

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РФ

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«Национальный исследовательский университет ИТМО»

**Факультет программной инженерии и компьютерной техники**

## **Лабораторная работа №3.1**

по дисциплине

“Технологии виртуализации”

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# Задача

Ознакомиться с функционалом создания контейнеров в Docker

## Ход работы

## Docker

Проверим наличие докера и его работу командами:

```
docker --version
```

```
docker run --name hello_delete_me hello-world
```

```
glados@GLaDOS: ~/Desktop/University/University/ITMO_4/autmn/VirtualizationTechnologies/lab4$ ./scripts/docker-init.sh
Проверяю, установлен ли докер
docker --version
Docker version 28.4.0, build d8eb465
Docker установлен. Ну или ты меня хорошо обманываешь T_T
Запускаю hello-контейнер
docker run --name hello_delete_me hello-world

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
1. The Docker client contacted the Docker daemon.
2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
   (amd64)
3. The Docker daemon created a new container from that image which runs the
   executable that produces the output you are currently reading.
4. The Docker daemon streamed that output to the Docker client, which sent it
   to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
$ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
https://hub.docker.com/

For more examples and ideas, visit:
https://docs.docker.com/get-started/

Список контейнеров
docker container ls --all
CONTAINER ID   IMAGE          COMMAND                  CREATED              STATUS              PORTS          NAMES
1fa113b28691   hello-world    "/hello"                 Less than a second ago    Exited (0) Less than a second ago           hello_delete_me
edd09b2fc6e9   bsord/tetris   "/docker-entrypoint...." 9 hours ago           Exited (0) 9 hours ago                       tetris
6341c8355af9   nginx:alpine   "/docker-entrypoint...." 9 hours ago           Exited (0) 9 hours ago                       nextcloud_web
cb3a6354c68e   nextcloud:latest "/entrypoint.sh apac..." 9 hours ago           Exited (0) 9 hours ago                       nextcloud_app
7807a6ee637a   mariadb:latest "/docker-entrypoint.s..." 9 hours ago           Exited (0) 9 hours ago                       nextcloud_db
69c49fefc22f   bamboocz/phpvirtualbox:latest "/bin/sh -c 'php82 /..." 10 hours ago          Exited (0) 10 hours ago                       phpvirtualbox

Не знаю какой смысл запускать что бы то ни было из второго пункта лр - но вот
docker run Hello_Rumskiy
docker: invalid reference format: repository name (library/Hello_Rumskiy) must be lowercase

Run 'docker run --help' for more information
Перейти к запуску Apache(y/n)?
y
```

# Nginx

Создание контейнера с nginx и проброс порта 80 -> 8080

```
glados@GLaDOS:~/Desktop/University/University/ITMO_4/autmn/VirtualizationTechnologies/Lab4$ ./scripts/init-nginx.sh
Подготавливаем к запуску контейнер с nginx
Создаю html файл
file:///home/glados/Desktop/University/University/ITMO_4/autmn/VirtualizationTechnologies/Lab4/dockerfiles/nginx/index.html
Собираю docker image для nginx2
Содержимое докер-файла:
FROM nginx:alpine

RUN mkdir -p /home/www/html

COPY index.html /home/www/html/

RUN echo 'server { \
    listen 80; \
    root /home/www/html; \
    index index.html; \
}' > /etc/nginx/conf.d/default.conf

EXPOSE 80
docker build --no-cache -t xoeqvdp/lab3-nginx .
[+] Building 0.5s (9/9) FINISHED
=> [internal] load build definition from Dockerfile
=> => transferring dockerfile: 256B
=> [internal] load metadata for docker.io/library/nginx:alpine
=> [internal] load .dockerignore
=> => transferring context: 2B
=> CACHED [1/4] FROM docker.io/library/nginx:alpine
=> [internal] load build context
=> => transferring context: 116B
=> [2/4] RUN mkdir -p /home/www/html
=> [3/4] COPY index.html /home/www/html/
=> [4/4] RUN echo 'server { \
=>     listen 80; \
=>     root /home/www/html; \
=>     index index.html; \
=> }' > /etc/nginx/conf.d/default.conf
=> exporting layers
=> => writing image sha256:d747a22dc18d668db7781b035c2f44a2a69e5398663fedd40f0c1e3d1523dc96
=> => naming to docker.io/xoeqvdp/lab3-nginx
Запускаю контейнер в фоне
docker run -d -p 8080:80 --name nginx-app xoeqvdp/lab3-nginx
318caad4d0acdf09210b5df0a187283470b9346f2ab470ce504b3ead607394974
Проверить доступность
Тыкай на меня, давай. ДАВАЙ ЖЕ.
Перейти к запуску MariaDB(y/n)?
n
Ну и не надо T_T
glados@GLaDOS:~/Desktop/University/University/ITMO_4/autmn/VirtualizationTechnologies/Lab4$
```

