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Практическая работа №3

Тема: «Docker и RabbitMQ»

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Docker — это платформа, которая позволяет упаковать в контейнер приложение со всем окружением и зависимостями, а затем доставить и запустить его в целевой системе. Приложение, упакованное в контейнер, изолируется от операционной системы и других приложений.

Обновим список пакетов:

```
lemp001@U20-001:~$ sudo apt update
[sudo] password for lemp001:
Hit:1 http://ru.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://ru.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Hit:3 http://deb.anydesk.com all InRelease
Get:4 http://ru.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]
Get:5 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Hit:6 https://dl.google.com/linux/chrome/deb stable InRelease
Hit:7 http://ppa.launchpad.net/serge-rider/dbeaver-ce/ubuntu focal InRelease
Hit:8 https://download.docker.com/linux/ubuntu bionic InRelease
Get:9 http://ru.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [2 118 kB]
Get:10 http://ru.archive.ubuntu.com/ubuntu focal-updates/main Translation-en [376 kB]
Get:11 http://ru.archive.ubuntu.com/ubuntu focal-updates/main amd64 DEP-11 Metadata [277 kB]
Get:12 http://ru.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 Packages [1 297 kB]
Get:13 http://ru.archive.ubuntu.com/ubuntu focal-updates/restricted Translation-en [184 kB]
Get:14 http://ru.archive.ubuntu.com/ubuntu focal-updates/universe amd64 DEP-11 Metadata [391 kB]
Get:15 http://ru.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 DEP-11 Metadata [944 B]
Get:16 http://ru.archive.ubuntu.com/ubuntu focal-backports/main amd64 DEP-11 Metadata [8 000 B]
Get:17 http://ru.archive.ubuntu.com/ubuntu focal-backports/universe amd64 DEP-11 Metadata [30,5 kB]
Get:18 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [1 744 kB]
Get:19 http://security.ubuntu.com/ubuntu focal-security/main Translation-en [292 kB]
Get:20 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata [40,7 kB]
Get:21 http://security.ubuntu.com/ubuntu focal-security/restricted amd64 Packages [1 207 kB]
Get:22 http://security.ubuntu.com/ubuntu focal-security/restricted Translation-en [171 kB]
Get:23 http://security.ubuntu.com/ubuntu focal-security/universe amd64 DEP-11 Metadata [77,6 kB]
Get:24 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 DEP-11 Metadata [2 464 B]
Fetched 8 554 kB in 3s (3 164 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
63 packages can be upgraded. Run 'apt list --upgradable' to see them.
lemp001@U20-001:~$
```

Устанавливаем необходимые зависимости:

```
lemp001@U20-001:~$ sudo apt install apt-transport-https ca-certificates curl software-properties-common
Reading package lists... Done
Building dependency tree
Reading state information... Done
ca-certificates is already the newest version (20211016-20.04.1).
curl is already the newest version (7.68.0-1ubuntu2.13).
software-properties-common is already the newest version (0.99.9.8).
The following packages were automatically installed and are no longer required:
  chromium-codecs-ffmpeg-extra gstreamer1.0-vaapi libfwupdplugin1 libgstreamer-plugins-bad1.0-0
  libva-wayland2
Use 'sudo apt autoremove' to remove them.
The following packages will be upgraded:
  apt-transport-https
1 upgraded, 0 newly installed, 0 to remove and 62 not upgraded.
Need to get 1 704 B of archives.
After this operation, 0 B of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://ru.archive.ubuntu.com/ubuntu focal-updates/universe amd64 apt-transport-https all 2.0.9 [1 704 B]
Fetched 1 704 B in 0s (40,6 kB/s)
(Reading database ... 185235 files and directories currently installed.)
Preparing to unpack .../apt-transport-https_2.0.9_all.deb ...
Unpacking apt-transport-https (2.0.9) over (2.0.8) ...
Setting up apt-transport-https (2.0.9) ...
lemp001@U20-001:~$
```

Добавляем GPG ключ для официального репозитория:

```
lemp001@U20-001:~$ curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
OK
```

