

1 Часть

Создание файла YAML для 2-х контейнеров

```
GNU nano 6.2 docker-compose.yml
version: '3.9'
services:
  db:
    image: mariadb:10.10.2
    #как пример показать и такое в режиме лайвкода:
    # build: ./db
    restart: always
    environment:
      MYSQL_ROOT_PASSWORD: 12345
  adminer:
    image: adminer:4.8.1
    restart: always
    ports:
      - 6080:8080

^G Help      ^O Write Out  ^W Where Is   ^K Cut        ^T Execute
^X Exit      ^R Read File  ^_ Replace    ^U Paste      ^J Justify
```

Создание и запуск в интерактивном режиме (начало листинга)

```

root@db-linux:/home/db# mkdir compose
root@db-linux:/home/db# cd compose
root@db-linux:/home/db/compose#
root@db-linux:/home/db/compose#
root@db-linux:/home/db/compose# nano docker-compose.yml
root@db-linux:/home/db/compose# nano docker-compose.yml
root@db-linux:/home/db/compose# nano docker-compose.yml
root@db-linux:/home/db/compose# docker ps -a
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS        PORTS          NAMES
root@db-linux:/home/db/compose#
root@db-linux:/home/db/compose# docker images
REPOSITORY          TAG          IMAGE ID          CREATED          SIZE
hello0              latest      83de42b2bcd8     2 days ago      807MB
ubuntu              22.10       692eb4a905c0     2 weeks ago     70.3MB
phpmyadmin/phpmyadmin latest      e4be0d1537f5     3 months ago    517MB
mysql               8.0.31      7484689f290f     7 months ago    538MB
nginx               latest      2b7d6430f78d     10 months ago   142MB
amytabb/docker_ubuntu16_essentials latest      13f6d277d91b     4 years ago     807MB
root@db-linux:/home/db/compose# docker-compose up
ERROR: build path /home/db/compose/db either does not exist, is not accessible, or is not a valid URL.
root@db-linux:/home/db/compose# nano docker-compose.yml
root@db-linux:/home/db/compose# docker-compose up
Creating network "compose_default" with the default driver
Pulling db (mariadb:10.10.2)...
ERROR: Get "https://registry-1.docker.io/v2/library/mariadb/manifests/sha256:bfc25a68e113de43d0d112f5a7126df8e27d5ce6e": dial tcp 34.205.13.154:443: i/o timeout
root@db-linux:/home/db/compose# docker-compose up
Pulling db (mariadb:10.10.2)...
10.10.2: Pulling from library/mariadb
10ac4908093d: Pull complete
44779101e748: Pull complete
a721db3e3f3d: Pull complete
1850a929b84a: Pull complete
397a918c7da3: Pull complete

```

Завершение установки и обмен данными

```

db_1      | 2023-07-16 12:03:59 0 [Note] Server socket created on IP: '::'.
db_1      | 2023-07-16 12:03:59 0 [Note] mariadbd: ready for connections.
db_1      | Version: '10.10.2-MariaDB-1:10.10.2+maria~ubu2204' socket: '/run/mysqld/mysqld.sock' port: 3306 mar
tribution
adminer_1 | [Sun Jul 16 14:55:19 2023] [::ffff:172.19.0.1]:44130 Accepted
adminer_1 | [Sun Jul 16 14:55:19 2023] [::ffff:172.19.0.1]:44130 [200]: GET /
adminer_1 | [Sun Jul 16 14:55:19 2023] [::ffff:172.19.0.1]:44130 Closing
adminer_1 | [Sun Jul 16 14:56:26 2023] [::ffff:10.0.2.2]:54515 Accepted
adminer_1 | [Sun Jul 16 14:56:26 2023] [::ffff:10.0.2.2]:54516 Accepted
adminer_1 | [Sun Jul 16 14:56:26 2023] [::ffff:10.0.2.2]:54515 [200]: GET /
adminer_1 | [Sun Jul 16 14:56:26 2023] [::ffff:10.0.2.2]:54515 Closing
adminer_1 | [Sun Jul 16 14:56:26 2023] [::ffff:10.0.2.2]:54516 [200]: GET /?file=default.css&version=4.8.1
adminer_1 | [Sun Jul 16 14:56:26 2023] [::ffff:10.0.2.2]:54516 Closing
adminer_1 | [Sun Jul 16 14:56:26 2023] [::ffff:10.0.2.2]:54517 Accepted
adminer_1 | [Sun Jul 16 14:56:26 2023] [::ffff:10.0.2.2]:54517 [200]: GET /?file=functions.js&version=4.8.1
adminer_1 | [Sun Jul 16 14:56:26 2023] [::ffff:10.0.2.2]:54517 Closing
adminer_1 | [Sun Jul 16 14:56:29 2023] [::ffff:10.0.2.2]:54531 Accepted
adminer_1 | [Sun Jul 16 14:56:29 2023] [::ffff:10.0.2.2]:54531 [200]: POST /?script=version
adminer_1 | [Sun Jul 16 14:56:29 2023] [::ffff:10.0.2.2]:54531 Closing
adminer_1 | [Sun Jul 16 14:56:29 2023] [::ffff:10.0.2.2]:54532 Accepted
adminer_1 | [Sun Jul 16 14:56:29 2023] [::ffff:10.0.2.2]:54532 [200]: GET /?file=favicon.ico&version=4.8.1
adminer_1 | [Sun Jul 16 14:56:29 2023] [::ffff:10.0.2.2]:54532 Closing
adminer_1 | [Sun Jul 16 14:56:30 2023] [::ffff:10.0.2.2]:54533 Accepted
adminer_1 | [Sun Jul 16 14:56:41 2023] [::ffff:10.0.2.2]:54533 [302]: POST /

