



Department of AIML Engineering  
Subject: Big Data Analytics Lab (CSL702)

Experiment No:1

Roll No: 10	Name:Rajeshwar Bura	Div: C	Batch: C1
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Code:

Step 1 : Install Java Development Kit

sudo apt update && sudo apt install openjdk-8-jdk

Step 2 : Verify the Java version : java -version

```
sanjay@sanjay-VirtualBox:~$ java --version
openjdk 11.0.20.1 2023-08-24
OpenJDK Runtime Environment (build 11.0.20.1+1-post-Ubuntu-0ubuntu123.04)
OpenJDK 64-Bit Server VM (build 11.0.20.1+1-post-Ubuntu-0ubuntu123.04, mixed mode, sharing)
sanjay@sanjay-VirtualBox:~$
```

Step 3 : Install SSH :

sudo apt install ssh.

Step 4 : Create the hadoop user :

sudo adduser hadoop

```
sanjay@sanjay-VirtualBox:~$ sudo adduser hadoop
Adding user 'hadoop' ...
Adding new group 'hadoop' (1001) ...
Adding new user 'hadoop' (1001) with group 'hadoop (1001)' ...
adduser: The home directory '/home/hadoop' already exists. Not copying from '/etc/skel'.
New password:
BAD PASSWORD: The password is shorter than 8 characters
Retype new password:
passwd: password updated successfully
Changing the user information for hadoop
Enter the new value, or press ENTER for the default
  Full Name []:
  Room Number []:
  Work Phone []:
  Home Phone []:
  Other []:
Is the information correct? [Y/n] y
Adding new user 'hadoop' to supplemental / extra groups 'users' ...
Adding user 'hadoop' to group 'users' ...
sanjay@sanjay-VirtualBox:~$ su - hadoop
Password:
hadoop@sanjay-VirtualBox:~$
```

Step 5 : Switch user :

su - hadoop

Step 6 : Configure SSH :

ssh-keygen -t rsa



Department of AIML Engineering  
Subject: Big Data Analytics Lab (CSL702)

```
hadoop@sanjay-VirtualBox:~$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/hadoop/.ssh/id_rsa):
Created directory '/home/hadoop/.ssh'.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/hadoop/.ssh/id_rsa
Your public key has been saved in /home/hadoop/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:yu8Hsie3mbQ7UifnfH6iam4kFLRRbEb9zVYGutbaYyg hadoop@sanjay-VirtualBox
The key's randomart image is:
+---[RSA 3072]-----+
|      .o+.  ..+o |
|      .o+ .  o  + |
|      .+   .  o.= |
|      .    E..=o. |
|      . S   ... . |
|      .o.= o      |
|      o*.B        |
|      +o*++ o .   |
|      X@*+.o      |
+-----[SHA256]-----+
hadoop@sanjay-VirtualBox:~$
```

**Step 7 : Set permissions :**

```
cat ~/.ssh/id_rsa.pub >> ~/.ssh/authorized_keys
```

```
chmod 640 ~/.ssh/authorized_keys
```

**Step 8 : SSH to the localhost:**

```
ssh localhost
```

```
hadoop@sanjay-VirtualBox:~/hadoop$ ssh localhost
The authenticity of host 'localhost (127.0.0.1)' can't be established.
ED25519 key fingerprint is SHA256:2ZsL3K5BK6G6h8isZpTufDvB69zWFKS7iFjvsnhWrS3I.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'localhost' (ED25519) to the list of known hosts.
Welcome to Ubuntu 23.04 (GNU/Linux 6.2.0-32-generic x86_64)

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

122 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

hadoop@sanjay-VirtualBox:~$
```