Добавление репозитория:

```
lemp001@U20-001:~$ sudo add-apt-repository "deb [arch=amd64] https://download.docker.com/linux/ubuntu focal stable"
Hit:1 http://deb.anydesk.com all InRelease
Get:2 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Hit:3 https://dl.google.com/linux/chrome/deb stable InRelease
Hit:4 http://ppa.launchpad.net/serge-rider/dbeaver-ce/ubuntu focal InRelease
Hit:5 https://download.docker.com/linux/ubuntu bionic InRelease
Get:6 https://download.docker.com/linux/ubuntu focal InRelease [57,7 kB]
Get:7 https://download.docker.com/linux/ubuntu focal/stable amd64 Packages [18,5 kB]
Hit:8 http://ru.archive.ubuntu.com/ubuntu focal InRelease
Hit:9 http://ru.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:10 http://ru.archive.ubuntu.com/ubuntu focal-backports InRelease
Fetched 190 kB in 4s (54,2 kB/s)
Reading package lists... Done
```

Опять обновляем список пакетов:

```
lemp001@U20-001:~$ sudo apt update
Hit:1 http://ru.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://ru.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Hit:3 http://deb.anydesk.com all InRelease
Get:4 http://ru.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]
Hit:5 https://dl.google.com/linux/chrome/deb stable InRelease
Hit:6 https://download.docker.com/linux/ubuntu bionic InRelease
Hit:7 https://download.docker.com/linux/ubuntu focal InRelease
Get:8 http://ru.archive.ubuntu.com/ubuntu focal-updates/main amd64 DEP-11 Metadata [278 kB]
Hit:9 http://ppa.launchpad.net/serge-rider/dbeaver-ce/ubuntu focal InRelease
Get:10 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:11 http://ru.archive.ubuntu.com/ubuntu focal-updates/universe amd64 DEP-11 Metadata [391 kB]
Get:12 http://ru.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 DEP-11 Metadata [944 B]
Get:13 http://ru.archive.ubuntu.com/ubuntu focal-backports/main amd64 DEP-11 Metadata [7 972 B]
Get:14 http://ru.archive.ubuntu.com/ubuntu focal-backports/universe amd64 DEP-11 Metadata [30,5 kB]
Fetched 1 045 kB in 1s (724 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
63 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

Список доступных пакетов docker:


```

lemp001@U20-001:~$ apt-cache policy docker-ce
docker-ce:
  Installed: 5:20.10.16~3-0~ubuntu-bionic
  Candidate: 5:20.10.18~3-0~ubuntu-focal
  Version table:
     5:20.10.18~3-0~ubuntu-focal 500
        500 https://download.docker.com/linux/ubuntu focal/stable amd64 Packages
     5:20.10.18~3-0~ubuntu-bionic 500
  LibreOffice Writer s://download.docker.com/linux/ubuntu bionic/stable amd64 Packages
     5:20.10.17~3-0~ubuntu-focal 500
        500 https://download.docker.com/linux/ubuntu focal/stable amd64 Packages
     5:20.10.17~3-0~ubuntu-bionic 500
        500 https://download.docker.com/linux/ubuntu bionic/stable amd64 Packages
     5:20.10.16~3-0~ubuntu-focal 500
        500 https://download.docker.com/linux/ubuntu focal/stable amd64 Packages
*** 5:20.10.16~3-0~ubuntu-bionic 500
        500 https://download.docker.com/linux/ubuntu bionic/stable amd64 Packages
     100 /var/lib/dpkg/status
     5:20.10.15~3-0~ubuntu-focal 500
        500 https://download.docker.com/linux/ubuntu focal/stable amd64 Packages
     5:20.10.15~3-0~ubuntu-bionic 500
        500 https://download.docker.com/linux/ubuntu bionic/stable amd64 Packages
     5:20.10.14~3-0~ubuntu-focal 500
        500 https://download.docker.com/linux/ubuntu focal/stable amd64 Packages
     5:20.10.14~3-0~ubuntu-bionic 500
        500 https://download.docker.com/linux/ubuntu bionic/stable amd64 Packages
     5:20.10.13~3-0~ubuntu-focal 500
        500 https://download.docker.com/linux/ubuntu focal/stable amd64 Packages
     5:20.10.13~3-0~ubuntu-bionic 500
        500 https://download.docker.com/linux/ubuntu bionic/stable amd64 Packages
     5:20.10.12~3-0~ubuntu-focal 500
        500 https://download.docker.com/linux/ubuntu focal/stable amd64 Packages
     5:20.10.12~3-0~ubuntu-bionic 500
        500 https://download.docker.com/linux/ubuntu bionic/stable amd64 Packages
     5:20.10.11~3-0~ubuntu-focal 500
        500 https://download.docker.com/linux/ubuntu focal/stable amd64 Packages
     5:20.10.11~3-0~ubuntu-bionic 500
        500 https://download.docker.com/linux/ubuntu bionic/stable amd64 Packages

```

Установка виртуального компонента docker:

```

lemp001@U20-001:~$ sudo apt install docker-ce
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  chromium-codecs-ffmpeg-extra gstreamer1.0-vaapi libfwupdplugin1 libgstreamer-plugins-bad1.0-0
  libva-wayland2
Use 'sudo apt autoremove' to remove them.
Suggested packages:
  aufs-tools cgroupfs-mount | cgroup-lite
The following packages will be upgraded:
  docker-ce
1 upgraded, 0 newly installed, 0 to remove and 62 not upgraded.
Need to get 20,4 MB of archives.
After this operation, 12,3 MB disk space will be freed.
Get:1 https://download.docker.com/linux/ubuntu focal/stable amd64 docker-ce amd64 5:20.10.18~3-0~ubuntu-
focal [20,4 MB]
Fetched 20,4 MB in 2s (9 810 kB/s)
(Reading database ... 185235 files and directories currently installed.)
Preparing to unpack .../docker-ce_5%3a20.10.18~3-0~ubuntu-focal_amd64.deb ...
Unpacking docker-ce (5:20.10.18~3-0~ubuntu-focal) over (5:20.10.16~3-0~ubuntu-bionic) ...
Setting up docker-ce (5:20.10.18~3-0~ubuntu-focal) ...
Processing triggers for systemd (245.4-4ubuntu3.17) ...

```

Проверим, что docker установлен и запущен:

```
lemp001@U20-001:~$ sudo systemctl status docker
● docker.service - Docker Application Container Engine
   Loaded: loaded (/lib/systemd/system/docker.service; enabled; vendor preset: enabled)
   Active: active (running) since Tue 2022-09-27 09:27:49 MSK; 36s ago
   TriggeredBy: ● docker.socket
     Docs: https://docs.docker.com
    Main PID: 2271422 (dockerd)
      Tasks: 7
     Memory: 30.7M
    CGroup: /system.slice/docker.service
            └─2271422 /usr/bin/dockerd -H fd:// --containerd=/run/containerd/containerd.sock

сен 27 09:27:49 U20-001 dockerd[2271422]: time="2022-09-27T09:27:49.049993975+03:00" level=warning msg=>
сен 27 09:27:49 U20-001 dockerd[2271422]: time="2022-09-27T09:27:49.050386582+03:00" level=warning msg=>
сен 27 09:27:49 U20-001 dockerd[2271422]: time="2022-09-27T09:27:49.050557285+03:00" level=warning msg=>
сен 27 09:27:49 U20-001 dockerd[2271422]: time="2022-09-27T09:27:49.050861690+03:00" level=info msg="Lo>
сен 27 09:27:49 U20-001 dockerd[2271422]: time="2022-09-27T09:27:49.277485434+03:00" level=info msg="De>
сен 27 09:27:49 U20-001 dockerd[2271422]: time="2022-09-27T09:27:49.316387693+03:00" level=info msg="Lo>
сен 27 09:27:49 U20-001 dockerd[2271422]: time="2022-09-27T09:27:49.354897547+03:00" level=info msg="Do>
сен 27 09:27:49 U20-001 dockerd[2271422]: time="2022-09-27T09:27:49.357168885+03:00" level=info msg="Da>
сен 27 09:27:49 U20-001 systemd[1]: Started Docker Application Container Engine.
сен 27 09:27:49 U20-001 dockerd[2271422]: time="2022-09-27T09:27:49.399683006+03:00" level=info msg="AP>
lines 1-21/21 (END)
```

Скачиваем надстройку docker-compose, предназначенную для решения задач, связанных с развёртыванием проектов и позволяющую с помощью одной команды запускать множество сервисов:

```
lemp001@U20-001:~$ sudo curl -L "https://github.com/docker/compose/releases/download/1.25.0/docker-compo
se-$(uname -s)-$(uname -m)" -o /usr/local/bin/docker-compose
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left   Speed
  0     0     0     0     0     0      0      0  --:--:-- --:--:-- --:--:--     0
100 16.2M  100 16.2M    0     0 15.3M      0  0:00:01  0:00:01 --:--:-- 37.3M
```

Дадим полный доступ другим пользователям и проверим версию docker-compose:

```
lemp001@U20-001:~$ sudo chmod +x /usr/local/bin/docker-compose
lemp001@U20-001:~$ docker-compose --version
docker-compose version 1.25.0, build 0a186604
```

Проверим, какие контейнеры docker запущены:

```
lemp001@U20-001:~$ docker-compose ps
ERROR:
       Can't find a suitable configuration file in this directory or any
       parent. Are you in the right directory?