```

Веб - интерфейс

← → ↻ 🏠 ⓘ localhost:6080/?server=db&username=root 🔍 📄 ☆ ⚙️ ☰ 🖨

Язык: Русский ▼ MySQL » db

Adminer 4.8.1

DB: ▼

[SQL-запрос](#) [Импорт](#)
[Экспорт](#)

Выбрать базу данных

[Создать базу данных](#) [Полномочия](#) [Список процессов](#) [Переменные](#) [Состояние](#)

Версия MySQL: **5.5.5-10.10.2-MariaDB-1:10.10.2+maria~ubu2204** с PHP-расширением **MySQLi**

Вы вошли как: **root@172.19.0.2**

	База данных - Обновить	Режим сопоставления	Таблицы	Размер - Вычислить
<input type="checkbox"/>	information_schema	utf8mb3_general_ci	?	?
<input type="checkbox"/>	mysql	utf8mb4_general_ci	?	?
<input type="checkbox"/>	performance_schema	utf8mb3_general_ci	?	?
<input type="checkbox"/>	sys	utf8mb3_general_ci	?	?

Выбранные (0)

[Удалить](#)

Останов и перезапуск в режиме демона

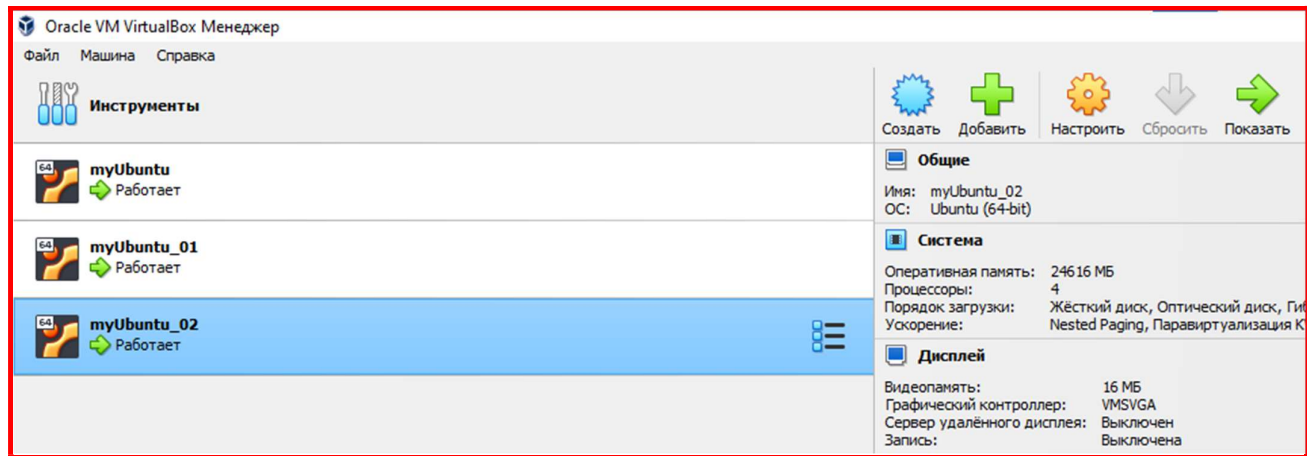
```

^X^CGracefully stopping... (press Ctrl+C again to force)
Stopping compose_db_1 ... done
Stopping compose_adminer_1 ... done
root@db-linux:/home/db/compose#
root@db-linux:/home/db/compose#
root@db-linux:/home/db/compose# docker-compose up -d
Starting compose_db_1 ... done
Starting compose_adminer_1 ... done
root@db-linux:/home/db/compose#
root@db-linux:/home/db/compose#
root@db-linux:/home/db/compose# docker ps
CONTAINER ID   IMAGE                COMMAND                  CREATED        STATUS              PORTS
NAMES
3b014066a000   mariadb:10.10.2     "docker-entrypoint.s..." 18 hours ago   Up About a minute   3306/tcp
compose_db_1
1833cdc1a323   adminer:4.8.1       "entrypoint.sh php -..." 18 hours ago   Up About a minute   0.0.0.0:6080->8080/tcp,
compose_adminer_1
root@db-linux:/home/db/compose# nano docker-compose.yml
root@db-linux:/home/db/compose# _

