Hadoop Installation Guide

Note: You need to setup Virtual Machine by following “Get your VM setup!” before setting up Hadoop

Every step is to be executed on the home directory. Use `cd` to move to home directory.

The commands in the guide use `pes2ug22cs000` as the notation for your username. If you have executed the VM setup correctly, then this should be your SRN in lowercase. This is important since the auto-evaluation depends on it. Verify your username by running `whoami` on the terminal.

Change any `/home/pes2ug22cs000/` to `/home/<your SRN>/`

Execute the following commands to move to the home directory and updating the package list and the system. This guide assumes that you are working with Ubuntu or a Debian based distribution.

```
cd
sudo apt update -y
sudo apt upgrade -y
```

Downloads

Step 1 - Installing Java

Since Hadoop 3.3.6 may not support newer versions of Java, we install Java 8 using the following command.

```
sudo apt install openjdk-8-jdk -y
```

Check if Java is successfully installed and the version with the following commands.

```
java -version
javac -version
```

Step 2 - Downloading Hadoop

Use the link given below to download and extract hadoop using the following commands.

```
cd
wget https://dlcdn.apache.org/hadoop/common/hadoop-3.3.6/hadoop-3
tar xzf $HOME/hadoop-3.3.6.tar.gz
```

Installation

Step 1 - Setup passwordless SSH for Hadoop

We install the following packages to allow us to setup an ssh server on the system as well as a client to remote into it with the following commands.

```
sudo apt install openssh-server openssh-client -y
```

Enable passwordless SSH

Generate an SSH key pair and define the location is is to be stored in id_rsa. Then use the cat command to store the public key as authorized_keys in the ssh directory. Follow these exact commands with change in permissions.

```
ssh-keygen -t rsa -P '' -f ~/.ssh/id_rsa
cat ~/.ssh/id_rsa.pub >> ~/.ssh/authorized_keys
chmod 0600 ~/.ssh/authorized_keys
```

ordless SSH is setup and working with

```
ssh localhost
```

> 💡 If the above command does not ask you for a password, you have successfully setup passwordless SSH.
>
> Type `exit` or press `Ctrl+d` to quit the SSH session.

Step 2 - Single Node Deployment

The current setup is called pseudo-distributed mode, allows each Hadoop daemon to run as a single Java process. A Hadoop environment is configured by editing the following list of configuration files:

- .bashrc
- hadoop-env.sh
- core-site.xml
- hdfs-site.xml
- mapred-site-xml
- yarn-site.xml

Before editing the above mentioned files, we need to make a few directories for our namenodes and datanodes along with the required permissions.

```
cd
mkdir dfsdata
mkdir tmpdata
mkdir dfsdata/datanode
mkdir dfsdata/namenode
```

Change permissions for the directories using the following commands.

```
sudo chown -R $USER:$USER $HOME/dfsdata/
sudo chown -R $USER:$USER $HOME/dfsdata/datanode/
sudo chown -R $USER:$USER $HOME/dfsdata/namenode
```

Editing and Setting up the ~/.bashrc config file

Open .bashrc with any text editor of your choice. This guide recommends using `nano` .

```
sudo nano ~/.bashrc
```

Scroll to the bottom of the file. Copy and paste the below mentioned statements to the end of the file.

Change pes2ug22cs000 to your SRN at 1 location

```
#Hadoop Path Configs
export HADOOP_HOME=/home/pes2ug22cs000/hadoop-3.3.6
export HADOOP_INSTALL=$HADOOP_HOME
export HADOOP_MAPRED_HOME=$HADOOP_HOME
export HADOOP_COMMON_HOME=$HADOOP_HOME
export HADOOP_HDFS_HOME=$HADOOP_HOME
export YARN_HOME=$HADOOP_HOME
export HADOOP_COMMON_LIB_NATIVE_DIR=$HADOOP_HOME/lib/native
export PATH=$PATH:$HADOOP_HOME/sbin:$HADOOP_HOME/bin
export HADOOP_OPTS=-Djava.library.path=$HADOOP_HOME/lib/native
```

Press `Ctrl+o` to save and `Ctrl+x` to exit nano . Apply changes to `bash` with the following command.

```
source ~/.bashrc
```

You can verify if the changes have been made by using the `echo` command and checking if the corresponding path gets printed in the terminal.

```
echo $HADOOP_HOME
echo $PATH
```

Setup hadoop-env.sh

Open the file with

```
sudo nano $HADOOP_HOME/etc/hadoop/hadoop-env.sh
```

Scroll down until you find the commented line `# export JAVA_HOME=` . Uncomment the line and replace the path with your Java path. The final line should look like this

```
export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64
```

> 💡 Note: If your VM is running on a mac then change the above JAVA_HOME path to “ java-8-openjdk-arm64 “ instead of “ java-8-openjdk-amd64 “

Save and exit the file as shown previously.

