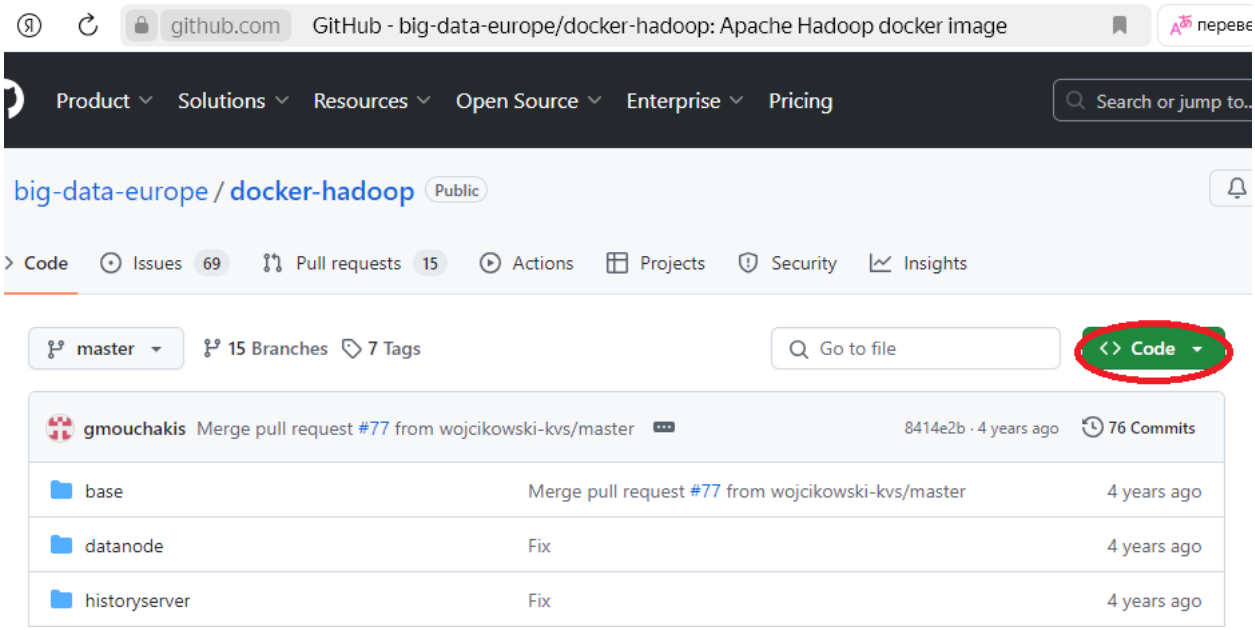
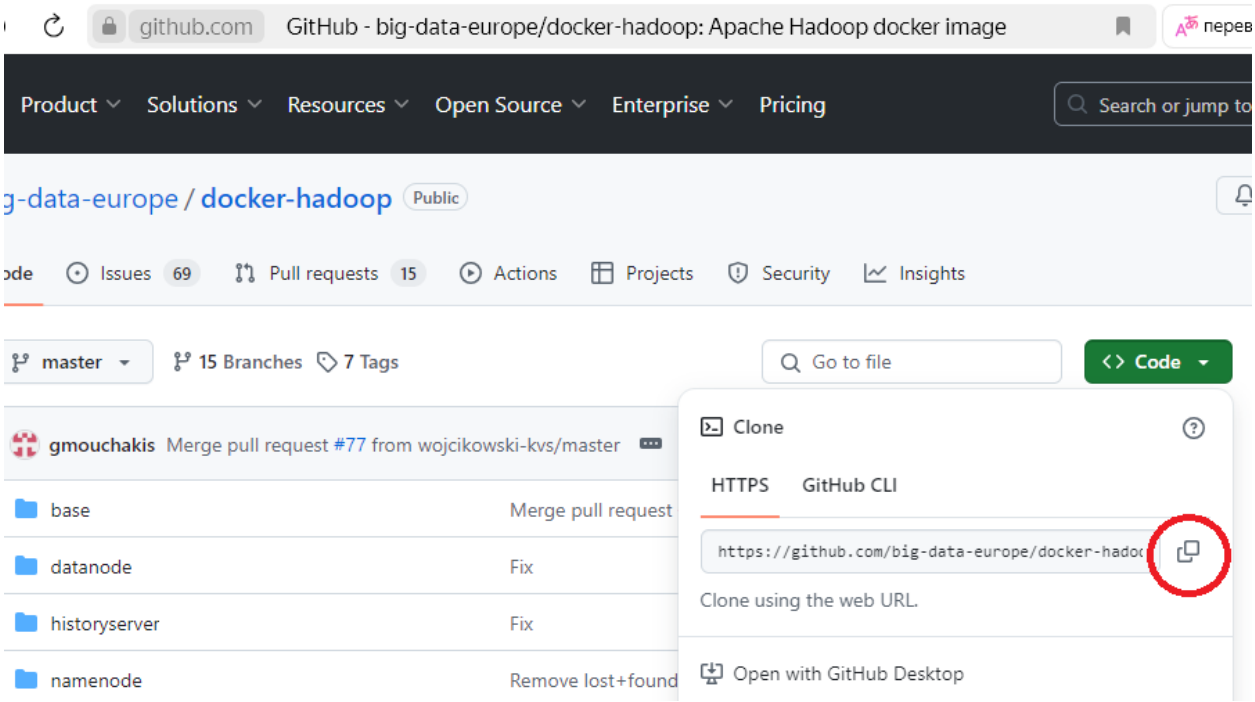
Установка Hadoop в Ubuntu