```

2 Часть

Создаем 3 виртуальных машины, подключенный через сетевой мост с отдельными ip адресами



```
0 192.168.236.239/24
1 192.168.236.1
2 192.168.236.156
```

Инициализация кластера

```
root@myUbuntu-02:/home/andrew# docker swarm leave --force
Node left the swarm.
root@myUbuntu-02:/home/andrew# docker swarm init
Swarm initialized: current node (8xd9hkfdqyzhy9aicgdaicis6) is now a manager.

To add a worker to this swarm, run the following command:

    docker swarm join --token SWMTKN-1-57asmlh6r397nymcssjdbmb1b0ln7tafcaylf1pre3dhpw5gj4-8quwvwb8y1947x6btmx1zof3b 192.168.1.1

To add a manager to this swarm, run 'docker swarm join-token manager' and follow the instructions.
```

- Добавление новых нод:
1-ая

```
root@myUbuntu-1:/home/andrew# docker swarm leave --force
Node left the swarm.
root@myUbuntu-1:/home/andrew# docker swarm join --token SWMTKN-1-57asmlh6r397nymcssjdbmb1b0ln7tafcaylf1pre3dhpw5gj4-8quwvwb8y1947x6
This node joined a swarm as a worker.
root@myUbuntu-1:/home/andrew#
```

2-я

```
root@andrew-VirtualBox:/home/andrew# docker swarm leave --force
Node left the swarm.
root@andrew-VirtualBox:/home/andrew# docker swarm join --token SWMTKN-1-57asmlh6r397nymcssjdbmb1b0ln7tafcaylf1pre3dhpw5gj4-8quwvwb8y1
This node joined a swarm as a worker.
root@andrew-VirtualBox:/home/andrew#
```

- Проверка состояния кластера

```
root@myUbuntu-02:/home/andrew# docker node ls
```

ID	HOSTNAME	STATUS	AVAILABILITY	MANAGER STATUS	ENGINE VERSION
2f09przm5obl dpd6flmbs4gcr	andrew-VirtualBox	Ready	Active		20.10.24
lvyd7o7qavrb3lmt98n1rirw2	myUbuntu-1	Ready	Active		24.0.4
8xd9hkfdqyzhy9aicgdaicis6 *	myUbuntu-02	Ready	Active	Leader	24.0.4

```
root@myUbuntu-02:/home/andrew#
```

Добавление нового менеджера

```

root@myUbuntu-02:/home/andrew# docker node promote myUbuntu-1
Node myUbuntu-1 promoted to a manager in the swarm.
root@myUbuntu-02:/home/andrew# docker node ls

```

ID	HOSTNAME	STATUS	AVAILABILITY	MANAGER STATUS	ENGINE VERSION
2f09przm5obl dpd6flmbs4gcr	andrew-VirtualBox	Ready	Active		20.10.24
lvvd7o7qavrb3lmt98n1rirw2	myUbuntu-1	Ready	Active	Reachable	24.0.4
8xd9hkfdqyzhy9aicgdaicis6 *	myUbuntu-02	Ready	Active	Leader	24.0.4

```

root@myUbuntu-02:/home/andrew#

```

Инспекция содержания ноды

```

root@myUbuntu-02:/home/andrew# docker node inspect self
[
  {
    "ID": "8xd9hkfdqyzhy9aicgdaicis6",
    "Version": {
      "Index": 9
    },
    "CreatedAt": "2023-07-18T14:54:18.332110007Z",
    "UpdatedAt": "2023-07-18T14:54:18.903272054Z",
    "Spec": {
      "Labels": {},
      "Role": "manager",
      "Availability": "active"
    },
    "Description": {
      "Hostname": "myUbuntu-02",
      "Platform": {
        "Architecture": "x86_64",
        "OS": "linux"
      }
    }
  }
]