**Step 9 : Switch user**

```
su - hadoop
```

**Step 10 : Install Hadoop**

```
wget https://dlcdn.apache.org/hadoop/common/hadoop-3.3.6/hadoop-3.3.6.tar.gz
```



Department of AIML Engineering  
Subject: Big Data Analytics Lab (CSL702)

```
tar -xvzf hadoop-3.3.6.tar.gz  
mv hadoop-3.3.6 hadoop
```

```
hadoop@sanjay-VirtualBox:~$ mv hadoop-3.3.6 hadoop  
hadoop@sanjay-VirtualBox:~$ ls  
hadoop  hadoop-3.3.6.tar.gz  
hadoop@sanjay-VirtualBox:~$
```

```
nano ~/.bashrc
```

```
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"
```

```
File Edit View Search Terminal Help  
GNU nano 7.2 /home/hadoop/.bashrc *  
# Alias definitions.  
# You may want to put all your additions into a separate file like  
# ~/.bash_aliases, instead of adding them here directly.  
# See /usr/share/doc/bash-doc/examples in the bash-doc package.  
  
if [ -f ~/.bash_aliases ]; then  
    . ~/.bash_aliases  
fi  
  
# enable programmable completion features (you don't need to enable  
# this, if it's already enabled in /etc/bash.bashrc and /etc/profile  
# sources /etc/bash.bashrc).  
if ! shopt -oq posix; then  
    if [ -f /usr/share/bash-completion/bash_completion ]; then  
        . /usr/share/bash-completion/bash_completion  
    elif [ -f /etc/bash_completion ]; then  
        . /etc/bash_completion  
    fi  
fi  
  
export JAVA_HOME=/usr/lib/jvm/java-11-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"  
  
^G Help      ^O Write Out  ^W Where Is   ^K Cut        ^T Execute    ^C Location   M-U Undo  
^X Exit      ^R Read File  ^_ Replace    ^U Paste      ^J Justify    ^_/ Go To Line M-E Redo
```



Department of AIML Engineering  
Subject: Big Data Analytics Lab (CSL702)

source ~/.bashrc

JAVA\_HOME=/usr/lib/jvm/java-8-openjdk-amd64

```
File Edit View Search Terminal Help
GNU nano 7.2 /home/hadoop/hadoop/etc/hadoop/hadoop-env.sh *
##
## Precedence rules:
##
## {yarn-env.sh|hdfs-env.sh} > hadoop-env.sh > hard-coded defaults
##
## {YARN_xyz|HDFS_xyz} > HADOOP_xyz > hard-coded defaults
##
# Many of the options here are built from the perspective that users
# may want to provide OVERWRITING values on the command line.
# For example:
#
# JAVA_HOME=/usr/lib/jvm/java-11-openjdk-amd64
#
# Therefore, the vast majority (BUT NOT ALL!) of these defaults
# are configured for substitution and not append. If append
# is preferable, modify this file accordingly.
###
# 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!
File Name to Write: /home/hadoop/hadoop/etc/hadoop/hadoop-env.sh
^G Help M-D DOS Format M-A Append M-B Backup File
^C Cancel M-M Mac Format M-P Prepend ^T Browse
```

## Step 11 : Configuring Hadoop :

cd hadoop/

mkdir -p ~/hadoopdata/hdfs/{namenode,datanode}

```
hadoop@sanjay-VirtualBox:~$ nano $HADOOP_HOME/etc/hadoop/hadoop-env.sh
hadoop@sanjay-VirtualBox:~$ cd hadoop/
hadoop@sanjay-VirtualBox:~/hadoop$ mkdir -p ~/hadoopdata/hdfs/{namenode,datanode}
hadoop@sanjay-VirtualBox:~/hadoop$
```

nano \$HADOOP\_HOME/etc/hadoop/core-site.xml

<configuration>

<property>

<name>fs.defaultFS</name>

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

</property>

</configuration>





Department of AIML Engineering  
Subject: Big Data Analytics Lab (CSL702)

```
GNU nano 7.2 /home/hadoop/hadoop/etc/hadoop/core-site.xml
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl" href="configuration.xsl"?>
<!--
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  you may not use this file except in compliance with the License.
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    http://www.apache.org/licenses/LICENSE-2.0

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  distributed under the License is distributed on an "AS IS" BASIS,
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
  See the license for the specific language governing permissions and
  limitations under the License. See accompanying LICENSE file.
-->

<!-- Put site-specific property overrides in this file. -->

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

nano \$HADOOP\_HOME/etc/hadoop/hdfs-site.xml

```
<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>
```



Department of AIML Engineering  
Subject: Big Data Analytics Lab (CSL702)

```
GNU nano 7.2 /home/hadoop/hadoop/etc/hadoop/hdfs-site.xml *
http://www.apache.org/licenses/LICENSE-2.0

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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
See the license for the specific language governing permissions and
limitations under the License. See accompanying LICENSE file.
-->

<!-- Put site-specific property overrides in this file. -->

<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>

[]
^G Help      ^O Write Out  ^W Where Is   ^K Cut        ^T Execute    ^C Location   M-U Undo
^X Exit      ^R Read File  ^_ Replace    ^U Paste      ^J Justify    ^_/ Go To Line M-E Redo
```

nano \$HADOOP\_HOME/etc/hadoop/yarn-site.xml

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

```
GNU nano 7.2 /home/hadoop/hadoop/etc/hadoop/mapred-site.xml
limitations under the License. See accompanying LICENSE file.
-->

<!-- Put site-specific property overrides in this file. -->

<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>

^G Help      ^O Write Out  ^W Where Is   ^K Cut        ^T Execute    ^C Location   M-U Undo
^X Exit      ^R Read File  ^_ Replace    ^U Paste      ^J Justify    ^_/ Go To Line M-E Redo
```



Department of AIML Engineering  
Subject: Big Data Analytics Lab (CSL702)

nano \$HADOOP\_HOME/etc/hadoop/yarn-site.xml

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