Разворачивать Hadoop и др. будем в контейнерах используя docker-compose.

https://github.com/WtCrow/docker-hadoop-spark-hive2-jupyter





Клонируем репозиторий на Ubuntu server:

```
user@hadoop-server:~$ git clone https://github.com/WtCrow/docker-hadoop-spark-hive2-jupyter.git
Cloning into 'docker-hadoop'...
remote: Enumerating objects: 539, done.
remote: Counting objects: 100% (189/189), done.
remote: Compressing objects: 100% (23/23), done.
remote: Total 539 (delta 169), reused 166 (delta 166), pack-reused 350 (from 1)
Receiving objects: 100% (539/539), 108.00 KiB | 349.00 KiB/s, done.
Resolving deltas: 100% (251/251), done.
user@hadoop-server:~$
```

Переходим в скачанную папку:

```
user@hadoop-server:~$ cd docker-hadoop-spark-hive2-jupyter/
user@hadoop-server:~/docker-hadoop-spark-hive2-jupyter$ ls
docker-compose.yml  example.ipynb  hadoop-hive.env  README.md  spark_conf
user@hadoop-server:~/docker-hadoop-spark-hive2-jupyter$
```

В папке находятся директории для каждого компонента Hadoop и **docker-compose.yml** – файл настройки многоконтейнерного приложения, настроим его открыв в редакторе.

Настройки нейм-ноды не трогаем:

```
  GNU nano 6.2                                docker-compose.yml
version: "3"

services:
  namenode:
    image: bde2020/hadoop-namenode:2.0.0-hadoop3.2.1-java8
    container_name: namenode
    restart: always
    ports:
      - 9870:9870
      - 9000:9000
    volumes:
      - hadoop_namenode:/hadoop/dfs/name
    environment:
      - CLUSTER_NAME=test
    env_file:
      - ./hadoop.env
```

Дата-нода по умолчанию одна,

```
GNU nano 6.2                                    docker-compose.yml
    env_file:
      - ./hadoop.env

  datanode:
    image: bde2020/hadoop-datanode:2.0.0-hadoop3.2.1-java8
    container_name: datanode
    restart: always
    volumes:
      - hadoop_datanode:/hadoop/dfs/data
    environment:
      SERVICE_PRECONDITION: "namenode:9870"
    env_file:
      - ./hadoop.env

  resourcemanager:
    image: bde2020/hadoop-resourcemanager:2.0.0-hadoop3.2.1-java8
    container_name: resourcemanager
    restart: always
```

