Exp No: 9 **Date: 09/10/2024**

HADOOP

SET UP A SINGLE HADOOP CLUSTER AND SHOW THE PROCESS USING WEB UI

AIM:

To set-up one node Hadoop cluster.

PROCEDURE:

1. System Update
2. Install Java
3. Add a dedicated Hadoop user
4. Install SSH and setup SSH certificates
5. Check if SSH works
6. Install Hadoop
7. Modify Hadoop config files
8. Format Hadoop filesystem
9. Start Hadoop
10. Check Hadoop through web UI
11. Stop Hadoop

THEORY:

Hadoop is an Apache open-source framework written in java that allows distributed processing of large datasets across clusters of computers using simple programming models. A Hadoop frame-worked application works in an environment that provides distributed storage and computation across clusters of computers. Hadoop is designed to scale up from a single server to thousands of machines, each offering local computation and storage.

HADOOP ARCHITECTURE

Hadoop framework includes following four modules:

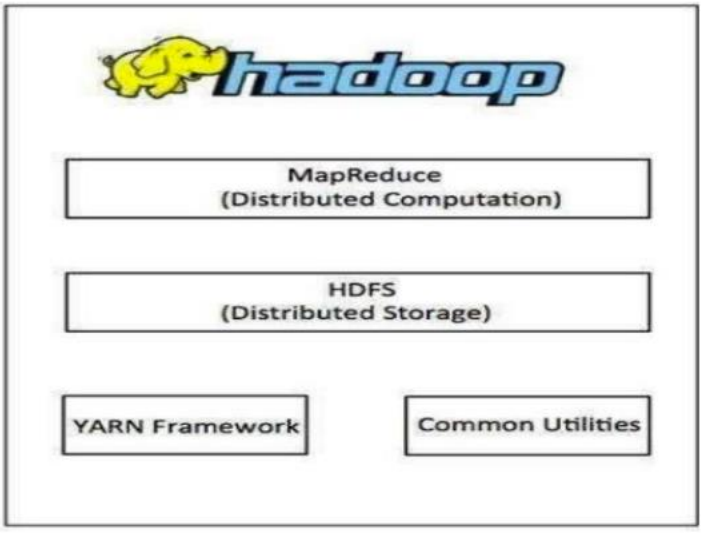
Hadoop Common: These are Java libraries and utilities required by other Hadoop modules. These libraries provide filesystem and OS level abstractions and contain the necessary Java files and scripts required to start Hadoop.

Hadoop YARN: This is a framework for job scheduling and cluster resource management.

Hadoop Distributed File System (HDFS): A distributed file system that provides high-throughput access to application data.

Hadoop MapReduce: This is a YARN-based system for parallel processing of large data sets.

We can use following diagram to depict these four components available in Hadoop framework.



PROCEDURE:

Step 1 – System Update

$ sudo apt-get update

Step 2 – Install Java and Set JAVA_HOME

$ sudo apt-get install default-jdk

$ java -version

```
haresh@fedora:~$ java -version
openjdk version "21.0.4" 2024-07-16
OpenJDK Runtime Environment (Red_Hat-21.0.4.0.7-2) (build 21.0.4+7)
OpenJDK 64-Bit Server VM (Red_Hat-21.0.4.0.7-2) (build 21.0.4+7, mixed mode, sha
ring)
```

Step 3 – Add a dedicated Hadoop user

$ sudo addgroup Hadoop

$ sudo adduser --ingroup hadoop hduser

// Add hduser to sudo user group

$ sudo adduser hduser sudo

Step 4 – Install SSH and Create Certificates

$ sudo apt-get install ssh

$ su hduser

$ ssh-keygen -t rsa -P ""

$ cat $HOME/.ssh/id_rsa.pub >> $HOME/.ssh/authorized_keys

Step 6 – Install Hadoop

$ wget https://archive.apache.org/dist/hadoop/core/hadoop-2.8.4/hadoop-2.8.4.tar.gz

