

*Laboratory Assignment File*  
*for*

# Big Data Analytics (CS0552)

Master of Technology  
in  
Computer Science & Engineering

Submitted by

**Yugal**  
(Roll no. 25903053)

Submitted to

**Dr. Shveta Mahajan**  
(Assistant Professor, NIT Jalandhar)



Department of Computer Science & Engineering  
Dr. B R Ambedkar National Institute of Technology Jalandhar  
Punjab, India-144008  
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## Contents

<b>Assignment 1: Install Apache Hadoop and Setup Single Node Cluster 27-01-2026</b>	<b>1</b>
1.1 Step 1: Installing Java . . . . .	1
1.2 Step 2: Setup SSH . . . . .	2
1.3 Step 3: Download and Configure Hadoop . . . . .	3
1.4 Step 4: Environment Variable Configuration . . . . .	4
1.5 Step 5: Hadoop XML Configuration Files . . . . .	5
1.6 Step 6: Format NameNode & Start Hadoop Services . . . . .	10
1.7 Step 7: HDFS Operations . . . . .	11
1.8 Result . . . . .	14
1.9 Conclusion . . . . .	14

## List of Figures

1	System Update Command . . . . .	1
2	Java Installation . . . . .	1
3	Java Version and Path Verification . . . . .	2
4	Install SSH Server . . . . .	2
5	Generate SSH Key Pair . . . . .	3
6	Create Hadoop User . . . . .	3
7	Download and Extract Hadoop . . . . .	4
8	Moving Hadoop . . . . .	4
9	.bashrc Modification . . . . .	5
10	hadoop-env.sh Modification . . . . .	6
11	core-site.xml Modification . . . . .	7
12	hdfs-site.xml Modification . . . . .	8
13	Creating Folder for NameNode and DataNode . . . . .	8
14	mapred-site.xml Modification . . . . .	9
15	yarn-site.xml Modification . . . . .	9
16	Format NameNode . . . . .	10
17	Start Hadoop Services . . . . .	10
18	Start YARN Services . . . . .	11
19	HDFS Operation 1 . . . . .	12
20	HDFS Operation 2 . . . . .	12
21	HDFS Result 1 . . . . .	13
22	HDFS Result 2 . . . . .	13

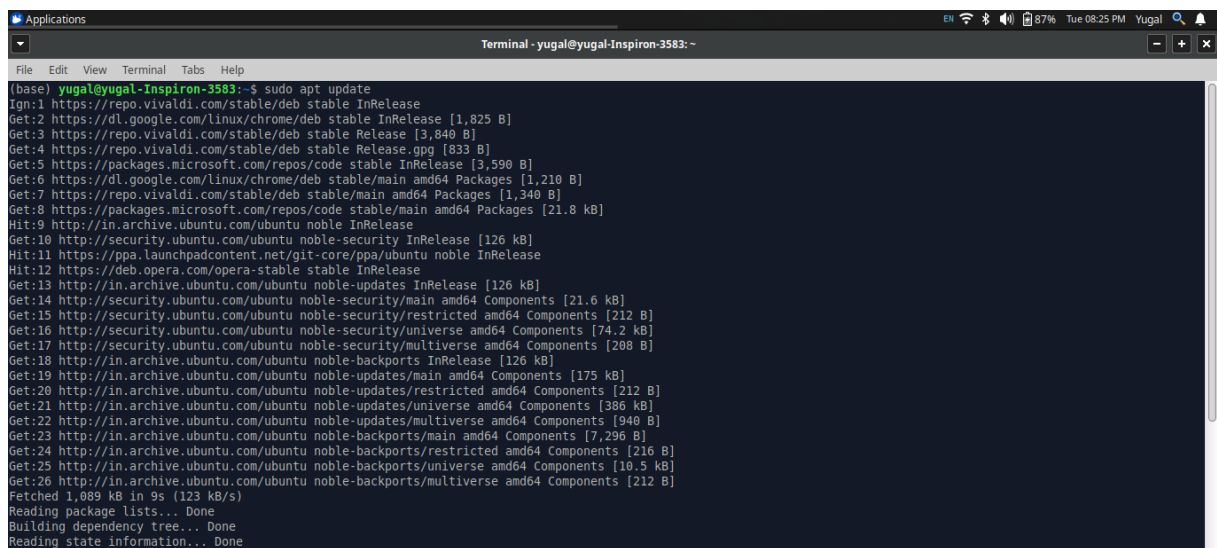
# Assignment 1: Install Apache Hadoop and Setup Single Node Cluster

**Objective:** To install and configure Apache Hadoop in pseudo-distributed mode and perform basic HDFS operations such as upload, delete, replication check, and permission handling.