Setup core-site.xml

Open the file with

```
sudo nano $HADOOP_HOME/etc/hadoop/core-site.xml
```

Replace the existing configuration tags with the following

Change pes2ug22cs000 to your SRN at 1 location

```
<configuration>
<property>
  <name>hadoop.tmp.dir</name>
  <value>/home/pes2ug22cs000/tmpdata</value>
</property>
<property>
  <name>fs.default.name</name>
  <value>hdfs://127.0.0.1:9000</value>
</property>
</configuration>
```

Save and exit the file.

Setup hdfs-site.xml

Open the file using

```
sudo nano $HADOOP_HOME/etc/hadoop/hdfs-site.xml
```

Replace the existing configuration tags with the following

Change pes2ug22cs000 to your SRN at 2 locations

```
<configuration>
    <property>
        <name>dfs.replication</name>
        <value>1</value>
    </property>
    <property>
        <name>dfs.namenode.name.dir</name>
        <value>/home/pes2ug22cs000/dfsdata/namenode</value>
    </property>
    <property>
        <name>dfs.datanode.data.dir</name>
        <value>/home/pes2ug22cs000/dfsdata/datanode</value>
    </property>
          ation>
```

Save and exit the file after making all the changes.

Setup mapred-site.xml

Open the file with

```
sudo nano $HADOOP_HOME/etc/hadoop/mapred-site.xml
```

Replace the existing configuration tags with the following

```
<configuration>
<property>
  <name>mapreduce.framework.name</name>
  <value>yarn</value>
</property>
</configuration>
```

Save and exit the file.

Setup yarn-site.xml

Open the file with

```
sudo nano $HADOOP_HOME/etc/hadoop/yarn-site.xml
```

Replace the existing configuration tags with the following

```
<configuration>
<property>
  <name>yarn.nodemanager.aux-services</name>
  <value>mapreduce_shuffle</value>
</property>
<property>
          arn.nodemanager.aux-services.mapreduce.shuffle.class</na
          rg.apache.hadoop.mapred.ShuffleHandler</value>
```

```
</property>
<property>
  <name>yarn.resourcemanager.hostname</name>
  <value>127.0.0.1</value>
</property>
<property>
  <name>yarn.acl.enable</name>
  <value>0</value>
</property>
<property>
  <name>yarn.nodemanager.env-whitelist</name>
  <value>JAVA_HOME,HADOOP_COMMON_HOME,HADOOP_HDFS_HOME,HADOOP_CON
</property>
</configuration>
```

Save and exit the file.

Execute the following commands to move to the home directory and updating the package list and the system. This guide assumes that you are working with Ubuntu or a Debian based distribution.

```
cd
sudo apt update -y
sudo apt upgrade -y
```

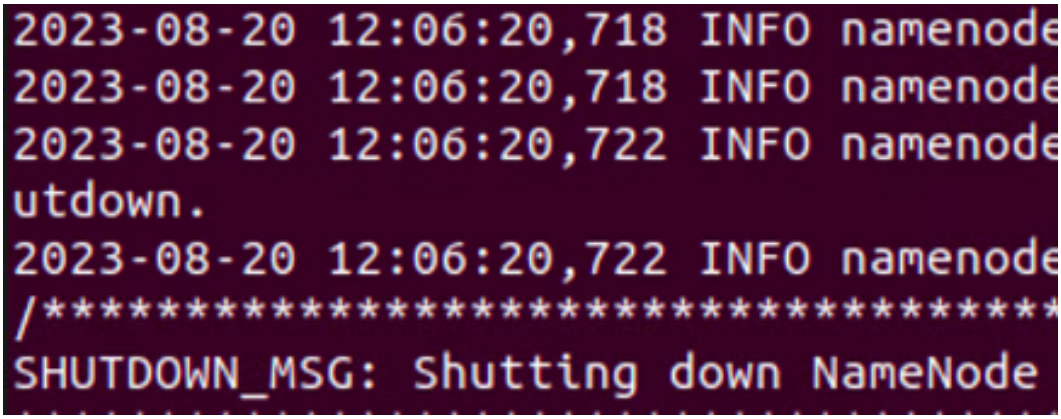
Step 3 - Format HDFS NameNode

Before starting Hadoop for the first time, the namenode must be formatted. Use the following command.

```
hdfs namenode -format
```

message will signify the end of the formatting process.

If you have reached this stage, it signifies that you have successfully installed hadoop.