Проверка работы



# MariaDB

## Создание и запуска контейнера MariaDB

```
glados@GLaDOS:~/Desktop/University/University/ITMO_4/autnn/VirtualizationTechnologies/lab4$ ./scripts/init-mariadb.sh
Запуск контейнера с MariaDB
Содержимое докер-файла:
FROM mariadb:latest

ENV MYSQL_ROOT_PASSWORD=rootpass
ENV MYSQL_USER=labuser
ENV MYSQL_PASSWORD=userpass

WORKDIR /home/DB

COPY init.sql /docker-entrypoint-initdb.d/

EXPOSE 3306

Создам изображение
docker build -t xoeqvdp/lab3-mariadb .
[+] Building 0.1s (8/8) FINISHED                                docker:default
=> [internal] load build definition from Dockerfile                0.0s
=> -- transferring dockerfile: 220B                                0.0s
=> WARN: SecretsUsedInArgOrEnv: Do not use ARG or ENV instructions for sensitive data (ENV "MYSQL_ROOT_PASSWORD") (line 3)  0.0s
=> WARN: SecretsUsedInArgOrEnv: Do not use ARG or ENV instructions for sensitive data (ENV "MYSQL_PASSWORD") (line 5)  0.0s
=> [internal] load metadata for docker.io/library/mariadb:latest  0.0s
=> [internal] load .dockerignore                                   0.0s
=> -- transferring context: 2B                                     0.0s
=> [1/3] FROM docker.io/library/mariadb:latest                    0.0s
=> [internal] load build context                                   0.0s
=> -- transferring context: 30B                                     0.0s
=> CACHED [2/3] WORKDIR /home/DB                                  0.0s
=> CACHED [3/3] COPY init.sql /docker-entrypoint-initdb.d/        0.0s
=> exporting to image                                             0.0s
=> exporting layers                                              0.0s
=> writing image sha256:7868f5bea4833c3675d634b2d7c8c6f49c6e898bd6b1ab87c88444d957baa36 0.0s
=> naming to docker.io/xoeqvdp/lab3-mariadb                       0.0s

2 warnings found (use docker --debug to expand):
 - SecretsUsedInArgOrEnv: Do not use ARG or ENV instructions for sensitive data (ENV "MYSQL_ROOT_PASSWORD") (line 3)
 - SecretsUsedInArgOrEnv: Do not use ARG or ENV instructions for sensitive data (ENV "MYSQL_PASSWORD") (line 5)
Создам контейнер
docker run -d -p 3306:3306 --name mariadb-app xoeqvdp/lab3-mariadb
0e9f019978886e9eb3984f9846e37b84a8450f88fb2b2031a01e89a272c7ebf2
для подключения к БД(пароль - rootpass)
glados@GLaDOS:~/Desktop/University/University/ITMO_4/autnn/VirtualizationTechnologies/lab4$ docker exec -it mariadb-app mariadb -u root -p
```

## Проверка работы через доступ к таблице

```
glados@GLaDOS:~/Desktop/University/University/ITMO_4/autnn/VirtualizationTechnologies/lab4$ docker exec -it mariadb-app mariadb -u root -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 3
Server version: 12.1.2-MariaDB-ubu2404 mariadb.org binary distribution

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> use rumskiy;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
MariaDB [rumskiy]> select * from messages;
+-----+
| id | text |
+-----+
| 1 | hello |
| 2 | darkness |
| 3 | my |
| 4 | old |
| 5 | friend |
+-----+
5 rows in set (0.002 sec)
```