```
GNU nano 7.2 /home/hadoop/hadoop/etc/hadoop/yarn-site.xml *
<?xml version="1.0"?>
<!--
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distributed under the License is distributed on an "AS IS" BASIS,
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
See the license for the specific language governing permissions and
limitations under the License. See accompanying LICENSE file.
-->
<configuration>
  <property>
    <name>yarn.nodemanager.aux-services</name>
    <value>mapreduce_shuffle</value>
  </property>
</configuration>

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

## Step 12 : Start Hadoop cluster:

hdfs namenode -format

```
2023-09-10 13:07:27,704 INFO snapshot.SnapshotManager: Loaded config captureOpenFiles: false, skipCaptureAccessTimeOnly
Change: false, snapshotDiffAllowSnapshotDescendant: true, maxSnapshotLimit: 65536
2023-09-10 13:07:27,712 INFO snapshot.SnapshotManager: Skiplist is disabled
2023-09-10 13:07:27,727 INFO util.GSet: Computing capacity for map cachedBlocks
2023-09-10 13:07:27,727 INFO util.GSet: VM type = 64-bit
2023-09-10 13:07:27,727 INFO util.GSet: 0.25% max memory 748 MB = 1.9 MB
2023-09-10 13:07:27,728 INFO util.GSet: capacity = 2^18 = 262144 entries
2023-09-10 13:07:27,744 INFO metrics.TopMetrics: NNTop conf: dfs.namenode.top.window.num.buckets = 10
2023-09-10 13:07:27,751 INFO metrics.TopMetrics: NNTop conf: dfs.namenode.top.num.users = 10
2023-09-10 13:07:27,752 INFO metrics.TopMetrics: NNTop conf: dfs.namenode.top.windows.minutes = 1,5,25
2023-09-10 13:07:27,755 INFO namenode.FSNamesystem: Retry cache on namenode is enabled
2023-09-10 13:07:27,756 INFO namenode.FSNamesystem: Retry cache will use 0.03 of total heap and retry cache entry expir
y time is 600000 millis
2023-09-10 13:07:27,761 INFO util.GSet: Computing capacity for map NameNodeRetryCache
2023-09-10 13:07:27,761 INFO util.GSet: VM type = 64-bit
2023-09-10 13:07:27,761 INFO util.GSet: 0.0299999999329447746% max memory 748 MB = 229.8 KB
2023-09-10 13:07:27,761 INFO util.GSet: capacity = 2^15 = 32768 entries
2023-09-10 13:07:27,804 INFO namenode.Storage: Allocated new BlockPoolId: BP-1272319295-127.0.1.1-1694331447796
2023-09-10 13:07:27,847 INFO common.Storage: Storage directory /home/hadoop/hadoopdata/hdfs/namenode has been successfu
lly formatted.
2023-09-10 13:07:27,899 INFO namenode.FSImageFormatProtobuf: Saving image file /home/hadoop/hadoopdata/hdfs/namenode/cu
rrent/fsimage.ckpt_000000000000000000 using no compression
2023-09-10 13:07:28,040 INFO namenode.FSImageFormatProtobuf: Image file /home/hadoop/hadoopdata/hdfs/namenode/current/f
simage.ckpt_000000000000000000 of size 401 bytes saved in 0 seconds .
2023-09-10 13:07:28,054 INFO namenode.NNStorageRetentionManager: Going to retain 1 images with txid >= 0
2023-09-10 13:07:28,074 INFO namenode.FSNamesystem: Stopping services started for active state
2023-09-10 13:07:28,078 INFO namenode.FSNamesystem: Stopping services started for standby state
2023-09-10 13:07:28,087 INFO namenode.FSImage: FSImageSaver clean checkpoint: txid=0 when meet shutdown.
2023-09-10 13:07:28,088 INFO namenode.NameNode: SHUTDOWN_MSG:
/*****
SHUTDOWN_MSG: Shutting down NameNode at sanjay-VirtualBox/127.0.1.1
*****/
hadoop@sanjay-VirtualBox:~/hadoop$
```





Department of AIML Engineering  
Subject: Big Data Analytics Lab (CSL702)

start-all.sh

```
hadoop@sanjay-VirtualBox:~$ 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]
Starting datanodes
Starting secondary namenodes [sanjay-VirtualBox]
Starting resourcemanager
Starting nodemanagers
hadoop@sanjay-VirtualBox:~$
```