// Extract Hadoop-2.8.4

$ sudo tar xvzf hadoop-2.8.4.tar.gz

// Create a folder 'hadoop' in /usr/local

$ sudo mkdir –p /usr/local/Hadoop

// Move the Hadoop folder to /usr/local/hadoop

$ sudo mv hadoop-2.8.4 /usr/local/Hadoop

// Assigning read and write access to Hadoop folder

$ sudo chown –R hduser:hadoop /usr/local/Hadoop

Step 7 - Modify Hadoop config files

//Hadoop Environmental variable setting – The following files will be modified

1. ~/.bashrc

2. /usr/local/hadoop/hadoop-2.8.4/etc/hadoop/hadoop-env.sh

3. /usr/local/hadoop/hadoop-2.8.4/etc/hadoop/core-site.xml

4. /usr/local/hadoop/hadoop-2.8.4/etc/hadoop/hdfs-site.xml

5. /usr/local/hadoop/hadoop-2.8.4/etc/hadoop/yarn-site.xml

6. /usr/local/hadoop/hadoop-2.8.4/etc/hadoop/mapred-site.xml.template

$ sudo nano ~/.bashrc

// Add the following lines at the end of the file

exportJAVA_HOME=/usr/lib/jvm/java-8-oracle

export HADOOP_HOME=/usr/local/hadoop/hadoop-2.8.4 export

PATH=$PATH:$HADOOP_HOME/bin

export PATH=$PATH:$HADOOP_HOME/sbin

export HADOOP_MAPRED_HOME=$HADOOP_HOME export

HADOOP_COMMON_HOME=$HADOOP_HOME export

HADOOP_HDFS_HOME=$HADOOP_HOME

export YARN_HOME=$HADOOP_HOME

HADOOP_COMMON_LIB_NATIVE_DIR=$HADOOP_HOME/lib/native export

HADOOP_OPTS="-D.java.library.path=$HADOOP_HOME/lib" export

PATH=$PATH:/usr/local/hadoop/hadoop-2.8.4/bin

```
export JAVA_HOME=/usr/lib/jvm/java-1.8.0-openjdk
export HADOOP_HOME=/home/haresh/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 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"
export HADOOP_STREAMING=$HADOOP_HOME/share/hadoop/tools/lib/hadoop-streaming-3.>
export HADOOP_LOG_DIR=$HADOOP_HOME/logs
export PDSH_RCMD_TYPE=ssh
```

// Configure Hadoop Files

$ cd /usr/local/hadoop/hadoop-2.8.4/etc/hadoop/

$ sudo nano hadoop-env.sh

// Add following line in hadoop-env.sh – Set JAVA variable in Hadoop

The java implementation to use.

export JAVA_HOME=/usr/lib/jvm/java-8-oracle

```
 GNU nano 7.2                    hadoop-env.sh
##
 Generic settings for HADOOP
##

 Technically, the only required environment variable is JAVA_HOME.
 All others are optional.  However, the defaults are probably not
 preferred.  Many sites configure these options outside of Hadoop,
 such as in /etc/profile.d

 The java implementation to use. By default, this environment
 variable is REQUIRED on ALL platforms except OS X!
xport JAVA_HOME=/usr/lib/jvm/java-1.8.0-openjdk

 Location of Hadoop.  By default, Hadoop will attempt to determine
 this location based upon its execution path.
 export HADOOP_HOME=

 Location of Hadoop's configuration information.  i.e., where this
 file is living. If this is not defined, Hadoop will attempt to
```

