockerfile/server# docker build -t test_good .
[+] Building 30.7s (11/11) FINISHED
=> [internal] load build definition from Dockerfile
=> => transferring dockerfile: 377B
=> [internal] load metadata for docker.io/library/python:3.10
=> [internal] load .dockerignore
=> => transferring context: 2B
=> [1/6] FROM docker.io/library/python:3.10@sha256:fd0fa50d997eb56ce560c6e5ca6a1f5cf8fdff87572a16ac07fb1f5ca01eb608
=> => resolve docker.io/library/python:3.10@sha256:fd0fa50d997eb56ce560c6e5ca6a1f5cf8fdff87572a16ac07fb1f5ca01eb608
=> => sha256:fd0fa50d997eb56ce560c6e5ca6a1f5cf8fdff87572a16ac07fb1f5ca01eb608 9.08kB / 9.08kB
=> => sha256:3b9d6bd35f8ef7d0697e7b08d1f5c781e488d3c8d1df3338b03bc22be44514d6 2.33kB / 2.33kB
=> => sha256:9ec1cdbafe6e73e1c44c39ee914db2553cc367cbfd215429bac3133b2c11778 6.32kB / 6.32kB
=> => sha256:60ed5086cc45cf232728d1d4f1d59871dbf5e98b2f622b2918d6ab45c88de5c8 21.38MB / 21.38MB