Jps

```
hadoop@sanjay-VirtualBox:~/hadoop$ jps
7235 NodeManager
6677 DataNode
7593 Jps
6554 NameNode
7116 ResourceManager
6893 SecondaryNameNode
hadoop@sanjay-VirtualBox:~/hadoop$
```

### Step 13 : Access Hadoop Namenode and Resource Manager :

sudo apt install net-tools

ifconfig

```
hadoop@sanjay-VirtualBox:~/hadoop$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.1.6 netmask 255.255.255.0 broadcast 192.168.1.255
    inet6 2401:4900:1c28:46c4:f76c:b206:abe3:2d45 prefixlen 64 scopeid 0x0<global>
    inet6 2401:4900:1c28:46c4:ed13:53f4:5c05:50c6 prefixlen 64 scopeid 0x0<global>
    inet6 fe80::112b:300a:9242:51f3 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:83:31:35 txqueuelen 1000 (Ethernet)
    RX packets 645228 bytes 934388358 (934.3 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 93618 bytes 8998032 (8.9 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 3331 bytes 491873 (491.8 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 3331 bytes 491873 (491.8 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

hadoop@sanjay-VirtualBox:~/hadoop$
```

<http://192.168.1.6:9870>





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← → ↺ 192.168.1.6:9870/dfshealth.html#tab-overview ☆

Hadoop Overview Datanodes Datanode Volume Failures Snapshot Startup Progress Utilities ▾

## Overview 'localhost:9000' (✓active)

Started:	Sun Sep 10 13:08:22 +0530 2023
Version:	3.3.6, r1be78238728da9266a4f88195058f08fd012bf9c
Compiled:	Sun Jun 18 13:52:00 +0530 2023 by ubuntu from (HEAD detached at release-3.3.6-RC1)
Cluster ID:	CID-dc5a1253-b0cd-4686-a807-fd0ddf4c5a9a
Block Pool ID:	BP-1272319295-127.0.1.1-1694331447796


## 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 69.85 MB of 107 MB Heap Memory. Max Heap Memory is 748 MB.  
Non Heap Memory used 51.89 MB of 55.44 MB Committed Non Heap Memory. Max Non Heap Memory is <unbounded>.

Configured Capacity:	24.44 GB
----------------------	----------

<http://192.168.1.6:8088>

← → ↺ 192.168.1.6:8088/cluster ☆



Cluster

- About
- Nodes
- Node Labels
- Applications
  - NEW
  - NEW SAVING
  - SUBMITTED
  - ACCEPTED
  - RUNNING
  - FINISHED
  - FAILED
  - KILLED
- Scheduler

Tools

### Cluster Metrics

Apps Submitted	0	Apps Pending	0	Apps Running	0	Apps Completed	0	Containers Running	0
----------------	---	--------------	---	--------------	---	----------------	---	--------------------	---

### Cluster Nodes Metrics

Active Nodes	1	Decommissioning Nodes	0	Decommissioned Nodes	0
--------------	---	-----------------------	---	----------------------	---

### Scheduler Metrics

Scheduler Type	Capacity Scheduler	Scheduling Resource Type	[memory-mb (unit=M), vcores]	Min	
----------------	--------------------	--------------------------	------------------------------	-----	--

ID	User	Name	Application Type	Application Tags	Queue	Application Priority	StartTime	LaunchTime	FinishTime
----	------	------	------------------	------------------	-------	----------------------	-----------	------------	------------

Showing 0 to 0 of 0 entries



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**Step 13 : Verify the Hadoop Cluster :**

hdfs dfs -mkdir /test1

hdfs dfs -mkdir /logs

hdfs dfs -ls /

```
hadoop@sanjay-VirtualBox:~/hadoop$ hdfs dfs -ls /  
Found 2 items  
drwxr-xr-x - hadoop supergroup      0 2023-09-10 13:16 /logs  
drwxr-xr-x - hadoop supergroup      0 2023-09-10 13:16 /test1  
hadoop@sanjay-VirtualBox:~/hadoop$
```

hdfs dfs -put /var/log/\* /logs/

The screenshot shows the Hadoop web interface at 192.168.1.6:9870/explorer.html#. The 'Browse Directory' section shows a list of files and directories. The table below represents the data shown in the interface:

Permission	Owner	Group	Size	Last Modified	Replication	Block Size	Name
drwxr-xr-x	hadoop	supergroup	0 B	Sep 10 13:19	0	0 B	logs
drwxr-xr-x	hadoop	supergroup	0 B	Sep 10 13:16	0	0 B	test1

**Step 14 : To stop hadoop services :**

stop-all.sh

```
hadoop@sanjay-VirtualBox:~/hadoop$ 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 [sanjay-VirtualBox]  
Stopping nodemanagers  
Stopping resourcemanager  
hadoop@sanjay-VirtualBox:~/hadoop$
```