## 1.1 Step 1: Installing Java

### Updating System

`sudo apt update`

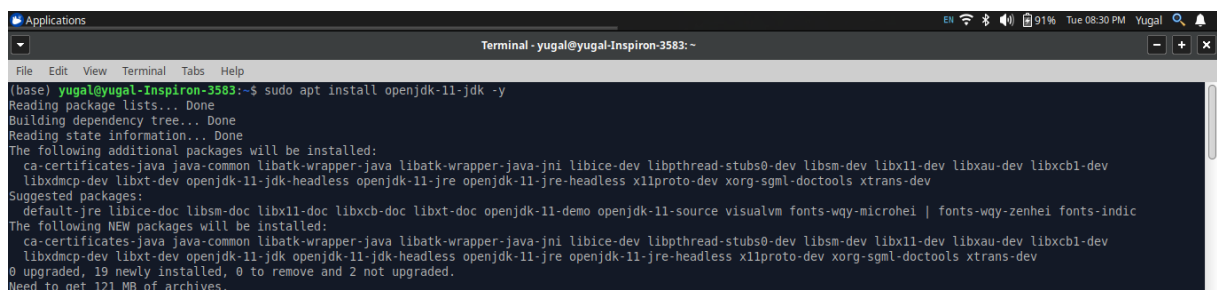


```
(base) yugal@yugal-Inspiron-3583:~$ sudo apt update
Ign:1 https://repo.vivaldi.com/stable/deb stable InRelease
Get:2 https://dl.google.com/linux/chrome/deb stable InRelease [1,825 B]
Get:3 https://repo.vivaldi.com/stable/deb stable Release [3,840 B]
Get:4 https://repo.vivaldi.com/stable/deb stable Release.gpg [833 B]
Get:5 https://packages.microsoft.com/repos/code stable InRelease [3,590 B]
Get:6 https://dl.google.com/linux/chrome/deb stable/main amd64 Packages [1,210 B]
Get:7 https://repo.vivaldi.com/stable/deb stable/main amd64 Packages [1,340 B]
Get:8 https://packages.microsoft.com/repos/code stable/main amd64 Packages [21.8 kB]
Hit:9 http://in.archive.ubuntu.com/ubuntu noble InRelease
Get:10 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Hit:11 https://ppa.launchpadcontent.net/git-core/ppa/ubuntu noble InRelease
Hit:12 https://deb.opera.com/opera-stable stable InRelease
Get:13 http://in.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:14 http://security.ubuntu.com/ubuntu noble-security/main amd64 Components [21.6 kB]
Get:15 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Components [212 B]
Get:16 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Components [74.2 kB]
Get:17 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [280 B]
Get:18 http://in.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:19 http://in.archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [175 kB]
Get:20 http://in.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 B]
Get:21 http://in.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [386 kB]
Get:22 http://in.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [940 B]
Get:23 http://in.archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [7,296 B]
Get:24 http://in.archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [216 B]
Get:25 http://in.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [10.5 kB]
Get:26 http://in.archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]
Fetched 1,089 kB in 9s (123 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
```

Figure 1: System Update Command

### Installing Java

`sudo apt install openjdk-11-jdk -y`

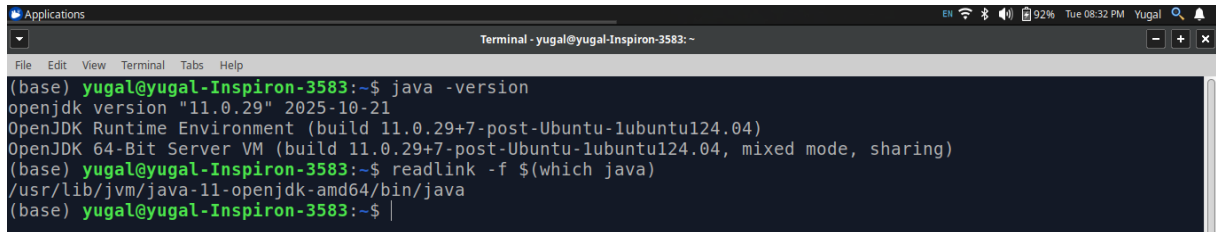


```
(base) yugal@yugal-Inspiron-3583:~$ sudo apt install openjdk-11-jdk -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  ca-certificates-java java-common libatk-wrapper-java libatk-wrapper-java-jni libice-dev libpthread-stubs0-dev libsm-dev libx11-dev libxau-dev libxcb1-dev
  libxdmcp-dev libxt-dev openjdk-11-jdk-headless openjdk-11-jre openjdk-11-jre-headless x11proto-dev xorg-sgml-doctools xtrans-dev
Suggested packages:
  default-jre libice-doc libsm-doc libx11-doc libxcb-doc libxt-doc openjdk-11-demo openjdk-11-source visualvm fonts-wqy-microhei | fonts-wqy-zenhei fonts-indic
The following NEW packages will be installed:
  ca-certificates-java java-common libatk-wrapper-java libatk-wrapper-java-jni libice-dev libpthread-stubs0-dev libsm-dev libx11-dev libxau-dev libxcb1-dev
  libxdmcp-dev libxt-dev openjdk-11-jdk openjdk-11-jdk-headless openjdk-11-jre openjdk-11-jre-headless x11proto-dev xorg-sgml-doctools xtrans-dev
0 upgraded, 19 newly installed, 0 to remove and 2 not upgraded.
Need to get 121 MB of archives.
After this operation, 479 MB of additional disk space will be used.
```