добавим еще две и дадим им уникальные имена и назначим свои volume:

```
  datanode1:
    image: bde2020/hadoop-datanode:2.0.0-hadoop3.2.1-java8
    container_name: datanode1
    restart: always
    volumes:
      - hadoop_datanode1:/hadoop/dfs/data
    environment:
      SERVICE_PRECONDITION: "namenode:9870"
    env_file:
      - ./hadoop.env
```

```
  datanode2:
    image: bde2020/hadoop-datanode:2.0.0-hadoop3.2.1-java8
    container_name: datanode2
    restart: always
    volumes:
      - hadoop_datanode2:/hadoop/dfs/data
    environment:
      SERVICE_PRECONDITION: "namenode:9870"
    env_file:
      - ./hadoop.env

  datanode3:
    image: bde2020/hadoop-datanode:2.0.0-hadoop3.2.1-java8
    container_name: datanode3
    restart: always
    volumes:
      - hadoop_datanode3:/hadoop/dfs/data
    environment:
      SERVICE_PRECONDITION: "namenode:9870"
    env_file:
      - ./hadoop.env
```

И добавим в конце файла наши volume:

```
      - ./hadoop.env

volumes:
  hadoop_namenode:
  hadoop_datanode1:
  hadoop_datanode2:
  hadoop_datanode3:
  hadoop_historyserver:
```

Сохраняем изменения в файле и стартуем, предварительно установив docker и docker-compose:

```
user@hadoop-server:~/docker-hadoop$ sudo snap install docker
[sudo] password for user:
docker 24.0.5 from Canonical✓ installed
user@hadoop-server:~/docker-hadoop$
```

```
user@hadoop-server:~/docker-hadoop$ sudo apt  install docker-compose
Чтение списков пакетов… Готово
Построение дерева зависимостей… Готово
Чтение информации о состоянии… Готово
Будут установлены следующие дополнительные пакеты:
  bridge-utils containerd dns-root-data dnsmasq-base docker.io pigz python3-docker
  python3-dockerpty python3-docopt python3-dotenv python3-texttable python3-websocket r
  ubuntu-fan
Предлагаемые пакеты:
  ifupdown aufs-tools cgroupfs-mount | cgroup-lite debootstrap docker-doc rinse zfs-fus
  | zfsutils
Следующие НОВЫЕ пакеты будут установлены:
  bridge-utils containerd dns-root-data dnsmasq-base docker-compose docker.io pigz
  python3-docker python3-dockerpty python3-docopt python3-dotenv python3-texttable
  python3-websocket runc ubuntu-fan
Обновлено 0 пакетов, установлено 15 новых пакетов, для удаления отмечено 0 пакетов, и 4
е обновлено.
Необходимо скачать 75,8 MB архивов.
После данной операции объём занятого дискового пространства возрастёт на 286 MB.
Хотите продолжить? [Д/н]
```

```
user@hadoop-server:~/docker-hadoop$ sudo docker-compose up -d
[+] Running 15/15
 ✔ Network docker-hadoop_default                Created
 ✔ Volume "docker-hadoop_hadoop_datanode3"      Created
 ✔ Volume "docker-hadoop_hadoop_datanode1"      Created
 ✔ Volume "docker-hadoop_hadoop_datanode2"      Created
 ✔ Container datanode2                          Started
 ✔ Container datanode1                          Started
 ✔ Container resourcemanager                    Started
 ✔ Container historyserver                      Started
 ✔ Container datanode3                          Started
 ✔ Container nodemanager                        Started
 ✔ Container spark-master                       Started
 ✔ Container namenode                           Started
 ✔ Container spark-worker                       Started
 ✔ Container jupyter-notebook                   Started
 ✔ Container hue                                Started
```