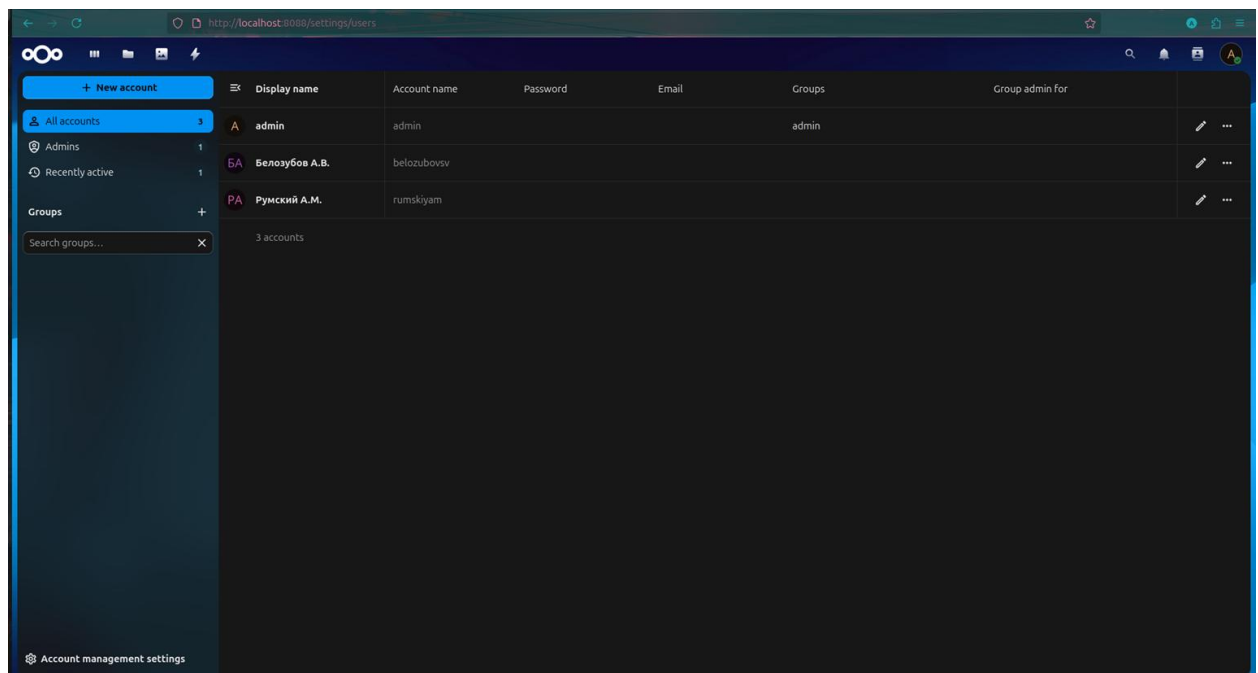
# NextCloud

Создание и запуск контейнера с NextCloud через docker-compose. Compose используется для упрощения настройки, так как сразу можно задать проброс портов и переменные окружения

```
glados@GLaDOS: ~/Desktop/University/University/ITMO_4/autmn/VirtualizationTechnologies/lab4$ ./scripts/init-nextCloud.sh
Запуск контейнера с NextCloud
Содержимое докер-файла:
version: '3.8'

services:
  nextcloud:
    image: nextcloud:latest
    ports:
      - "8088:80"
    volumes:
      - /home/www/NextCloud:/var/www/html
    environment:
      - NEXTCLOUD_ADMIN_USER=admin
      - NEXTCLOUD_ADMIN_PASSWORD=adminpass
    restart: unless-stopped
Запускаем через docker-compose
docker compose up -d
WARN[0000] /home/glados/Desktop/University/University/ITMO_4/autmn/VirtualizationTechnologies/lab4/dockerfiles/nextcloud/docker-compose.yaml: the attribute 'version' is obsolete, it will be ignored, please remove it to avoid potential confusion
[+] Running 2/2
 ✓ Network nextcloud_default      Created                                0.1s
 ✓ Container nextcloud-nextcloud-1 Started                               0.2s
Проверить доступность
Тыкай на меня, давай. ДАВАЙ ЖЕ.
glados@GLaDOS: ~/Desktop/University/University/ITMO_4/autmn/VirtualizationTechnologies/lab4$
```