=> => sha256:4d508a9407359de608ead2a7e385506c4cb83d0e6937bc10caabb98da682c7c 6.16MB / 6.16MB
=> => sha256:0a52f5c07e30cf04c0209bdd45963b9b55d65e569d2bb91ab5cfe772ae63f87 250B / 250B
=> => extracting sha256:4d508a9407359de608ead2a7e385506c4cb83d0e6937bc10caabb98da682c7c
=> => extracting sha256:60ed5086cc45cf232728d1d4f1d59871dbf5e98b2f622b2918d6ab45c88de5c8
=> => extracting sha256:0a52f5c07e30cf04c0209bdd45963b9b55d65e569d2bb91ab5cfe772ae63f87
=> [internal] load build context
=> => transferring context: 1.49kB
=> [2/6] WORKDIR /app
=> [3/6] COPY ./requirements.txt /app/server/requirements.txt
=> [4/6] COPY ./alembic.ini /app/alembic.ini
=> [5/6] COPY ./src /app/server/src
=> [6/6] RUN apt-get update && pip install --no-cache-dir --upgrade -r /app/server/requirements.txt
=> => exporting to image
=> => exporting layers
=> => writing image sha256:b19d8a99eb60b5073dc13aa38a42b2c604273118b997eb87fab22dcc261b212