Дожидаемся запуска всех контейнеров и открываем в браузере страницу админки Hadoop:

```
user@hadoop-server:~$ sudo docker ps
CONTAINER ID   IMAGE                                                    COMMAND                  CREATED          STATUS                            PORTS
                                                                        NAMES
0ce7e3b41768   bde2020/hadoop-resourcemanager:2.0.0-hadoop3.2.1-java8   "/entrypoint.sh /run…"   19 minutes ago   Up About a minute (unhealthy)   8088/tcp
                                                                        resourcemanager
38888ffcdf39   bde2020/hadoop-datanode:2.0.0-hadoop3.2.1-java8          "/entrypoint.sh /run…"   19 minutes ago   Up 19 minutes (healthy)         9864/tcp
                                                                        datanode3
0d13ba27c834   bde2020/hadoop-datanode:2.0.0-hadoop3.2.1-java8          "/entrypoint.sh /run…"   19 minutes ago   Up 19 minutes (healthy)         9864/tcp
                                                                        datanode2
6896432c9d0a   bde2020/hadoop-nodemanager:2.0.0-hadoop3.2.1-java8       "/entrypoint.sh /run…"   19 minutes ago   Up About a minute (unhealthy)   8042/tcp
                                                                        nodemanager
a26495e130b3   bde2020/hadoop-historyserver:2.0.0-hadoop3.2.1-java8     "/entrypoint.sh /run…"   19 minutes ago   Up About a minute (unhealthy)   8188/tcp
                                                                        historyserver
50dd81a149a8   bde2020/hadoop-datanode:2.0.0-hadoop3.2.1-java8          "/entrypoint.sh /run…"   19 minutes ago   Up 19 minutes (healthy)         9864/tcp
                                                                        datanode1
741bd87e49c4   bde2020/hadoop-namenode:2.0.0-hadoop3.2.1-java8          "/entrypoint.sh /run…"   19 minutes ago   Up 19 minutes (healthy)         0.0.0.0:9000->9
000/tcp, :::9000->9000/tcp, 0.0.0.0:9870->9870/tcp, :::9870->9870/tcp   namenode
user@hadoop-server:~$
```

10.10.10.121:50070 Namenode information

Hadoop | Overview | Datanodes | Datanode Volume Failures | Snapshot | Startup Progress | Utilities

Overview 'namenode:8020' (active)

Started:	Tue Oct 29 04:59:09 UTC 2024
Version:	2.7.4, rcd915e1e8d9d0131462a0b7301586c175728a282
Compiled:	2017-08-01T00:29Z by kshvachk from branch-2.7.4
Cluster ID:	CID-74d2a272-2c9f-46fb-a6eb-0e73653f72d5
Block Pool ID:	BP-460939484-172.18.0.3-1730104026474

Summary

Security is off.

Safemode is off.

28 files and directories, 3 blocks = 31 total filesystem object(s).

Summary

Security is off.

Safemode is off.

1 files and directories, 0 blocks (0 replicated blocks, 0 erasure coded block groups) = 1 total filesystem object(s).

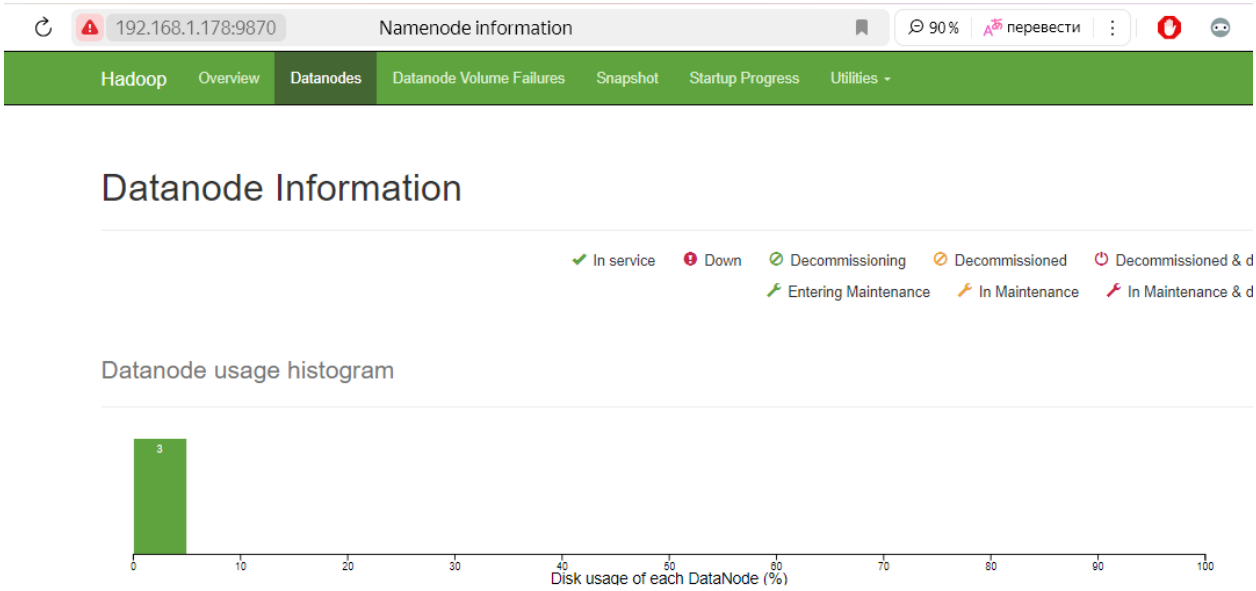
Heap Memory used 27.81 MB of 44.87 MB Heap Memory. Max Heap Memory is 475.63 MB.