## Проверка работы



# Compose

Файл:

version: '3.8'

services:

db:

image: mariadb:latest

container\_name: nextcloud\_db

restart: unless-stopped

environment:

MYSQL\_ROOT\_PASSWORD: rootpass

MYSQL\_USER: labuser

MYSQL\_PASSWORD: userpass

volumes:

- /home/DB:/docker-entrypoint-initdb.d/

- db\_data:/var/lib/mysql

networks:

- nextcloud\_net

web:

image: nginx:alpine

container\_name: nextcloud\_web

restart: unless-stopped

volumes:

- /home/www/html:/usr/share/nginx/html

- ./nginx.conf:/etc/nginx/conf.d/default.conf

ports:

- "80:80"

depends\_on:

- nextcloud

networks:

- nextcloud\_net

nextcloud:

image: nextcloud:latest

container\_name: nextcloud\_app

restart: unless-stopped

ports:

- "2022:80"

volumes:

- /home/www/NextCloud:/var/www/html

environment:

- NEXTCLOUD\_ADMIN\_USER=admin

- NEXTCLOUD\_ADMIN\_PASSWORD=adminpass

- MYSQL\_HOST=db

- MYSQL\_USER=root

- MYSQL\_PASSWORD=rootpass

- MYSQL\_DATABASE=nextcloud

depends\_on:

- db

networks:

- nextcloud\_net

volumes:

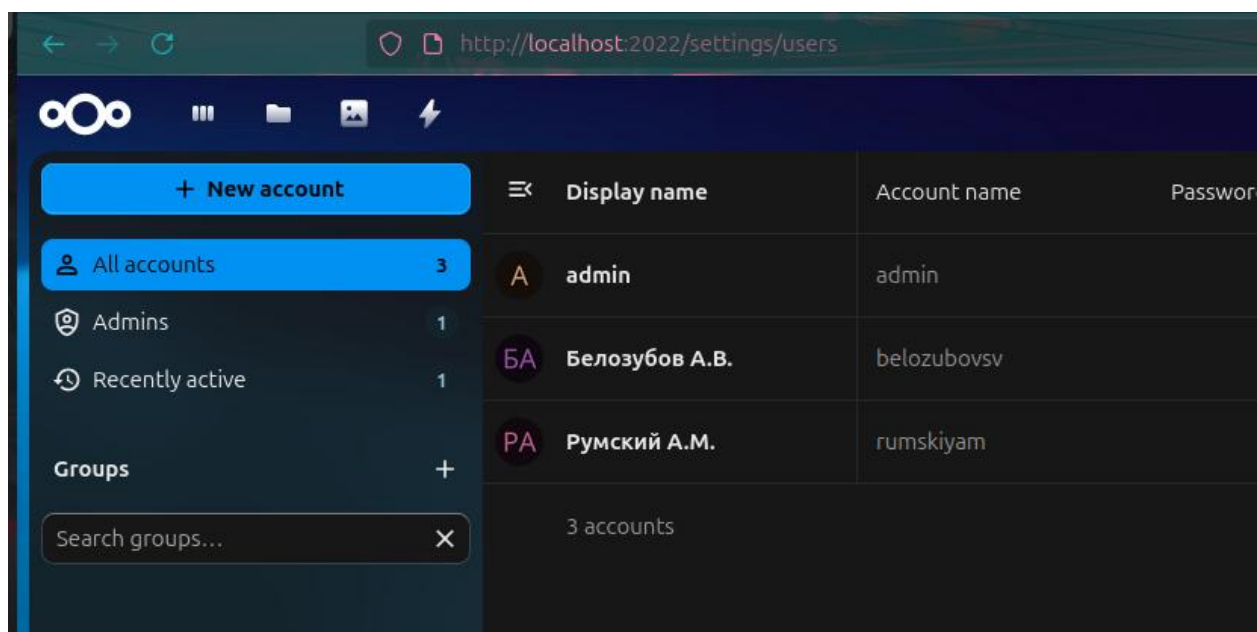
db\_data:

networks:

nextcloud\_net:

driver: bridge

Проверка работы

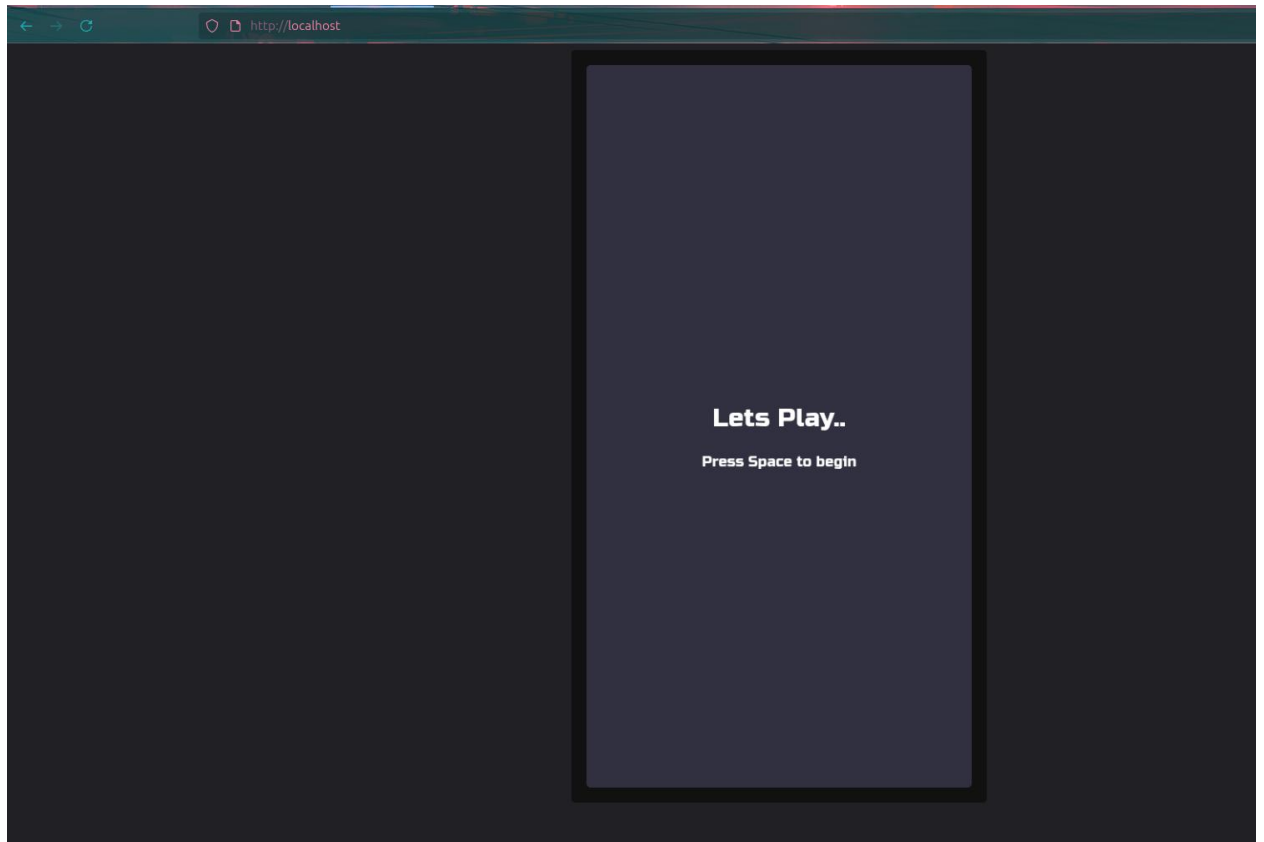




## Game

```
docker run -d -p 80:80 --name tetris bsord/tetris
```

Или, если запуск повторный: `docker start tetris`



## Вывод

В ходе данной лабораторной работы я ознакомился с системой контейнеризации Docker, базовым набором команд для создания и управления контейнерами и снимками, а так же изучил структуру docker compose и его команды.

