Exp.1 Downloading and installing Hadoop, Understanding different Hadoop modes, Startup scripts, Configuration files.

AIM:

To Download and install Hadoop, Understanding different Hadoop modes, Startup scripts, Configuration files.

Procedure:

Step 1 : Install Java Development Kit
The default Ubuntu repositories contain Java 8 and Java 11 both. But, Install Java 8 because hive only works on this version. Use the following command to install it.

$sudo apt update&&sudo apt install openjdk-8-jdk Step 2 :

Verify the Java version
Once installed, verify the installed version of Java with the following command:

$ java -version

Step 3: Install SSH

SSH (Secure Shell) installation is vital for Hadoop as it enables secure communication between nodes in the Hadoop cluster. This ensures data integrity, confidentiality, and allows for efficient distributed processing of data across the cluster.
$sudo apt install ssh

Step 4 : Create the hadoop user :
All the Hadoop components will run as the user that you create for Apache Hadoop, and the user will also be used for logging in to Hadoop's web interface.
Run the command to create user and set password:

$ sudo adduser hadoop

Step 5 : Switch user
Switch to the newly created hadoop user: $
su - hadoop

Step 6 : Configure SSH
Now configure password-less SSH access for the newly created hadoop user, so didn't enter the key to save file and passphrase. Generate an SSH keypair (generate Public and Private Key Pairs)first

$ssh-keygen -t rsa

Step 7 : Set permissions :

Next, append the generated public keys from id_rsa.pub to authorized_keys and set proper permission:
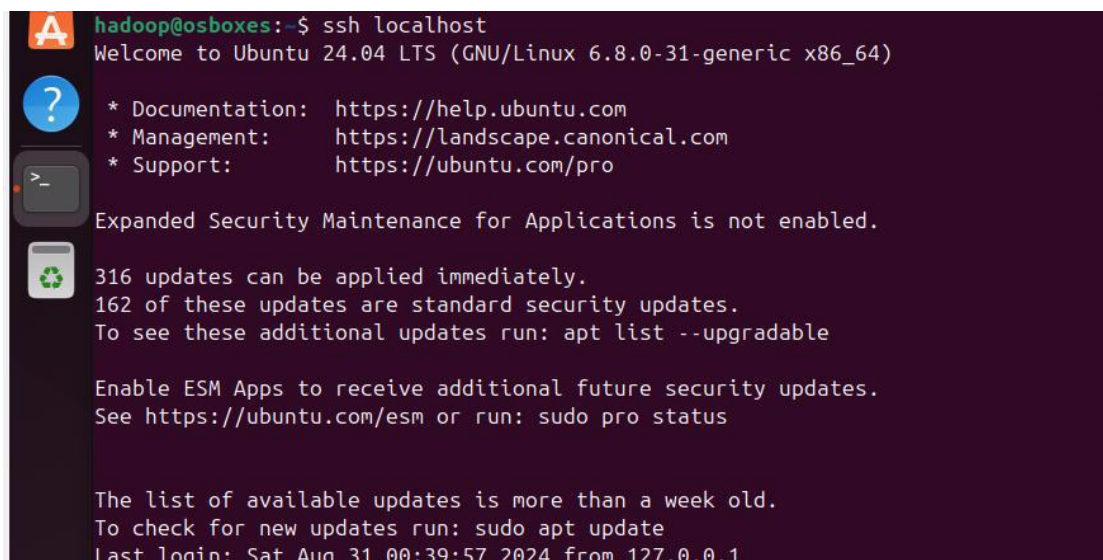
$ cat ~/.ssh/id_rsa.pub >> ~/.ssh/authorized_keys $

chmod 640 ~/.ssh/authorized_keys

Step 8 : SSH to the localhost
Next, verify the password less SSH authentication with the following command:

$ ssh localhost

You will be asked to authenticate hosts by adding RSA keys to known hosts. Type yes and hit
Enter to authenticate the localhost:

```
hadoop@osboxes:~$ ssh localhost
Welcome to Ubuntu 24.04 LTS (GNU/Linux 6.8.0-31-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/pro

Expanded Security Maintenance for Applications is not enabled.

316 updates can be applied immediately.
162 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status


The list of available updates is more than a week old.
To check for new updates run: sudo apt update
Last login: Sat Aug 31 00:39:57 2024 from 127.0.0.1
```

```
hadoop@osboxes:~$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as hadoop in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
localhost: namenode is running as process 8126.  Stop it first and ensure /tmp/hadoop-hadoop-namenode.pid file is emp
 before retry.
Starting datanodes
localhost: datanode is running as process 8271.  Stop it first and ensure /tmp/hadoop-hadoop-datanode.pid file is emp
 before retry.
Starting secondary namenodes [osboxes]
osboxes: secondarynamenode is running as process 8462.  Stop it first and ensure /tmp/hadoop-hadoop-secondarynamenode
id file is empty before retry.
Starting resourcemanager
resourcemanager is running as process 8728.  Stop it first and ensure /tmp/hadoop-hadoop-resourcemanager.pid file is
pty before retry.
Starting nodemanagers
localhost: nodemanager is running as process 8868.  Stop it first and ensure /tmp/hadoop-hadoop-nodemanager.pid file
 empty before retry.
```