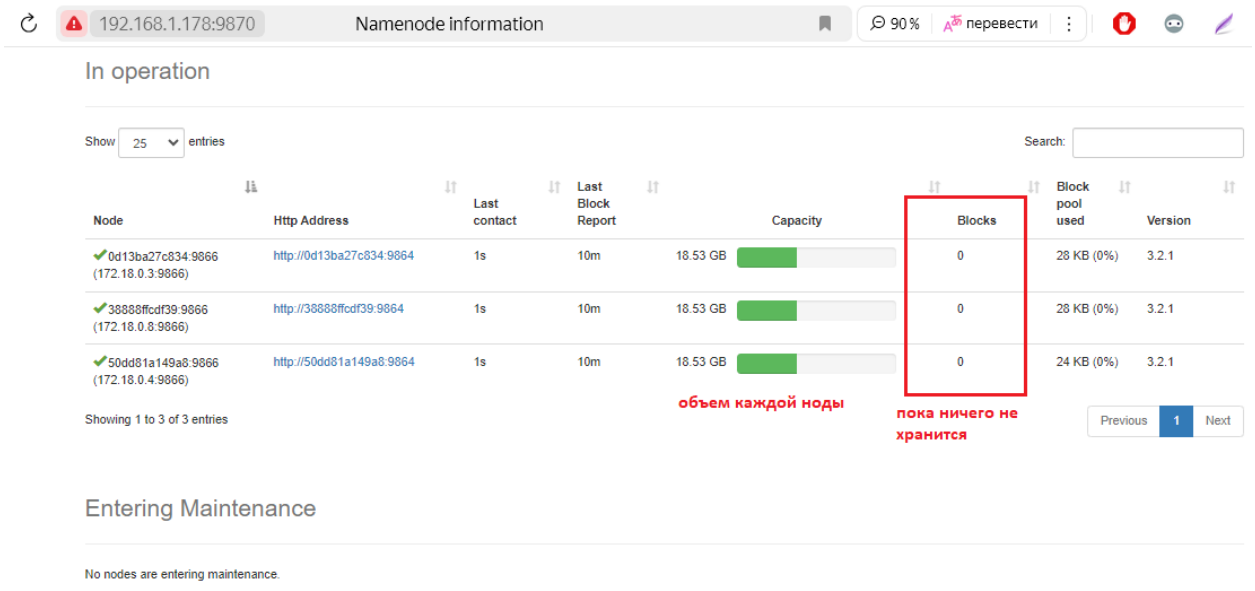
Non Heap Memory used 44.48 MB of 45.59 MB Commited Non Heap Memory. Max Non Heap Memory is <unbounded>.

объем кластера

Configured Capacity:	55.59 GB
Configured Remote Capacity:	0 B
DFS Used:	72 KB (0%)
Non DFS Used:	20.96 GB
DFS Remaining:	31.73 GB (57.08%)
Block Pool Used:	72 KB (0%)
DataNodes usages% (Min/Median/Max/stdDev):	0.00% / 0.00% / 0.00% / 0.00%
Live Nodes "живые" ноды	3 (Decommissioned: 0, In Maintenance: 0)
Dead Nodes	0 (Decommissioned: 0, In Maintenance: 0)