## Дополнительное задание

### Текст:

Подключить portainer в финальный docker-compose

### Выполнение:

Изменим docker-compose

```
version: '3.8'
```

```
services:
```

```
  db:
```

```
    image: mariadb:latest
```

```
    container_name: nextcloud_db
```

```
    restart: unless-stopped
```

```
    environment:
```

```
      MYSQL_ROOT_PASSWORD: rootpass
```

```
      MYSQL_USER: labuser
```

```
      MYSQL_PASSWORD: userpass
```

```
    volumes:
```

```
      - /home/DB:/docker-entrypoint-initdb.d/
```

```
      - db_data:/var/lib/mysql
```

```
    networks:
```

```
      - nextcloud_net
```

```
  web:
```

```
    image: nginx:alpine
```

```
    container_name: nextcloud_web
```

```
    restart: unless-stopped
```

```
    volumes:
```

```
      - /home/www/html:/usr/share/nginx/html
```

```
      - ./nginx.conf:/etc/nginx/conf.d/default.conf
```

```
    ports:
```

```
      - "80:80"
```

```
    depends_on:
```

```
      - nextcloud
```

networks:

- nextcloud\_net

nextcloud:

image: nextcloud:latest

container\_name: nextcloud\_app

restart: unless-stopped

ports:

- "2022:80"

volumes:

- /home/www/NextCloud:/var/www/html

environment:

- NEXTCLOUD\_ADMIN\_USER=admin
- NEXTCLOUD\_ADMIN\_PASSWORD=adminpass
- MYSQL\_HOST=db
- MYSQL\_USER=root
- MYSQL\_PASSWORD=rootpass
- MYSQL\_DATABASE=nextcloud

depends\_on:

- db

networks:

- nextcloud\_net

portainer:

image: portainer/portainer-ce:latest

container\_name: portainer

restart: unless-stopped

ports:

- "9000:9000"

volumes:

- /var/run/docker.sock:/var/run/docker.sock
- portainer\_data:/data

networks:

- nextcloud\_net

volumes:

db\_data:

portainer\_data:

networks:

nextcloud\_net:

driver: bridge

После этого, по адресу localhost:9000

The screenshot shows the Portainer web interface in a web browser. The address bar displays 'localhost:9000'. The interface has a dark theme. On the left is a sidebar with the 'PORTAINER.io' logo and a navigation menu including 'Home', 'local' (selected), 'Dashboard', 'Templates', 'Stacks', 'Containers', 'Images', 'Networks', 'Volumes', 'Events', and 'Host'. Below this is an 'Administration' section with links for 'User-related', 'Environment-related', 'Registries', 'Logs', 'Notifications', and 'Settings'. The main area is titled 'Containers' and shows a 'Container list' table. The table has columns for Name, State, Quick Actions, Stack, Image, Created, IP Address, Published Ports, and Ownership. It lists several containers: 'cloud-mqtt' (exited - code 0), 'fog-nodered' (exited - code 143), 'minikube' (exited - code 130), 'nextcloud\_app' (running), 'nextcloud\_db' (running), 'nextcloud\_web' (running), 'phpvirtualbox-72-2-phpvirtual...' (exited - code 0), 'portainer' (running), and 'tetris' (exited - code 0). The 'portainer' container is highlighted, showing it is running on the 'compose' stack using the 'portainer/portainer-ce:latest' image. At the bottom right of the table, there is a pagination control showing 'Items per page' set to '10'.