```



```

    "CertIssuerSubject": "MBMXETAPBgNVBAMTCHN3Y2",
    "CertIssuerPublicKey": "MFkwEwYHKoZIzj0CAQYI
  },
  "Status": {
    "State": "ready",
    "Addr": "192.168.236.239"
  },
  "ManagerStatus": {
    "Leader": true,
    "Reachability": "reachable",
    "Addr": "192.168.236.239:2377"
  }
}
]

```

Просмотр имеющихся сетей в кластере

```

root@myUbuntu-02:/home/andrew# docker network ls
NETWORK ID          NAME                DRIVER              SCOPE
999217b81439        bridge              bridge              local
f91ad73bb672        docker_gwbridge     bridge              local
c722f5a7b7d3        host                host                local
jxr142en41vq        ingress             overlay             swarm
322ff05dd544        none                null                local
root@myUbuntu-02:/home/andrew#

```

Создание сети:

```
root@myUbuntu-02:/home/andrew# docker network create --driver overlay --subnet 4.5.6.0/24 test-network --attachable
nwvgwopz187ofpnmiuip3f0c8
root@myUbuntu-02:/home/andrew# docker network ls
NETWORK ID          NAME                DRIVER              SCOPE
999217b81439        bridge              bridge              local
f91ad73bb672        docker_gwbridge     bridge              local
c722f5a7b7d3        host                host                local
jxr142en41vq        ingress             overlay             swarm
322ff05dd544        none                null                local
nwvgwopz187o        test-network        overlay             swarm
root@myUbuntu-02:/home/andrew#
```

Запуск контейнера и подключение его к сети.

```
root@myUbuntu-02:/home/andrew# docker run -d --ip 4.5.6.7 --net test-network --name container-1 busybox sleep 600
Unable to find image 'busybox:latest' locally
latest: Pulling from library/busybox
809d8e20e203: Pull complete
Digest: sha256:2376a0c12759aa1214ba83e771ff252c7b1663216b192fbe5e0fb364e952f85c
Status: Downloaded newer image for busybox:latest
986a7c285344f3f68187f2eced63a926b827796788635e3e859bc992bdde3717
root@myUbuntu-02:/home/andrew# docker exec -it container-1 sh
/ # ping 4.5.6.7
PING 4.5.6.7 (4.5.6.7): 56 data bytes
64 bytes from 4.5.6.7: seq=0 ttl=64 time=0.061 ms
64 bytes from 4.5.6.7: seq=1 ttl=64 time=0.084 ms
64 bytes from 4.5.6.7: seq=2 ttl=64 time=0.106 ms
64 bytes from 4.5.6.7: seq=3 ttl=64 time=0.125 ms
64 bytes from 4.5.6.7: seq=4 ttl=64 time=0.296 ms
64 bytes from 4.5.6.7: seq=5 ttl=64 time=0.110 ms
64 bytes from 4.5.6.7: seq=6 ttl=64 time=0.137 ms
64 bytes from 4.5.6.7: seq=7 ttl=64 time=0.112 ms
64 bytes from 4.5.6.7: seq=8 ttl=64 time=0.092 ms
64 bytes from 4.5.6.7: seq=9 ttl=64 time=0.075 ms
^C
--- 4.5.6.7 ping statistics ---
10 packets transmitted, 10 packets received, 0% packet loss
round-trip min/avg/max = 0.061/0.119/0.296 ms
/ #
```

Запуск второго контейнера на другой ноде:

```
root@myUbuntu-1:/home/andrew# docker run -d --ip 4.5.6.8 --net test-network --name container-2 busybox sleep 600
Unable to find image 'busybox:latest' locally
latest: Pulling from library/busybox
809d8e20e203: Pull complete
Digest: sha256:2376a0c12759aa1214ba83e771ff252c7b1663216b192fbe5e0fb364e952f85c
Status: Downloaded newer image for busybox:latest
69dcc98f7d9e7a3e07b597886af67da28fd8201e2252c5945a37103d82dbb484
root@myUbuntu-1:/home/andrew#
```