Step 4 - Starting Hadoop

Navigate to the `hadoop` folder and execute the following commands. `start-all.sh` is a shell script that is used to start all the processes


```
cd
cd hadoop-3.3.6/sbin/
./start-all.sh
```

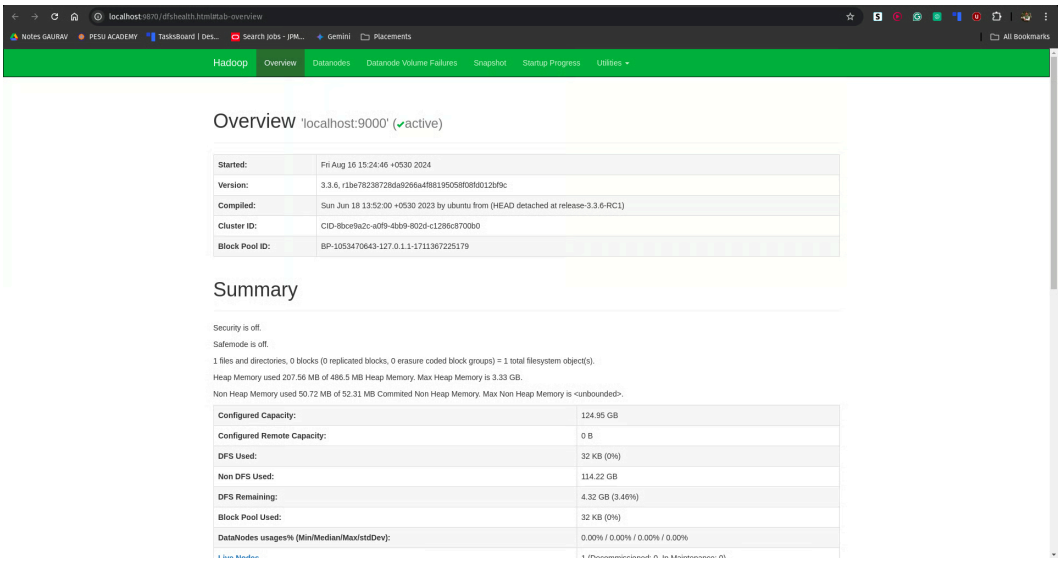
Type `jps` to find all the Java Processes started by the shell script. You should see a total of 6 processes, including the `jps` process. Note that the order of the items and the process IDs will be different.

```
2994 DataNode
3219 SecondaryNameNode
3927 Jps
3431 ResourceManager
2856 NameNode
3566 NodeManager
```

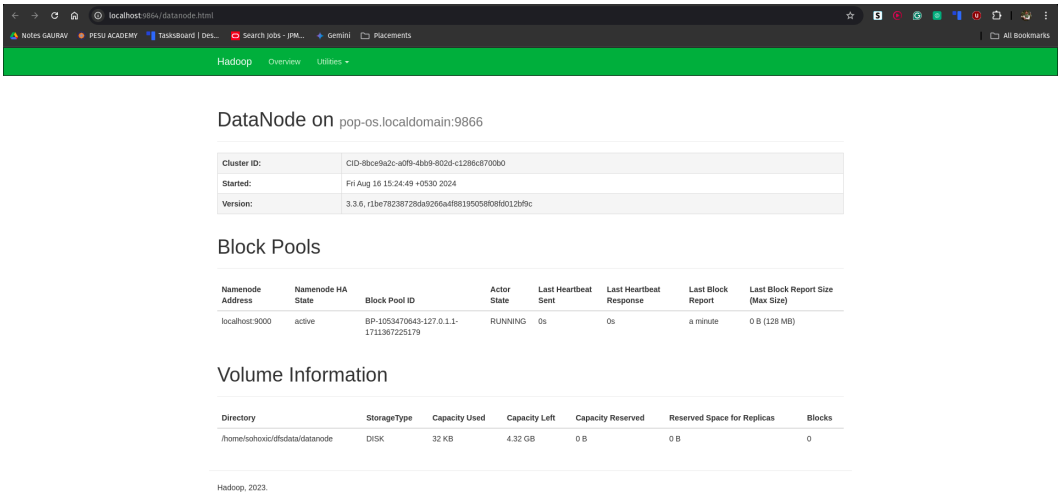
Step 5 - Accessing Hadoop from the Browser

You can access Hadoop on `localhost` on the following ports

- NameNode - http://localhost:9870



- DataNode - http://localhost:9864



- YARN Manager - http://localhost:8088

Step 6 - Hadoop Examples

We will be using the Wordcount example to demonstrate the usage of Hadoop. Create a text file named `input.txt` with any content you want. Next, we will put this to the HDFS folder `/example` with the following command.

```
cd
hdfs dfs -mkdir /example
hdfs dfs -put input.txt /example
```

Run the following command for the wordcount example.

```
hadoop jar $HADOOP_HOME/share/hadoop/mapreduce/hadoop-mapreduce-e
```

You can check the output with the following command.

```
hdfs dfs -cat /example/output/part-r-00000
```