$ nano ~/.bashrc

Append the below lines to file.

```
export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64
export HADOOP_HOME=/home/hadoop/hadoop
export HADOOP_INSTALL=$HADOOP_HOME
export HADOOP_MAPRED_HOME=$HADOOP_HOME
export HADOOP_COMMON_HOME=$HADOOP_HOME
export HADOOP_HDFS_HOME=$HADOOP_HOME
export HADOOP_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"
```

Save and close the file. Then, activate the environment variables with the following command:

s$ source ~/.bashrc

Next, open the Hadoop environment variable file:

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

Search for the "export JAVA_HOME" and configure it.

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

Save and close the file when you are finished.

Step 11 : Configuring Hadoop :
First, you will need to create the namenode and datanode directories inside the Hadoop user home directory. Run the following command to create both directories:

```
$ cd hadoop/
$mkdir -p ~/hadoopdata/hdfs/{namenode,datanode}

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

Change the following name as per your system hostname:

```
<configuration>
    <property>
        <name>fs.defaultFS</name>
        <value>hdfs://localhost:9000</value>
    </property>
</configuration>
```

Save and close the file.

Then, edit the hdfs-site.xml file:

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

• Change the NameNode and DataNode directory paths as shown below:

```
<configuration>
    <property>
        <name>dfs.replication</name>
        <value>1</value>
    </property>

    <property>
        <name>dfs.namenode.name.dir</name>
        <value>file:///home/hadoop/hadoopdata/hdfs/namenode</value>
    </property>

    <property>
        <name>dfs.datanode.data.dir</name>
        <value>file:///home/hadoop/hadoopdata/hdfs/datanode</value>
    </property>
</configuration>
```

• Then, edit the mapred-site.xml file:

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

- Make the following changes:

```xml
<configuration>
    <property>
        <name>yarn.app.mapreduce.am.env</name>
        <value>HADOOP_MAPRED_HOME=$HADOOP_HOME/home/hadoop/hadoop/bin/hadoop</value>
    </property>
    <property>
        <name>mapreduce.map.env</name>
        <value>HADOOP_MAPRED_HOME=$HADOOP_HOME/home/hadoop/hadoop/bin/hadoop</value>
    </property>
    <property>
        <name>mapreduce.reduce.env</name>
        <value>HADOOP_MAPRED_HOME=$HADOOP_HOME/home/hadoop/hadoop/bin/hadoop</value>
    </property>
</configuration>
```

- Then, edit the yarn-site.xml file:
  $nano $HADOOP_HOME/etc/hadoop/yarn-site.xml
- Make the following changes:

```xml
<configuration>
    <property>
        <name>yarn.nodemanager.aux-services</name>
        <value>mapreduce_shuffle</value>
    </property>
</configuration>
```

Save the file and close it .

Step 12 – Start Hadoop Cluster

Before starting the Hadoop cluster. You will need to format the Namenode as a hadoop user. Run

the following command to format the Hadoop Namenode:

$hdfs namenode –format

Once the namenode directory is successfully formatted with hdfs file system, you will see the message "Storage directory /home/hadoop/hadoopdata/hdfs/namenode has been successfully formatted "

Then start the Hadoop cluster with the following command.
  $ start-all.sh

```
hadoop@osboxes:~$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as hadoop in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
localhost: namenode is running as process 8126.  Stop it first and ensure /tmp/hadoop-hadoop-namenode.pid file is empty
 before retry.
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localhost: datanode is running as process 8271.  Stop it first and ensure /tmp/hadoop-hadoop-datanode.pid file is empty
 before retry.
Starting secondary namenodes [osboxes]
osboxes: secondarynamenode is running as process 8462.  Stop it first and ensure /tmp/hadoop-hadoop-secondarynamenode.p
id file is empty before retry.
Starting resourcemanager
resourcemanager is running as process 8728.  Stop it first and ensure /tmp/hadoop-hadoop-resourcemanager.pid file is em
pty before retry.
Starting nodemanagers
localhost: nodemanager is running as process 8868.  Stop it first and ensure /tmp/hadoop-hadoop-nodemanager.pid file is
 empty before retry.
```

You can now check the status of all Hadoop services using the jps command:

$ jps

