

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РФ

Федеральное государственное автономное образовательное учреждение высшего образования
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Факультет программной инженерии и компьютерной техники

Лабораторная работа №3.1

по дисциплине
“Технологии виртуализации”

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Санкт-Петербург, 2025 год

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/autumn/VirtualizationTechnologies/lab4$ ./scripts/docker-init.sh  
Проверено, установлен ли докер  
docker --version  
Docker version 28.4.0, build d8eb465  
Docker установлен. Ну или ты меня хорошо обманываешь Т_Т  
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  
7887a6eee637a mariadb:latest "docker-entrypoint.s..." 9 hours ago Exited (0) 9 hours ago nextcloud_db  
69c49fefc2f bambooocz/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(у/n)?  
S
```

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
    Создаем html файл
        file:///home/glados/Desktop/University/University/ITMO_4/autmn/VirtualizationTechnologies/lab4/dockerfiles/nginx/index.html
    Собираем docker image для nginx
Содержимое докер-файла:
FROM nginx:alpine

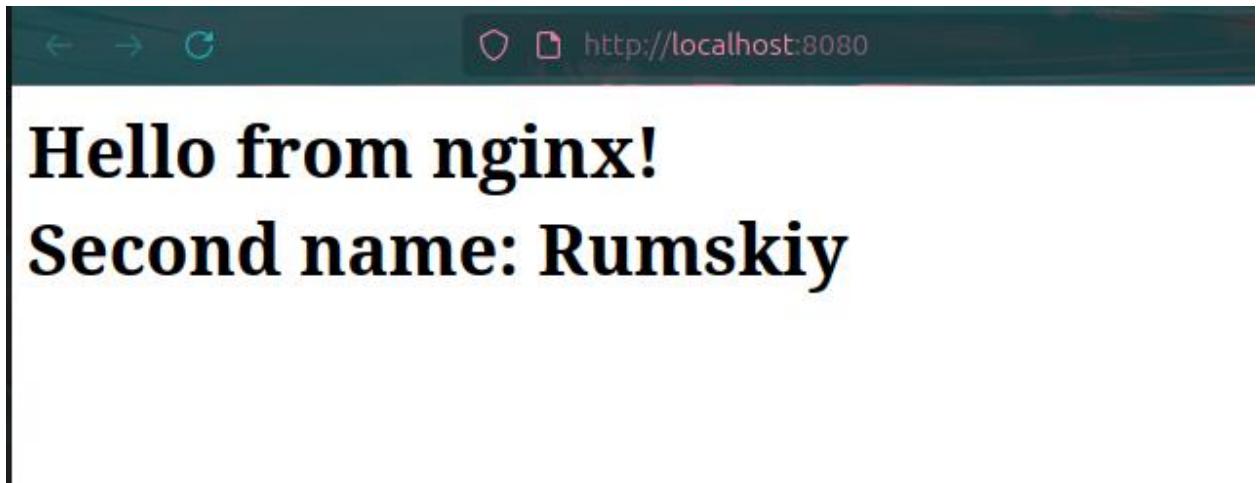
RUN mkdir -p /home/www/html

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 .dockerrcignore
--> 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 image sha256:d747a22dc18d668db7781b035c2f44a2a69e5398663fedd40f0c1e3d1523dc96
--> exporting layers
--> writing image sha256:d747a22dc18d668db7781b035c2f44a2a69e5398663fedd40f0c1e3d1523dc96
--> naming to docker.io/xoeqvdp/lab3-nginx
Запускаем контейнер в фоне
docker run -d -p 8080:80 --name nginx-app xoeqvdp/lab3-nginx
318caadd4d9acf09210b55df0a187283470b9346f2ab47ce504b3ead607394974
Проверить доступность
Тыкай на меня, давай. ДАВАЙ ХЕ.
Перейти к запуску MariaDB(y/n)?
n
Ну и не надо Т_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/autmn/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

Создаю изображение
docker build -t xoeqvdp/lab3-mariadb .
[+] Building 0.1s (8/8) FINISHED
=> [internal] load build definition from Dockerfile
=> => transferring dockerfile: 220B
=> WARN: SecretsUsedInArgOrEnv: Do not use ARG or ENV instructions for sensitive data (ENV "MYSQL_ROOT_PASSWORD") (line 3)
=> WARN: SecretsUsedInArgOrEnv: Do not use ARG or ENV instructions for sensitive data (ENV "MYSQL_PASSWORD") (line 5)
=> [internal] load metadata for docker.io/library/mariadb:latest
=> [internal] load .dockerrcignore
=> => transferring context: 2B
=> [1/3] FROM docker.io/library/mariadb:latest
=> [internal] load build context
=> => transferring context: 30B
=> CACHED [2/3] WORKDIR /home/DB
=> CACHED [3/3] COPY init.sql /docker-entrypoint-initdb.d/
=> exporting to image
=> => exporting layers
=> => writing image sha256:7060f5bea4833c3675d634b2d7c8c6f49c6e8988bd6b1ab87c88444d957baa36
=> => naming to docker.io/xoeqvdp/lab3-mariadb

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)
Создаю контейнер
docker run -d -p 3306:3306 --name mariadb-app xoeqvdp/lab3-mariadb
0e9f01997886e9eb3904f9846e37b84a8450f88fb2b2031a01e89a272c7ebf2
Для подключения к БД(пароль - rootpass):
docker exec -it mariadb-app mariadb -u root -p
glados@GLaDOS:~/Desktop/University/University/ITMO_4/autmn/VirtualizationTechnologies/lab4$
```