       Supported filenames: docker-compose.yml, docker-compose.yaml
```

Скачаем официальный образ RabbitMQ – брокер сообщений – приложение, которое преобразует сообщение по одному протоколу от приложения-

источника в сообщение протокола приложения-приёмника, тем самым выступая между ними посредником:

```
lemp001@U20-001:~$ sudo docker pull rabbitmq:3.6.14-management
3.6.14-management: Pulling from library/rabbitmq
e7bb522d92ff: Pull complete
ad90649c4d84: Pull complete
5a318b914d6c: Pull complete
cedd60f70052: Pull complete
f754361b064d: Pull complete
9024d880d342: Pull complete
b3d775050fc8: Pull complete
6e9f52fff670: Pull complete
2af9c86e1071: Pull complete
80eef1b61d37: Pull complete
82f0271a3b5e: Pull complete
c6f959a3f62b: Pull complete
a289a4ffa099: Pull complete
Digest: sha256:8f4d1feacc3f160a8e426dd33c57b7147c8e863d6283e917e3ce5f790830cca3
Status: Downloaded newer image for rabbitmq:3.6.14-management
docker.io/library/rabbitmq:3.6.14-management
```

Создадим docker volume для RabbitMQ – папку хоста, примонтированную к файловой системе контейнера:

```
lemp001@U20-001:~$ sudo docker volume create rabbitmq_data
rabbitmq_data
```

Запустим контейнер с RabbitMQ:

```
lemp001@U20-001:~$ sudo docker run -d --hostname rabbitmq --log-driver=journald --name rabbitmq -p 5672:5672 -p 15672:15672 -p 15674:15674 -p 25672:25672 -p 61613:61613 -v rabbitmq_data:/var/lib/rabbitmq rabbitmq:3.6.14-management
2ad0041d6ee63429d0c15d3eb5dc07bdfad217c8a25fa0b83afc2b41107a975d
```

Определим ip-адрес контейнера (sudo docker container inspect rabbitmq) и зайдём в Web по этому адресу:

```
"GlobalIPv6PrefixLen": 0,
"IPAddress": "172.17.0.2",
"IPPrefixLen": 16,
```

⚠ Not secure | 172.17.0.2:15672




Username:

Password:

Login

ter

 3.6.14 Erlang 19.2.1

Refreshed 2022-09-27 10:16:30 Refresh every 5 seconds Virtual host All Cluster rabbit@rabbitmq User guest Log out

Overview Connections Channels Exchanges Queues

Admin

Totals

Queued messages last minute ?

Currently idle

Message rates last minute ?

Currently idle

Global counts ?

Connections: 0 Channels: 0 Exchanges: 8 Queues: 0 Consumers: 0

Nodes

Name	File descriptors ?	Socket descriptors ?	Erlang processes	Memory	Disk space	Uptime	Info
rabbit@rabbitmq	20 1048576 available	0 943626 available	319 1048576 available	73MB 3.1GB high watermark	21GB 48MB low watermark	10m 39s	basic disc 1

Ports and contexts

Export definitions

Import definitions

HTTP API Server Docs Tutorials Community Support Community Slack Commercial Support Plugins GitHub Changelog

Проверка имеющихся контейнеров:

```

lemp001@U20-001:~$ sudo docker ps -a
CONTAINER ID   IMAGE                                COMMAND                  CREATED        STATUS      PORTS
2ad0041d6ee6   rabbitmq:3.6.14-management         "docker-entrypoint.s..." 17 minutes ago Up
17 minutes    4369/tcp, 5671/tcp, 0.0.0.0:5672->5672/tcp, :::5672->5672/tcp, 0.0.0.0:15672->15672/tcp, :::15672->15672/tcp, 0.0.0.0:15674->15674/tcp, :::15674->15674/tcp, 0.0.0.0:25672->25672/tcp, :::25672->25672/tcp, 15671/tcp, 0.0.0.0:61613->61613/tcp, :::61613->61613/tcp rabbitmq
5c0358979c2b   frolov2022_postgres                "docker-entrypoint.s..." 3 months ago   Exited (0) 55 minutes ago
401e799a20ce   marcelmittelstaedt/hive_base:latest "/startup.sh"           3 months ago   Created
682bce5961bf   marcelmittelstaedt/spark_base:latest "/startup.sh"           3 months ago   Exited (137) 55 minutes ago
0ee998acdcb2   marcelmittelstaedt/hiveserver_base:latest "/startup.sh"           3 months ago   Exited (137) 3 months ago

```

Удалим лишние контейнеры:

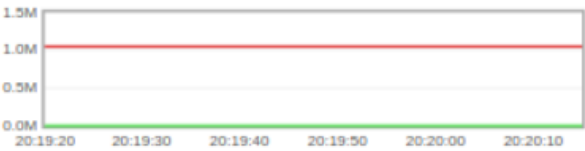
```