Figure 2: Java Installation

## Java Version and Path Verification

```
java -version  
readlink -f $(which java)
```

A terminal window titled 'Terminal - yugal@yugal-Inspiron-3583: ~' showing the output of 'java -version' and 'readlink -f \$(which java)'. The output shows OpenJDK version 11.0.29 and the path /usr/lib/jvm/java-11-openjdk-amd64/bin/java.

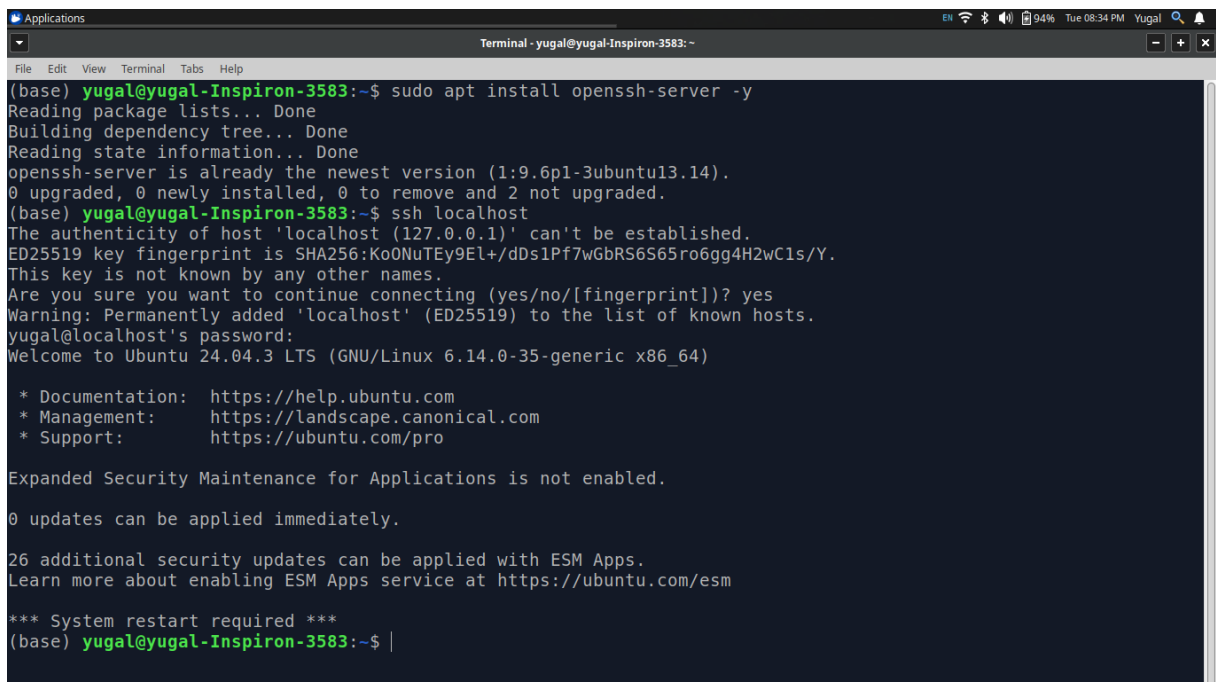
```
(base) yugal@yugal-Inspiron-3583:~$ java -version  
openjdk version "11.0.29" 2025-10-21  
OpenJDK Runtime Environment (build 11.0.29+7-post-Ubuntu-1ubuntu124.04)  
OpenJDK 64-Bit Server VM (build 11.0.29+7-post-Ubuntu-1ubuntu124.04, mixed mode, sharing)  
(base) yugal@yugal-Inspiron-3583:~$ readlink -f $(which java)  
/usr/lib/jvm/java-11-openjdk-amd64/bin/java  
(base) yugal@yugal-Inspiron-3583:~$
```