```
hadoop@osboxes:~$ jps
10898 Jps
8868 NodeManager
8728 ResourceManager
9212 RunJar
8126 NameNode
8462 SecondaryNameNode
8271 DataNode
```

Step 13 – Access Hadoop Namenode and Resource Manager

- First we need to know our ipaddress, In Ubuntu we need to install net-tools to run ipconfig command,
  If you installing net-tools for the first time switch to default user:
  $sudo apt install net-tools

- Then run ifconfig command to know our ip address:

```
hadoop@osboxes:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.0.2.15  netmask 255.255.255.0  broadcast 10.0.2.255
        inet6 fe80::a00:27ff:fe56:6fa2  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:56:6f:a2  txqueuelen 1000  (Ethernet)
        RX packets 458730  bytes 616003488 (616.0 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 171067  bytes 18436556 (18.4 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 21342  bytes 2170633 (2.1 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 21342  bytes 2170633 (2.1 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```
ifconfig

Here my ip address is 192.168.1.6.
- To access the Namenode, open your web browser and visit the URL http://your-server-ip:9870.
- You should see the following screen:
  http://192.168.1.6:9870

To access Resource Manage, open your web browser and visit the URL http://your-server-ip:8088. You should see the following screen:

http://192.168.16:8088

Step 14 – Verify the Hadoop Cluster

At this point, the Hadoop cluster is installed and configured. Next, we will create some directories in the HDFS filesystem to test the Hadoop.

Let's create some directories in the HDFS filesystem using the following command:

```
$ hdfsdfs -mkdir /test1 $
hdfsdfs -mkdir /logs
```

Next, run the following command to list the above directory:

```
$ hdfs dfs -ls /
```

You should get the following output:

Also, put some files to hadoop file system. For the example, putting log files from host machine to hadoop file system.

```
$ hdfs dfs -put /var/log/* /logs/
```

You can also verify the above files and directory in the Hadoop Namenode web interface.

Go to the web interface, click on the Utilities => Browse the file system. You should see your directories which you have created earlier in the following screen:
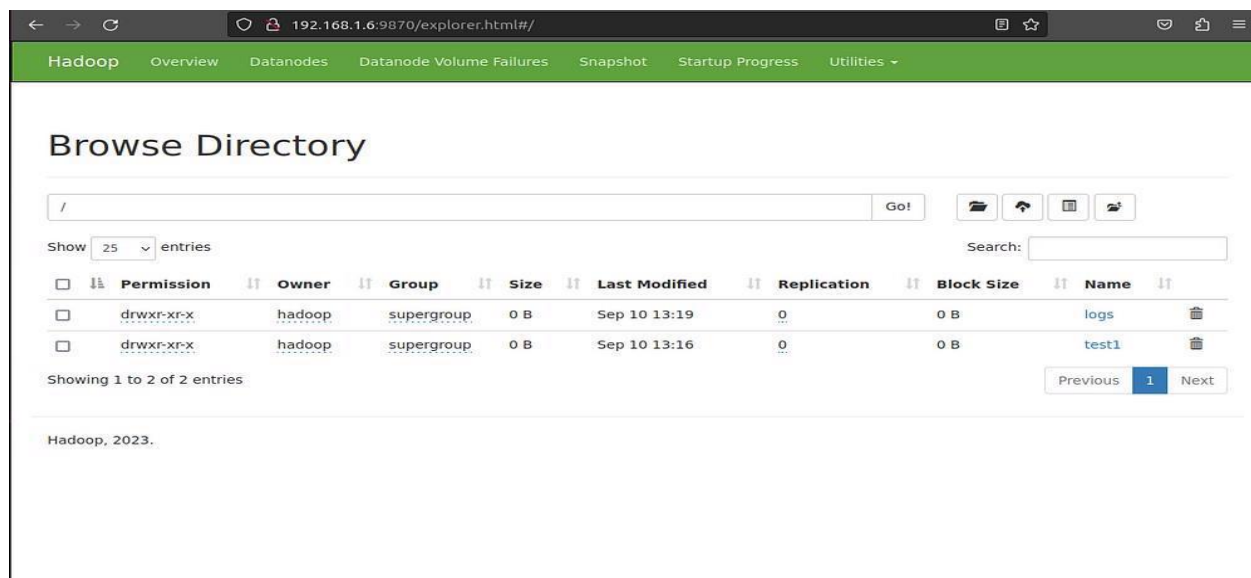
Step 15 – Stop Hadoop Cluster

To stop the Hadoop all services, run the following command:

```
$ stop-all.sh
```

```
hadoop@osboxes:~$ stop-all.sh
WARNING: Stopping all Apache Hadoop daemons as hadoop in 10 seconds.
WARNING: Use CTRL-C to abort.
Stopping namenodes on [localhost]
Stopping datanodes
Stopping secondary namenodes [osboxes]
Stopping nodemanagers
Stopping resourcemanager
```