// Create datanode and namenode

$ sudo mkdir –p /usr/local/hadoop_tmp/hdfs/namenode

$ sudo mkdir –p /usr/local/hadoop_tmp/hdfs/datanode

// Changing ownership to hadoop_tmp

$ sudo chown –R hduser:hadoop /usr/local/hadoop_tmp

// Edit hdfs-site.xml

$ sudo nano hdfs-site.xml

// Add the following lines between <configuration> ..... </configuration>

<configuration>

<property>

<name>dfs.replication</name>

<value>1</value>

</property>

<property>

<name>dfs.namenode.name.dir</name>

<value>file:/usr/local/hadoop_tmp/hdfs/namenode</value>

</property>

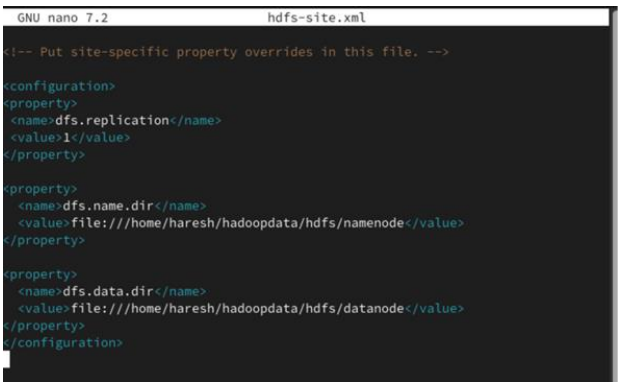
<property>

<name>dfs.datanode.data.dir</name>

<value>file:/usr/local/hadoop_tmp/hdfs/datanode</value>

</property>

</configuration>



// Edit core-site.xml

$ sudo nano core-site.xml

21

// Add the following lines between <configuration> ..... </configuration>

<configuration>

<property>

<name>fs.default.name</name>

<value>hdfs://localhost:9000</value>

</property>

</configuration>

// Edit yarn-site.xml

$ sudo nano yarn-site.xml

// Add the following lines between <configuration> ..... </configuration>

<configuration>

<property>

<name>yarn.nodemanager.aux-services</name>

<value>mapreduce_shuffle</value>

</property>

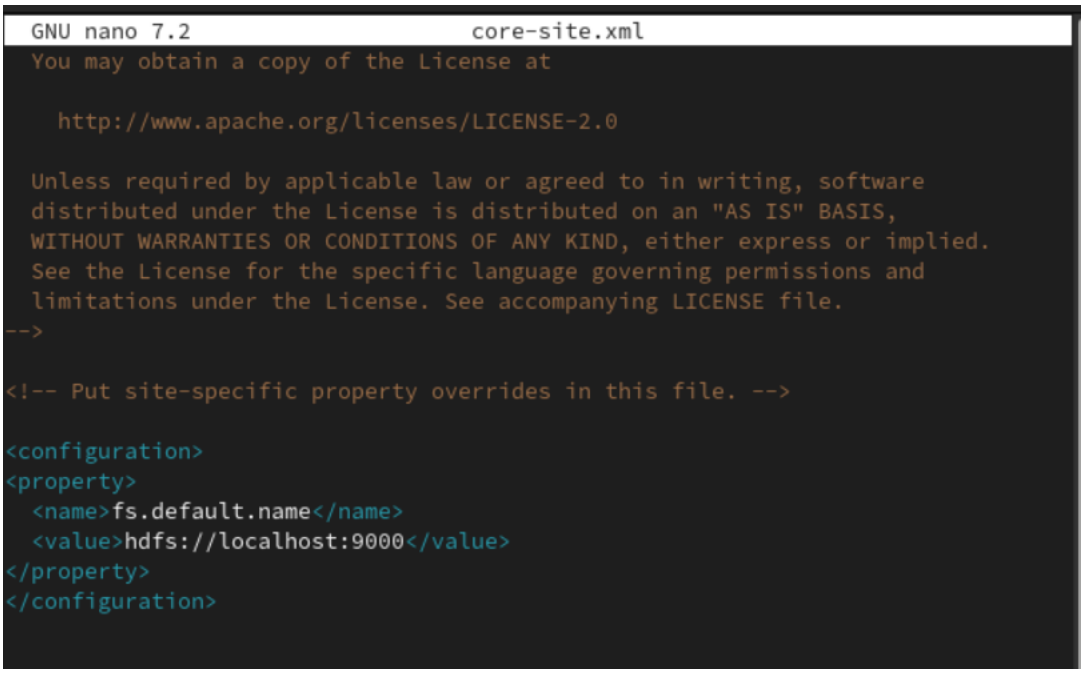
<property>