Проверка контейнеров на связь между собой

```
/ # ping 4.5.6.8
PING 4.5.6.8 (4.5.6.8): 56 data bytes
64 bytes from 4.5.6.8: seq=0 ttl=64 time=0.833 ms
64 bytes from 4.5.6.8: seq=1 ttl=64 time=1.609 ms
64 bytes from 4.5.6.8: seq=2 ttl=64 time=1.380 ms
64 bytes from 4.5.6.8: seq=3 ttl=64 time=1.247 ms
64 bytes from 4.5.6.8: seq=4 ttl=64 time=1.053 ms
64 bytes from 4.5.6.8: seq=5 ttl=64 time=0.959 ms
64 bytes from 4.5.6.8: seq=6 ttl=64 time=1.109 ms
^C
--- 4.5.6.8 ping statistics ---
7 packets transmitted, 7 packets received, 0% packet loss
round-trip min/avg/max = 0.833/1.170/1.609 ms
/ #
```

Доступные сетевые пространства имен:

```
/ # exit
root@myUbuntu-02:/home/andrew# ll /var/run/docker/netns
total 0
drwxr-xr-x 2 root root 140 июл 18 18:43 ./
drwx----- 8 root root 180 июл 18 18:43 ../
-r--r--r-- 1 root root  0 июл 18 17:54 1-jxr142en41
-r--r--r-- 1 root root  0 июл 18 18:43 1-nwvgwopz18
-r--r--r-- 1 root root  0 июл 18 18:43 872230fea924
-r--r--r-- 1 root root  0 июл 18 17:54 ingress_sbox
-r--r--r-- 1 root root  0 июл 18 18:43 lb_nwvgwopz1
root@myUbuntu-02:/home/andrew#
```

Более подробная информация о сети


```
root@myUbuntu-02:/home/andrew# nsenter --net=/var/run/docker/netns/1-jxr142en41 ip -d link show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00 promiscuity 0 minmtu 0 maxmtu 0 addrngenmode eui64
35
2: br0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1450 qdisc noqueue state UP mode DEFAULT group default
    link/ether 72:e4:96:6d:9a:64 brd ff:ff:ff:ff:ff:ff promiscuity 0 minmtu 68 maxmtu 65535
    bridge forward_delay 1500 hello_time 200 max_age 2000 ageing_time 30000 stp_state 0 priority 32768 vl
64 designated_root 8000.72:e4:96:6d:9a:64 root_port 0 root_path_cost 0 topology_change 0 topology_change_
imer 0.00 gc_timer 0.00 vlan_default_pvid 0 vlan_stats_enabled 0 vlan_stats_per_port 0 group_fwd_ma
1 mcast_query_use_ifaddr 0 mcast_querier 0 mcast_hash_elasticity 16 mcast_hash_max 4096 mcast_last_membe
00 mcast_membership_interval 26000 mcast_querier_interval 25500 mcast_query_interval 12500 mcast_query_re
_enabled 0 mcast_igmp_version 2 mcast_mld_version 1 nf_call_iptables 0 nf_call_ip6tables 0 nf_call_arptab
5536 gso_max_segs 65535
10: vxlan0@if10: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1450 qdisc noqueue master br0 state UNKNOWN mode D
    link/ether b2:a4:15:dd:cb:97 brd ff:ff:ff:ff:ff:ff link-netnsid 0 promiscuity 1 minmtu 68 maxmtu 6553
vxlan id 4096 srcport 0 0 dstport 4789 proxy l2miss l3miss ttl auto ageing 300 udpcsum noudp6zerocsum
bridge_slave state forwarding priority 32 cost 100 hairpin off guard off root_block off fastleave off
2769 designated_cost 0 designated_bridge 8000.72:e4:96:6d:9a:64 designated_root 8000.72:e4:96:6d:9a:64 ho
0.00 topology_change_ack 0 config_pending 0 proxy_arp off proxy_arp_wifi off mcast_router 1 mcast_fast_le
up_fwd_mask 0 group_fwd_mask_str 0x0 vlan_tunnel off isolated off addrngenmode eui64 numtxqueues 1 numrxqu
12: veth0@if11: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1450 qdisc noqueue master br0 state UP mode DEFAULT
    link/ether 72:e4:96:6d:9a:64 brd ff:ff:ff:ff:ff:ff link-netnsid 1 promiscuity 1 minmtu 68 maxmtu 6553
veth
    bridge_slave state forwarding priority 32 cost 2 hairpin off guard off root_block off fastleave off 1
70 designated_cost 0 designated_bridge 8000.72:e4:96:6d:9a:64 designated_root 8000.72:e4:96:6d:9a:64 hold
00 topology_change_ack 0 config_pending 0 proxy_arp off proxy_arp_wifi off mcast_router 1 mcast_fast_leav
_fwd_mask 0 group_fwd_mask_str 0x0 vlan_tunnel off isolated off addrngenmode eui64 numtxqueues 4 numrxqueu
root@myUbuntu-02:/home/andrew#
```