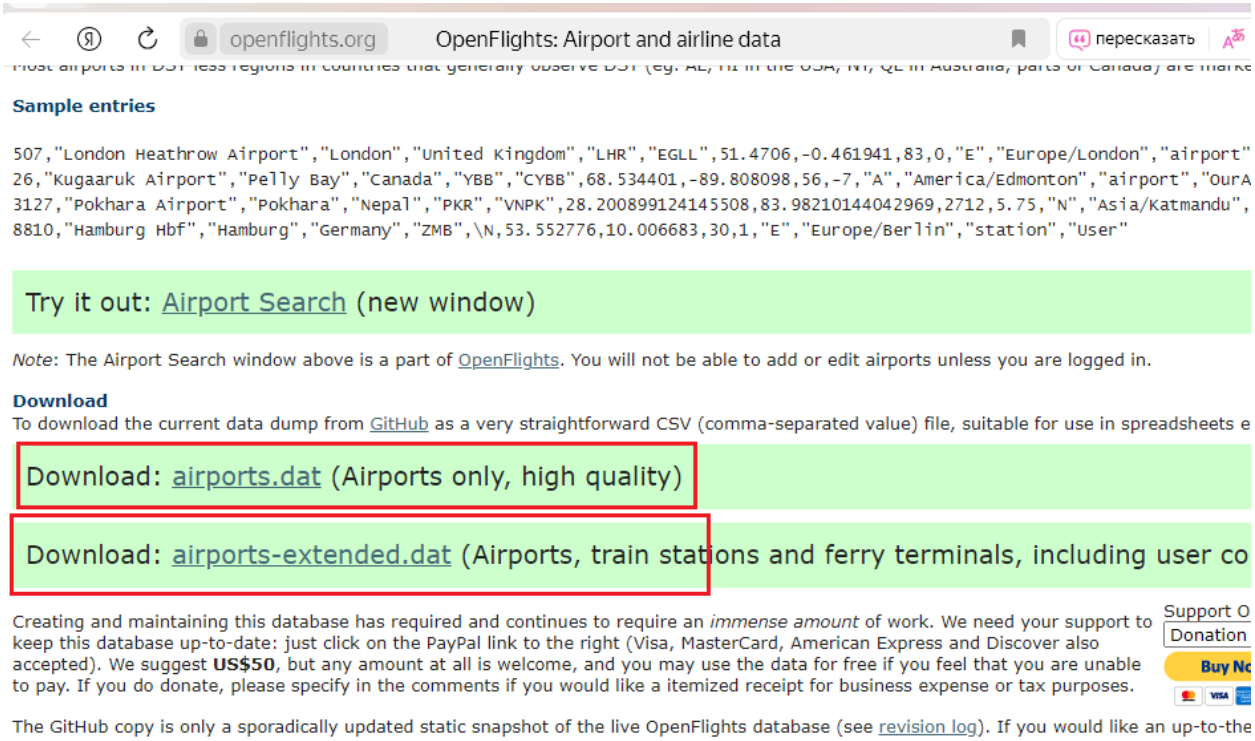
Во вкладке Datanodes, можно посмотреть на ноды:





Теперь загрузим данные, например, откроем в браузере https://openflights.org/data

Копируем ссылки:



И скачиваем на сервер:

```
user@hadoop-server:~$ wget https://raw.githubusercontent.com/jpatokal/openflights/m
aster/data/airports.dat
--2024-10-25 04:56:00--  https://raw.githubusercontent.com/jpatokal/openflights/mas
ter/data/airports.dat
Resolving raw.githubusercontent.com (raw.githubusercontent.com)... 185.199.111.133,
 185.199.108.133, 185.199.110.133, ...
Connecting to raw.githubusercontent.com (raw.githubusercontent.com)|185.199.111.133
|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 1127225 (1,1M) [text/plain]
Saving to: 'airports.dat'

airports.dat         100%[===================>]   1,07M  2,51MB/s    in 0,4s

2024-10-25 04:56:01 (2,51 MB/s) - 'airports.dat' saved [1127225/1127225]

user@hadoop-server:~$
```

```
user@hadoop-server:~$ wget https://raw.githubusercontent.com/jpatokal/openflights/m
aster/data/airports-extended.dat
--2024-10-25 04:56:49--  https://raw.githubusercontent.com/jpatokal/openflights/mas
ter/data/airports-extended.dat
Resolving raw.githubusercontent.com (raw.githubusercontent.com)... 185.199.111.133,
 185.199.108.133, 185.199.110.133, ...
Connecting to raw.githubusercontent.com (raw.githubusercontent.com)|185.199.111.133
|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 1670162 (1,6M) [text/plain]
Saving to: 'airports-extended.dat'

airports-extended.da 100%[===================>]   1,59M  2,93MB/s    in 0,5s

2024-10-25 04:56:50 (2,93 MB/s) - 'airports-extended.dat' saved [1670162/1670162]

user@hadoop-server:~$
```