Проверка работы через доступ к таблице

```
glados@GLaDOS:~/Desktop/University/University/ITMO_4/autmn/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-ubuntu2404 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
  ✓ Container nextcloud-nextcloud-1    Started
Проверить доступность
Такой на меня, давай.. ДАВАЙ ЖЕ.
glados@GLaDOS:~/Desktop/University/University/ITMO_4/autmn/VirtualizationTechnologies/lab4$
```

Проверка работы

Display name	Account name	Password	Email	Groups	Group admin for
A	admin			admin	
БА	belozubovsv				
РА	rumskiyam				

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

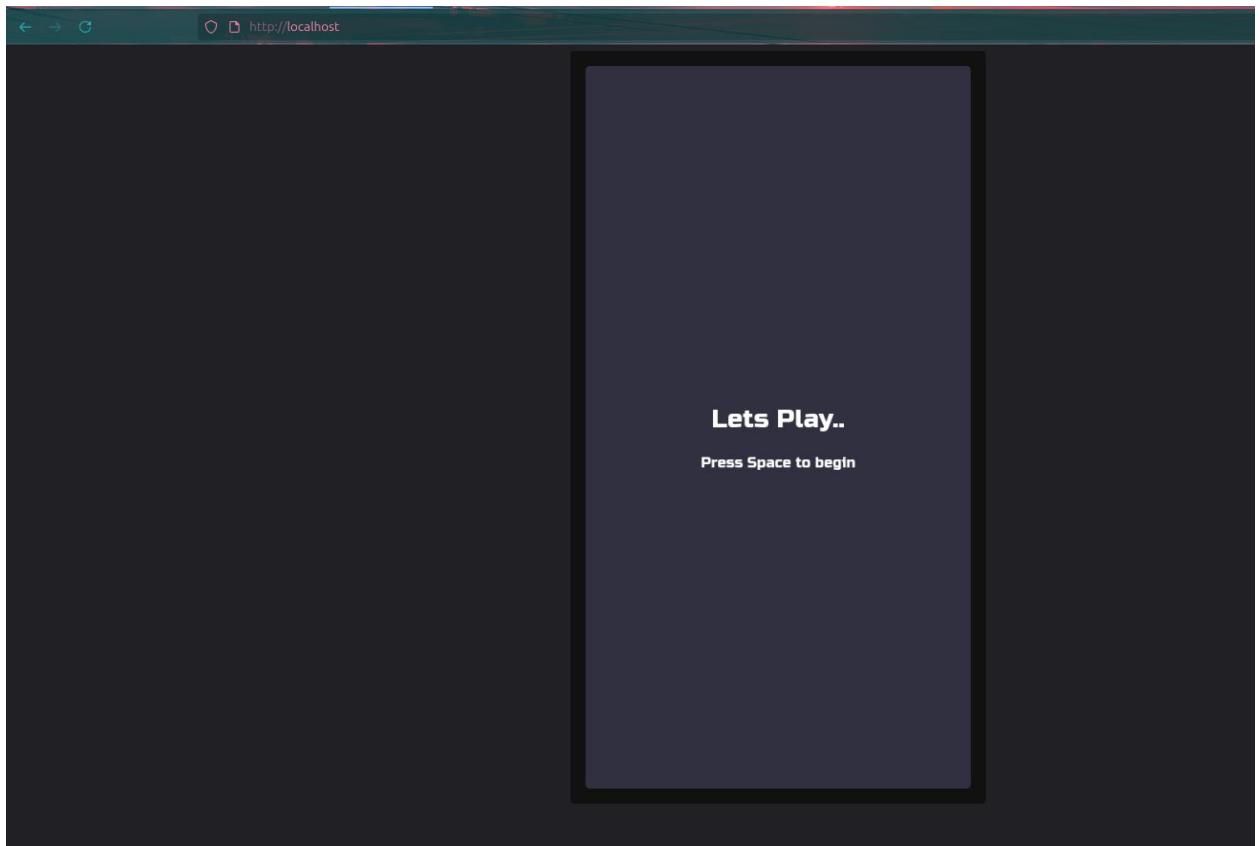
The screenshot shows a web application interface for managing user accounts. The URL in the address bar is `http://localhost:2022/settings/users`. On the left, there's a sidebar with navigation links: 'All accounts' (3), 'Admins' (1), 'Recently active' (1), and a 'Groups' section with a search bar. The main area is a table with three columns: 'Display name', 'Account name', and 'Password'. The table contains three rows of data:

Display name	Account name	Password
A admin	admin	
БА Белозубов А.В.	belozubovsv	
РА Румский А.М.	rumskiyam	

Below the table, it says '3 accounts'.