lemp001@U20-001:~$ sudo docker rm 401e799a20ce
401e799a20ce
lemp001@U20-001:~$ sudo docker rm 682bce5961bf
682bce5961bf
lemp001@U20-001:~$ sudo docker rm 0ee998acdcb2
0ee998acdcb2

```

При запуске sender.py, на графиках наблюдаются незначительные изменения:

File descriptors ?



Used

21

Limit

1048576

Socket descriptors ?



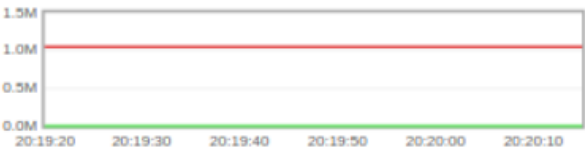
Used

1

Limit

943626

Erlang processes



Used

336

Limit

1048576

Memory



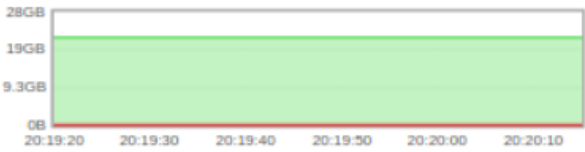
Used

77MB

Limit

3.1GB

Disk space



Free

22GB

Limit

48MB



Удалим контейнер:

```
lemp001@U20-001:~$ sudo docker stop rabbitmq
rabbitmq
lemp001@U20-001:~$ sudo docker rm rabbitmq
rabbitmq
```

Создадим файл в каталоге проекта run.sh:

```
lemp001@U20-001:~$ sudo touch run.sh
```

Определим ему права на запуск:

```
lemp001@U20-001:~$ sudo chmod +x run.sh
```

Запишем скрипт для поднятия брокера в докере:

```
GNU nano 4.8 run.sh
docker run -d \
--hostname rabbitmq \
--log-driver=journald \
--name rabbitmq \
-p 5672:5672 \
-p 15672:15672 \
-p 15674:15674 \
-p 25672:25672 \
-p 61613:61613 \
-v rabbitmq_data:/var/lib/rabbitmq \
rabbitmq:3.6.14-management
```

[Read 11 lines]

^G Get Help	^O Write Out	^W Where Is	^K Cut Text	^J Justify	^C Cur Pos	M-U Undo
^X Exit	^R Read File	^_ Replace	^U Paste Text	^T To Spell	^_ Go To Line	M-E Redo

Сохраняем и запускаем исполняемый файл run.sh:

```
lemp001@U20-001:~$ sudo sh run.sh
09fa13f0b79cb50ab04de47cbb145e2ffb49209a4b7dd0a97c197e389dc6cabf
```

Создадим docker volume для RabbitMQ – папку хоста, примонтированную к файловой системе контейнера:

```
lemp001@U20-001:~$ sudo docker volume create rabbitmq_data
rabbitmq_data
```

Контейнер rabbitmq запущен:


```
lemp001@U20-001:~$ sudo docker container inspect rabbitmq
[
  {
    "Id": "09fa13f0b79cb50ab04de47cbb145e2ffb49209a4b7dd0a97c197e389dc6cabf",
    "Created": "2022-10-03T18:01:49.302555515Z",
    "Path": "docker-entrypoint.sh",
    "Args": [
      "rabbitmq-server"
    ],
    "State": {
      "Status": "running",
      "Running": true,
      "Paused": false,
      "Restarting": false,
      "OOMKilled": false,
      "Dead": false,
      "Pid": 2481173,
      "ExitCode": 0,
      "Error": "",
      "StartedAt": "2022-10-03T18:01:50.044739362Z",
      "FinishedAt": "0001-01-01T00:00:00Z"
    },
  },
]
```