Затем копируем файлы в контейнер:

```
user@hadoop-server:~$ sudo docker cp airports.dat namenode:/
Successfully copied 1.13MB to namenode:/
user@hadoop-server:~$ sudo docker cp airports-extended.dat namenode:/
Successfully copied 1.67MB to namenode:/
user@hadoop-server:~$
```

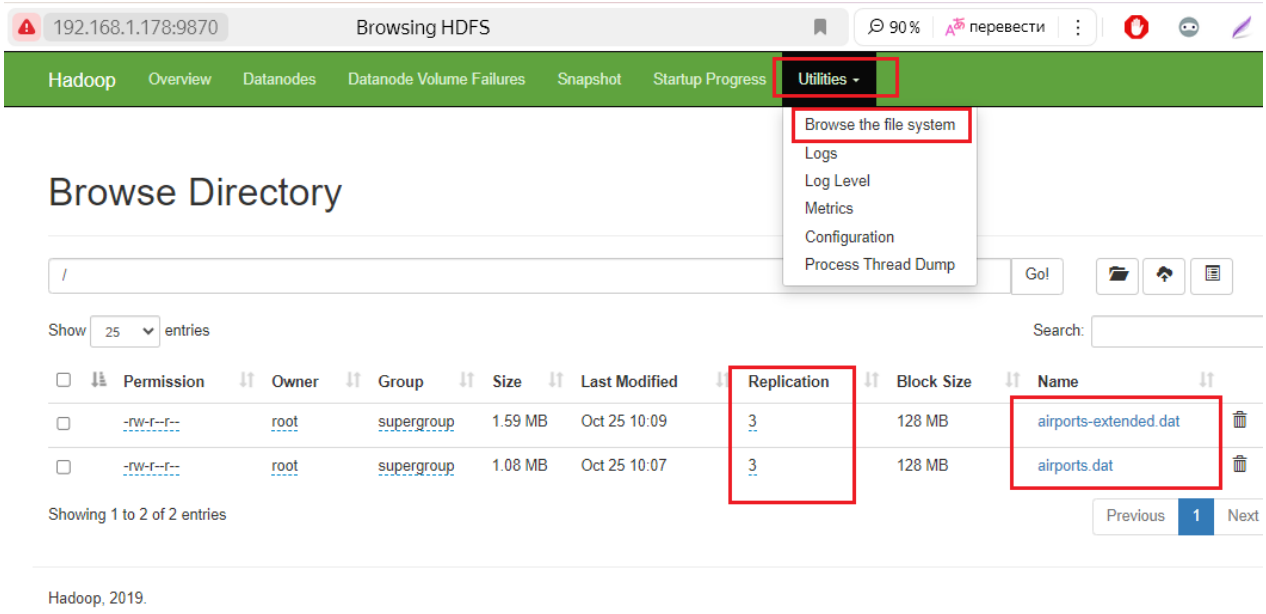
Проверяем, файлы внутри контейнера:

```
user@hadoop-server:~$ sudo docker exec -it namenode /bin/bash
root@741bd87e49c4:/# ls
KEYS                  boot        hadoop       lib64  proc    sbin  usr
airports-extended.dat dev         hadoop-data  media  root    srv   var
airports.dat          entrypoint.sh home         mnt    run     sys
bin                   etc         lib          opt    run.sh  tmp
root@741bd87e49c4:/#
```