=> => naming to docker.io/library/test_good
root@dba-vm: /home/dba/Documents/prakticheskoe-zadanie3/good_dockerfile/server# docker run -d --name test_good -p 8000:8000 test_good
4cd8c8e60iddafe8e737c84f8e8d738323dec7b59a27782b15a61c090201207
root@dba-vm: /home/dba/Documents/prakticheskoe-zadanie3/good_dockerfile/server#
```

Рис.8 Запуск хорошего файла



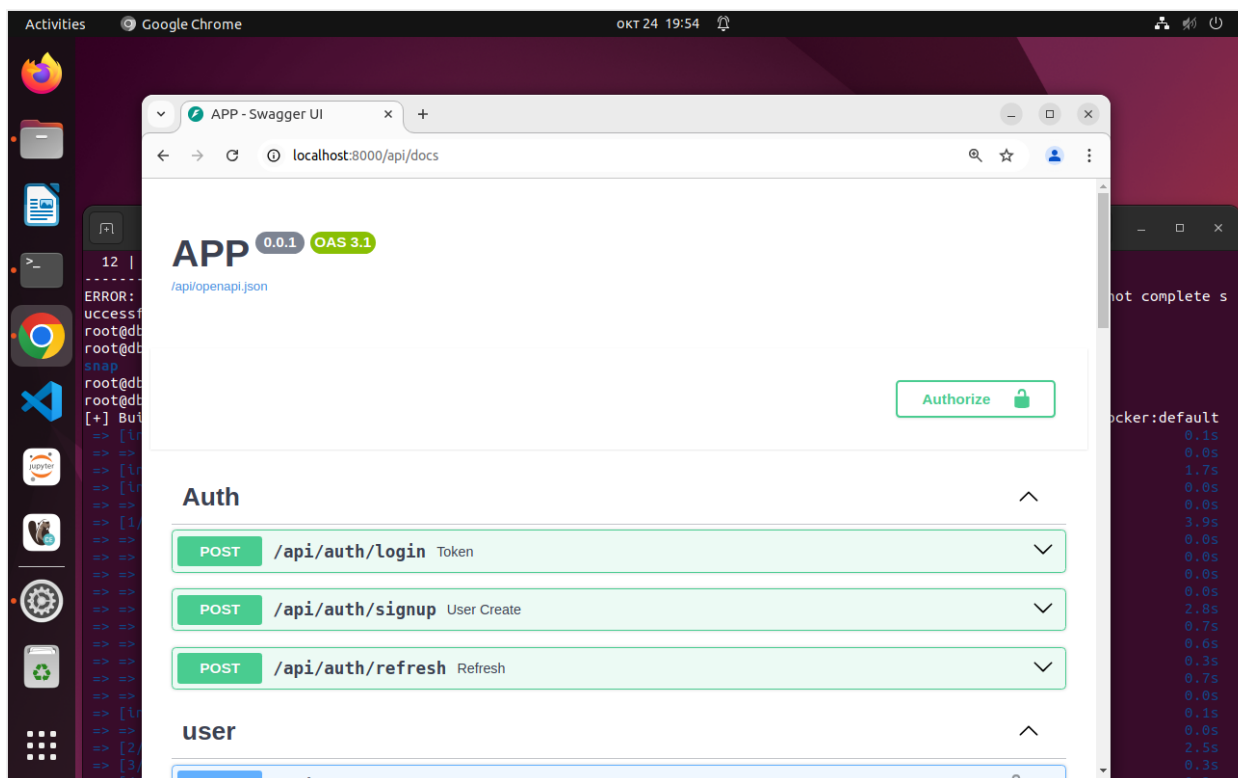


Рис.9 Результат выполнения хорошего dockerfile

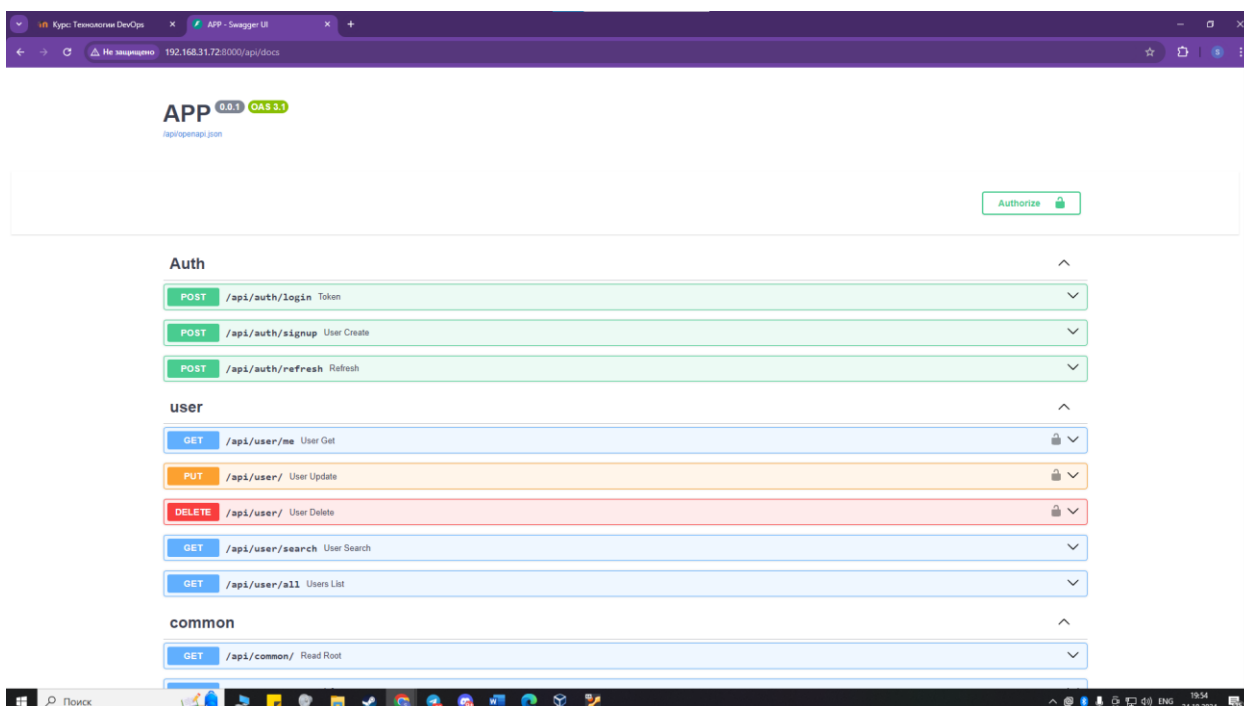


Рис.10 Результат выполнения хорошего dockerfile

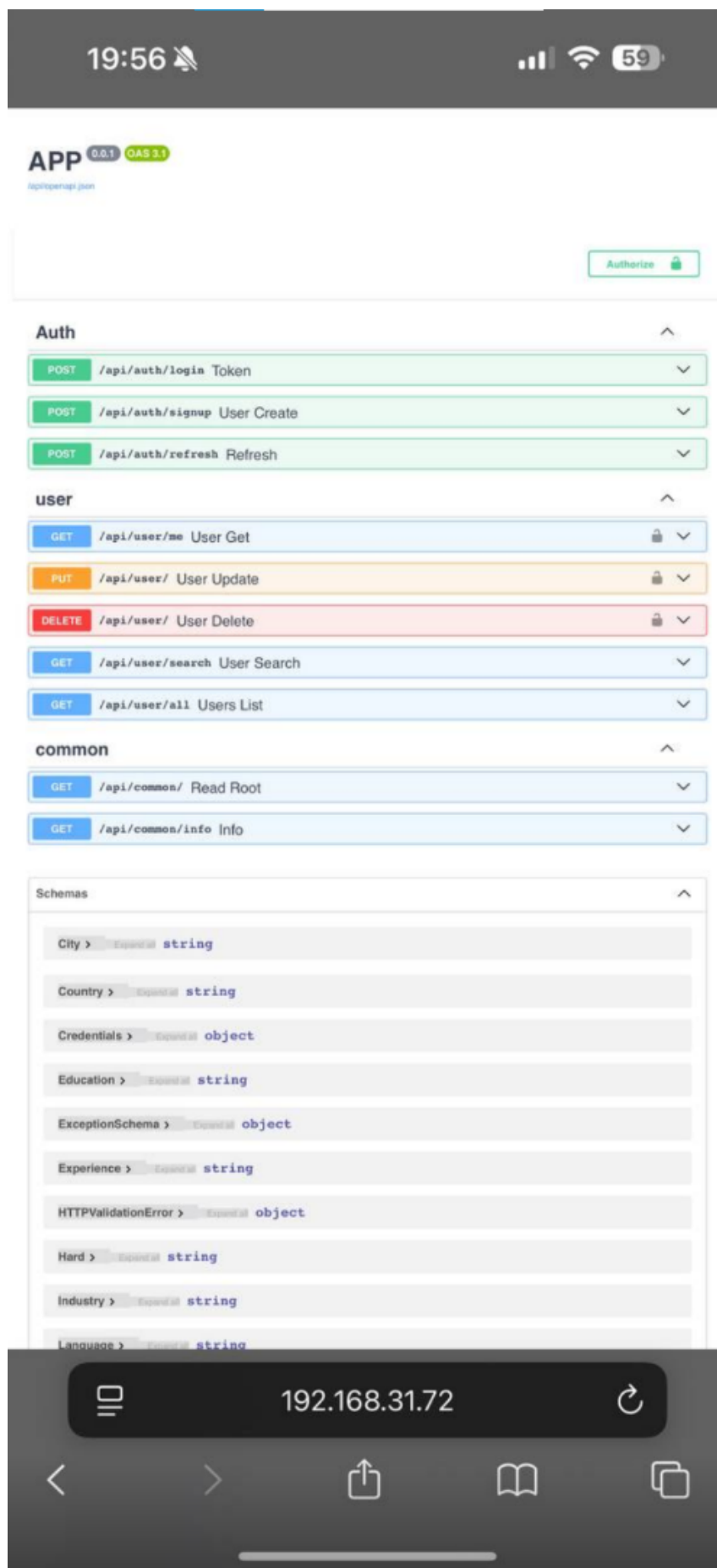


Рис.10 Результат выполнения хорошего dockerfile

### **Заключение**

После выполнения практической работы, были получены практические и теоретические навыки по работе с Docker, Dockerfile, рассмотрены «плохие» и «хорошие» практики по использованию контейнеров.