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

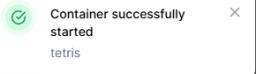
The screenshot shows the Portainer interface at localhost:9000. The left sidebar is titled 'local' and includes sections for Home, Dashboard, Templates, Stacks, Containers (which is selected), Images, Networks, Volumes, Events, and Host. The right panel is titled 'Container list' and displays a table of running containers. The table columns are: Name, State, Quick Actions, Stack, Image, Created, IP Address, Published Ports, and Ownership. The running containers listed are:

Name	State	Quick Actions	Stack	Image	Created	IP Address	Published Ports	Ownership
nextcloud_app	running	[Start/Stop]	compose	nextcloud:latest	2025-12-27 14:33:50	172.18.0.4	2022:80	administrator
nextcloud_db	running	[Start/Stop]	compose	mariadb:latest	2025-12-27 14:33:32	172.18.0.3	-	administrator
nextcloud_web	running	[Start/Stop]	compose	nginx:alpine	2025-12-27 14:33:50	172.18.0.5	80:80	administrator
portainer	running	[Start/Stop]	compose	portainer/portainer-ce:latest	2025-12-27 14:33:50	172.18.0.2	9000:9000	administrator

Проверка: Запуск контейнера

Containers

Container list



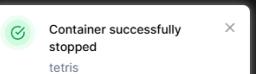
<input type="checkbox"/>	Name	State	Quick Actions	Stack	Image	Created	IP Address	Published Ports	Ownership
<input type="checkbox"/>	cloud-mqtt	exited - code 0	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	-	eclipse-mosquitto	2025-12-18 20:15:02	-	-	administrator
<input type="checkbox"/>	fog-nodered	exited - code 143	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	-	nodered/node-red	2025-12-18 19:41:26	-	-	administrator
<input type="checkbox"/>	minikube	exited - code 130	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	-	gcr.io/k8s-minikube/kicbase:v0.0.48	2025-12-18 18:05:45	-	-	administrator
<input type="checkbox"/>	nextcloud_app	running	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	compose	nextcloud:latest	2025-12-27 14:33:50	172.18.0.4	2222:80	administrator
<input type="checkbox"/>	nextcloud_db	running	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	compose	mariadb:latest	2025-12-27 14:33:32	172.18.0.3	-	administrator
<input type="checkbox"/>	nextcloud_web	running	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	compose	nginx:alpine	2025-12-27 14:33:50	172.18.0.5	80:80	administrator
<input type="checkbox"/>	phpvirtualbox-72-2-phpvirtual...	exited - code 0	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	phpvirtualbox-72-2	phpvirtualbox-72-2-phpvirtualbox	2025-12-27 11:59:52	-	-	administrator
<input type="checkbox"/>	portainer	running	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	compose	portainer/portainer-ce:latest	2025-12-27 14:33:50	172.18.0.2	9000:9000	administrator
<input type="checkbox"/>	tetris	running	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	-	bsord/tetris	2025-12-27 15:46:04	172.17.0.2	8080:80	administrator

Items per page: 10

Проверка: Остановка контейнера

Containers

Container list



<input type="checkbox"/>	Name	State	Quick Actions	Stack	Image	Created	IP Address	Published Ports	Ownership
<input type="checkbox"/>	cloud-mqtt	exited - code 0	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	-	eclipse-mosquitto	2025-12-18 20:15:02	-	-	administrator
<input type="checkbox"/>	fog-nodered	exited - code 143	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	-	nodered/node-red	2025-12-18 19:41:26	-	-	administrator
<input type="checkbox"/>	minikube	exited - code 130	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	-	gcr.io/k8s-minikube/kicbase:v0.0.48	2025-12-18 18:05:45	-	-	administrator
<input type="checkbox"/>	nextcloud_app	running	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	compose	nextcloud:latest	2025-12-27 14:33:50	172.18.0.4	2222:80	administrator
<input type="checkbox"/>	nextcloud_db	running	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	compose	mariadb:latest	2025-12-27 14:33:32	172.18.0.3	-	administrator
<input type="checkbox"/>	nextcloud_web	running	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	compose	nginx:alpine	2025-12-27 14:33:50	172.18.0.5	80:80	administrator
<input type="checkbox"/>	phpvirtualbox-72-2-phpvirtual...	exited - code 0	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	phpvirtualbox-72-2	phpvirtualbox-72-2-phpvirtualbox	2025-12-27 11:59:52	-	-	administrator
<input type="checkbox"/>	portainer	running	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	compose	portainer/portainer-ce:latest	2025-12-27 14:33:50	172.18.0.2	9000:9000	administrator
<input type="checkbox"/>	tetris	exited - code 0	<input type="button" value="Start"/> <input type="button" value="Stop"/> <input type="button" value="Kill"/> <input type="button" value="Restart"/> <input type="button" value="Pause"/> <input type="button" value="Resume"/> <input type="button" value="Remove"/>	-	bsord/tetris	2025-12-27 15:46:04	-	-	administrator

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