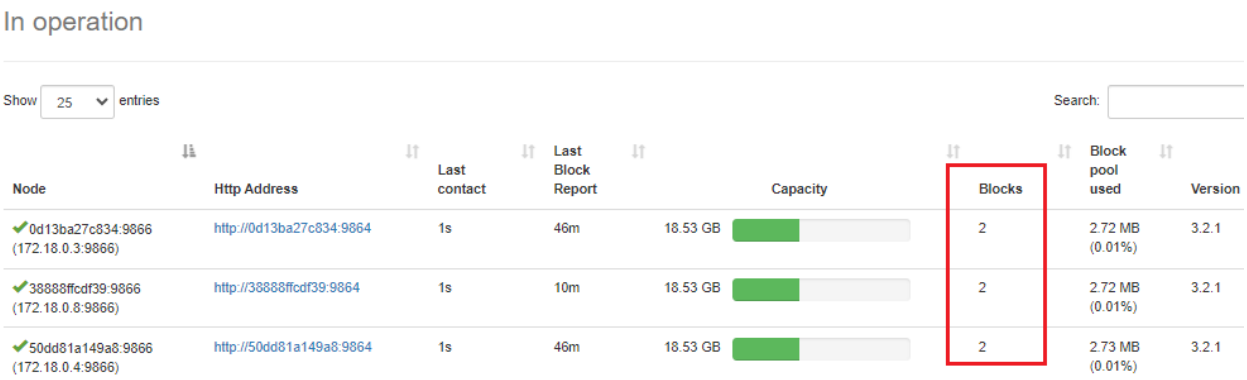
Затем кладем файлы в HDFS:

```
root@741bd87e49c4:/# hdfs dfs -put airports.dat /
2024-10-25 05:07:41,064 INFO sasl.SaslDataTransferClient: SASL encryption trust che
ck: localHostTrusted = false, remoteHostTrusted = false
root@741bd87e49c4:/# hdfs dfs -put airports-extended.dat /
2024-10-25 05:09:10,403 INFO sasl.SaslDataTransferClient: SASL encryption trust che
ck: localHostTrusted = false, remoteHostTrusted = false
root@741bd87e49c4:/#
```

Проверяем в админке:



Фактор репликации 3, значит файл должен быть на всех трех нодах:



Можно прочитать содержимое файла:

```
root@741bd87e49c4:/#hdfs dfs -cat /airports.dat
```

```
2591,\N,\N,\N,"airport","OurAirports"
14100,"Ramon Airport","Eilat","Israel","ETM","LLER",29.723694,35.011416,288,\N,\N,
N,"airport","OurAirports"
14101,"Rustaq Airport","Al Masna'ah","Oman","MNH","OORQ",23.640556,57.4875,349,\N,
N,\N,"airport","OurAirports"
14102,"Laguindingan Airport","Cagayan de Oro City","Philippines","CGY","RPMY",8.61
203,124.456496,190,\N,\N,\N,"airport","OurAirports"
14103,"Kostomuksha Airport","Kostomuksha","Russia",\N,"ULPM",64.61799621579999,30.
87000274699997,681,\N,\N,\N,"airport","OurAirports"
14104,"Privolzhskiy Air Base","Astrakhan","Russia",\N,"XRAP",46.396,47.893,-66,\N,
N,\N,"airport","OurAirports"
14105,"Kubinka Air Base","Kubinka","Russia",\N,"UUMB",55.611695,36.650002,614,\N,\
,\N,"airport","OurAirports"
14106,"Rogachyovo Air Base","Belaya","Russia",\N,"ULDA",71.61669921880001,52.47829
1873,272,\N,\N,\N,"airport","OurAirports"
14107,"Ulan-Ude East Airport","Ulan Ude","Russia",\N,"XIUW",51.849998474121094,107
73799896240234,1670,\N,\N,\N,"airport","OurAirports"
14108,"Krechevitsy Air Base","Novgorod","Russia",\N,"ULLK",58.625,31.385000228881
6,85,\N,\N,\N,"airport","OurAirports"
14109,"Desierto de Atacama Airport","Copiapo","Chile","CPO","SCAT",-27.2611999512,
70.7791976929,670,\N,\N,\N,"airport","OurAirports"
14110,"Melitopol Air Base","Melitopol","Ukraine",\N,"UKDM",46.880001,35.305,0,\N,\
,\N,"airport","OurAirports"
root@741bd87e49c4:/#
```

Установка и настройка распределенной файловой системы завершена.