<name>yarn.nodemanager.aux-services.mapreduce.shuffle.class</name>

<value>org.apache.hadoop.mapred.Shuffle-Handler</value>

</property>

</configuration>



// Edit mapred-site.xml

$ cp /usr/local/hadoop/hadoop-2.8.4/etc/hadoop/mapred-site.xml.template

/usr/local/hadoop/hadoop-2.8.4/etc/hadoop/mapred-site.xml

$ sudo nano mapred-site.xml

// Add the following lines between <configuration> ..... </configuration>

<configuration>

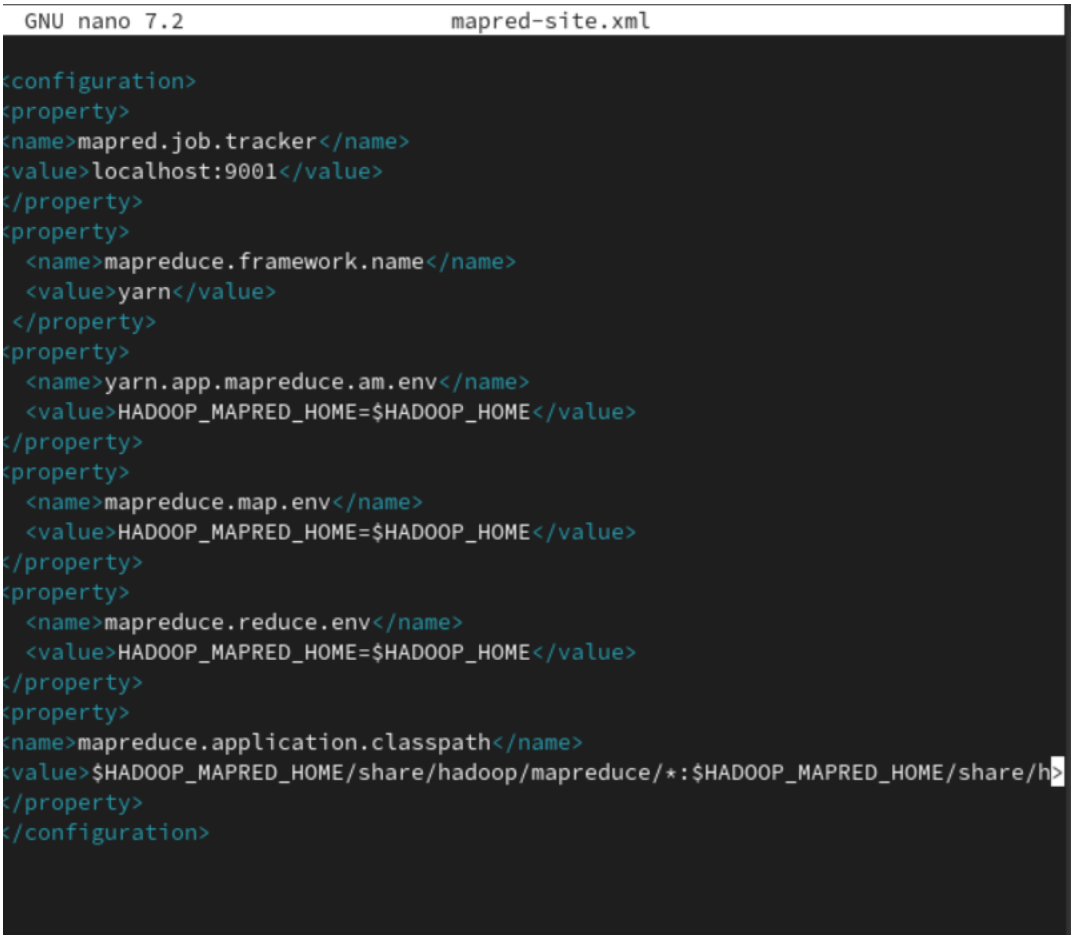
<property>

<name>mapreduce.framework.name</name>

<value>yarn</value>

</property>

</configuration>



Step 8 – Format Hadoop File System

$ cd /usr/local/hadoop/hadoop-2.8.4/bin

$ hadoop namenode -format

Step 9 - Start Hadoop

$ cd /usr/local/hadoop/hadoop-2.8.4/sbin

// Starting dfs services

$ start-dfs.sh

// Starting mapreduce services

$ start-yarn.sh

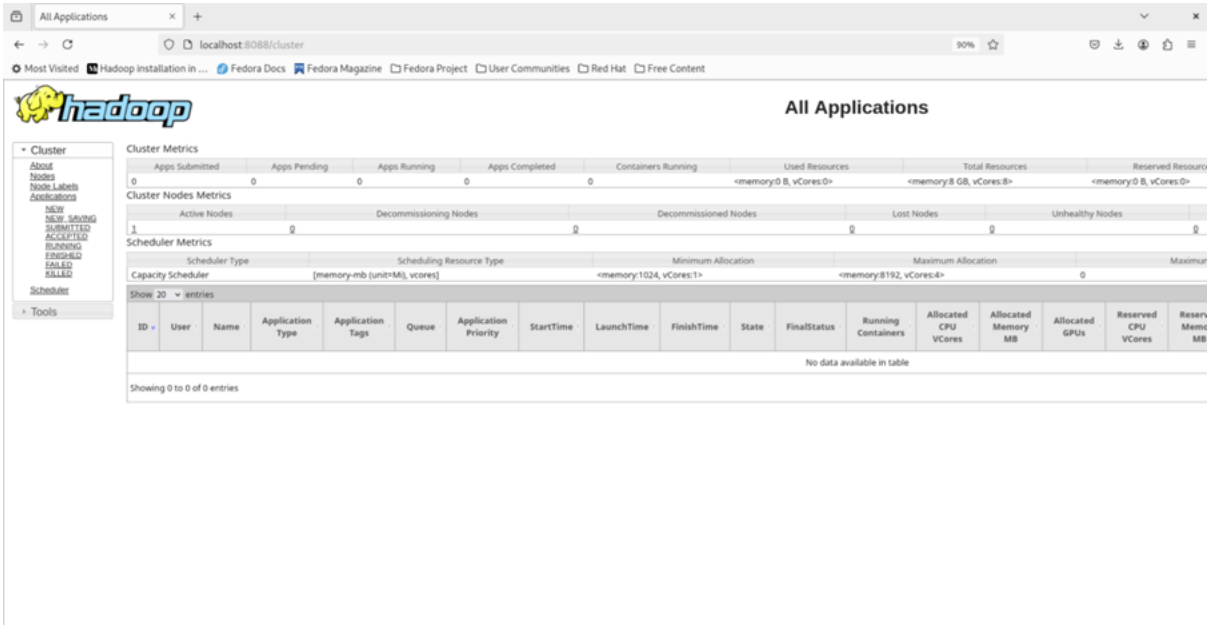
```
haresh@fedora:~$ sshd service start
sshd re-exec requires execution with an absolute path
haresh@fedora:~$ sshd service start^C
haresh@fedora:~$ service sshd restart
Redirecting to /bin/systemctl restart sshd.service
haresh@fedora:~$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as haresh in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [fedora]
Starting resourcemanager
Starting nodemanagers
haresh@fedora:~$
```