Name	State	Quick Actions	Stack	Image	Created	IP Address	Published Ports	Ownership
cloud-mqtt	exited - code 0	[Icons]	-	eclipse-mosquitto	2025-12-18 20:15:02	-	-	administrator
fog-nodered	exited - code 143	[Icons]	-	nodered/node-red	2025-12-18 19:41:26	-	-	administrator
minikube	exited - code 130	[Icons]	-	gcr.io/k8s-minikube/kicbase:v0.0.48	2025-12-18 18:05:45	-	-	administrator
nextcloud_app	running	[Icons]	compose	nextcloud:latest	2025-12-27 14:33:50	172.18.0.4	80:80	administrator
nextcloud_db	running	[Icons]	compose	mysql:latest	2025-12-27 14:33:32	172.18.0.3	-	administrator
nextcloud_web	running	[Icons]	compose	nginx:alpine	2025-12-27 14:33:50	172.18.0.5	80:80	administrator
phpvirtualbox-72-2-phpvirtual...	exited - code 0	[Icons]	phpvirtualbox-72-2	phpvirtualbox-72-2-phpvirtualbox	2025-12-27 11:59:52	-	-	administrator
portainer	running	[Icons]	compose	portainer/portainer-ce:latest	2025-12-27 14:33:50	172.18.0.2	9000:9000	administrator
tetris	exited - code 0	[Icons]	-	bsord/tetris	2025-12-27 15:46:04	-	-	administrator

Проверка: Запуск контейнера

Containers

Container list

Containers

Search...

Start

Stop

Kill

Restart

Pause

Resume

Remove

+ Add container

Name	State	Quick Actions	Stack	Image	Created	IP Address	Published Ports	Ownership
cloud-mqtt	exited - code 0		-	eclipse-mosquitto	2025-12-18 20:15:02	-	-	administrator
fog-nodered	exited - code 143		-	nodered/node-red	2025-12-18 19:41:26	-	-	administrator
minikube	exited - code 130		-	gcr.io/k8s-minikube/kicbase:v0.0.48	2025-12-18 18:05:45	-	-	administrator
nextcloud_app	running		compose	nextcloud:latest	2025-12-27 14:33:50	172.18.0.4	2022:80	administrator
nextcloud_db	running		compose	mariadb:latest	2025-12-27 14:33:32	172.18.0.3	-	administrator
nextcloud_web	running		compose	nginx:alpine	2025-12-27 14:33:50	172.18.0.5	80:80	administrator
phpvirtualbox-72-2-phpvirtual...	exited - code 0		phpvirtualbox-72-2	phpvirtualbox-72-2-phpvirtualbox	2025-12-27 11:59:52	-	-	administrator
portainer	running		compose	portainer/portainer-ce:latest	2025-12-27 14:33:50	172.18.0.2	9000:9000	administrator
tetris	running		-	bsord/tetris	2025-12-27 15:46:04	172.17.0.2	8080:80	administrator

Items per page 10

Container successfully started  
tetris

Проверка: Остановка контейнера

Containers

Container list

Containers

Search...

Start

Stop

Kill

Restart

Pause

Resume

Remove

+ Add container

Name	State	Quick Actions	Stack	Image	Created	IP Address	Published Ports	Ownership
cloud-mqtt	exited - code 0		-	eclipse-mosquitto	2025-12-18 20:15:02	-	-	administrator
fog-nodered	exited - code 143		-	nodered/node-red	2025-12-18 19:41:26	-	-	administrator
minikube	exited - code 130		-	gcr.io/k8s-minikube/kicbase:v0.0.48	2025-12-18 18:05:45	-	-	administrator
nextcloud_app	running		compose	nextcloud:latest	2025-12-27 14:33:50	172.18.0.4	2022:80	administrator
nextcloud_db	running		compose	mariadb:latest	2025-12-27 14:33:32	172.18.0.3	-	administrator
nextcloud_web	running		compose	nginx:alpine	2025-12-27 14:33:50	172.18.0.5	80:80	administrator
phpvirtualbox-72-2-phpvirtual...	exited - code 0		phpvirtualbox-72-2	phpvirtualbox-72-2-phpvirtualbox	2025-12-27 11:59:52	-	-	administrator
portainer	running		compose	portainer/portainer-ce:latest	2025-12-27 14:33:50	172.18.0.2	9000:9000	administrator
tetris	exited - code 0		-	bsord/tetris	2025-12-27 15:46:04	-	-	administrator

Items per page 10

Container successfully stopped  
tetris