$ jps

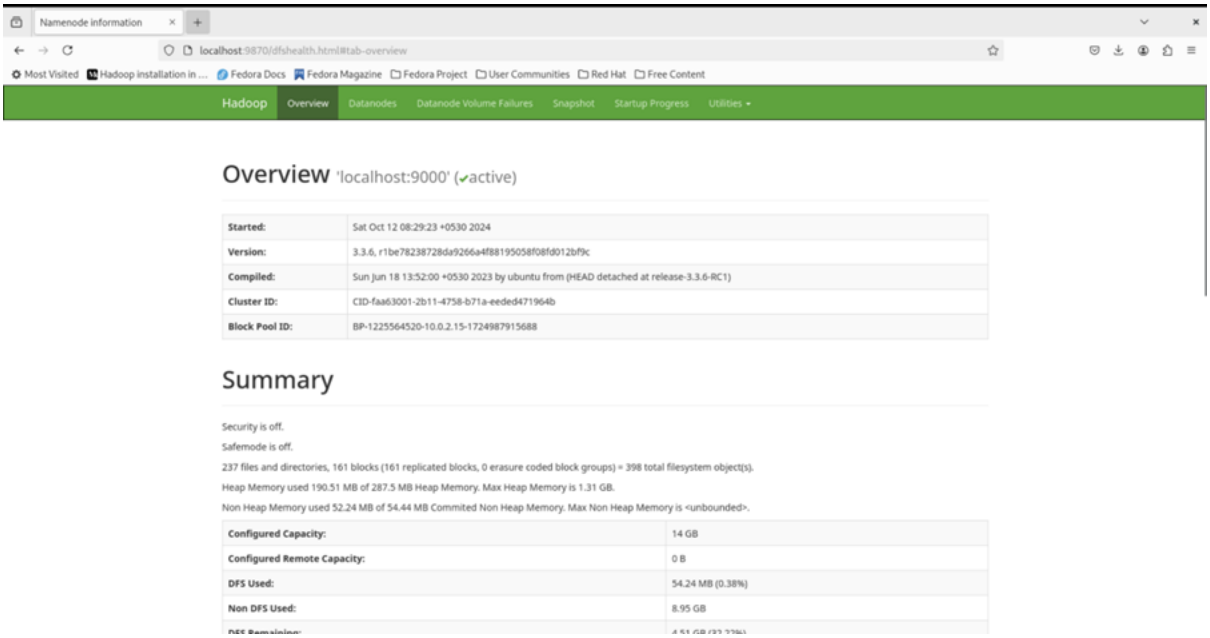
```
haresh@fedora:~$ jps
3987 NameNode
4467 SecondaryNameNode
4699 ResourceManager
4843 NodeManager
4205 DataNode
5247 Jps
haresh@fedora:~$
```

Step 10 - Check Hadoop through web UI

Go to browser type http://localhost:8088 – All Applications Hadoop Cluster



Go to browser type http://localhost:50070 – Hadoop Namenode



Step 11 - Stop Hadoop

$ stop-dfs.sh

$ stop-yarn.sh

RESULT:

Hadoop has been successfully installed and nodes have been successfully created.