Figure 3: Java Version and Path Verification

## 1.2 Step 2: Setup SSH

### Install SSH Server

```
sudo apt install openssh-server -y  
ssh localhost
```

A terminal window titled 'Terminal - yugal@yugal-Inspiron-3583: ~' showing the installation of openssh-server and an attempt to connect to localhost. The output shows that openssh-server is already installed and the connection attempt fails due to an unknown host key fingerprint.

```
(base) yugal@yugal-Inspiron-3583:~$ sudo apt install openssh-server -y  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
openssh-server is already the newest version (1:9.6p1-3ubuntu13.14).  
0 upgraded, 0 newly installed, 0 to remove and 2 not upgraded.  
(base) yugal@yugal-Inspiron-3583:~$ ssh localhost  
The authenticity of host 'localhost (127.0.0.1)' can't be established.  
ED25519 key fingerprint is SHA256:Ko0NuTEy9EL+/dDs1Pf7wGbRS6S6Sro6gg4H2wC1s/Y.  
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.  
yugal@localhost's password:  
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.14.0-35-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.  
  
0 updates can be applied immediately.  
  
26 additional security updates can be applied with ESM Apps.  
Learn more about enabling ESM Apps service at https://ubuntu.com/esm  
  
*** System restart required ***  
(base) yugal@yugal-Inspiron-3583:~$
```

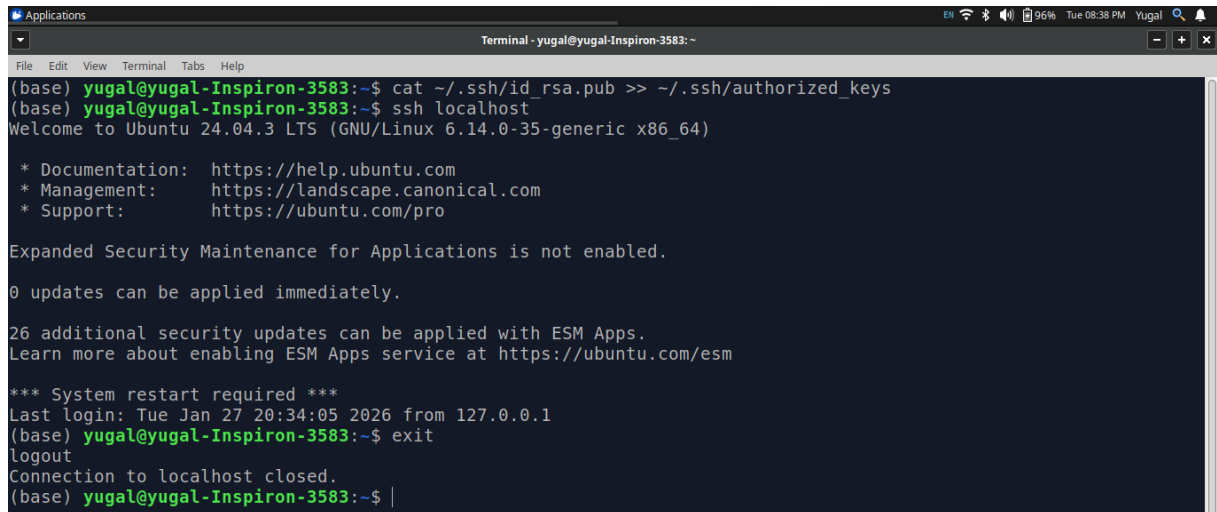
Figure 4: Install SSH Server

### Generate SSH Key Pair

```
ssh-keygen -t rsa -P ""  
cat ~/.ssh/id_rsa.pub >> ~/.ssh/authorized_keys
```

```
ssh localhost
```

```
exit
```

A terminal window titled 'Terminal - yugal@yugal-Inspiron-3583: ~' showing the process of generating an SSH key pair and connecting to localhost. The user runs 'cat ~/.ssh/id\_rsa.pub >> ~/.ssh/authorized\_keys', then 'ssh localhost'. The terminal output shows the Ubuntu 24.04.3 LTS login banner, system updates, and the user logging out after the connection to localhost is closed.

```
(base) yugal@yugal-Inspiron-3583:~$ cat ~/.ssh/id_rsa.pub >> ~/.ssh/authorized_keys
(base) yugal@yugal-Inspiron-3583:~$ ssh localhost
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.14.0-35-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.

0 updates can be applied immediately.

26 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm

*** System restart required ***
Last login: Tue Jan 27 20:34:05 2026 from 127.0.0.1
(base) yugal@yugal-Inspiron-3583:~$ exit
logout
Connection to localhost closed.
(base) yugal@yugal-Inspiron-3583:~$ |
```

Figure 5: Generate SSH Key Pair

### 1.3 Step 3: Download and Configure Hadoop

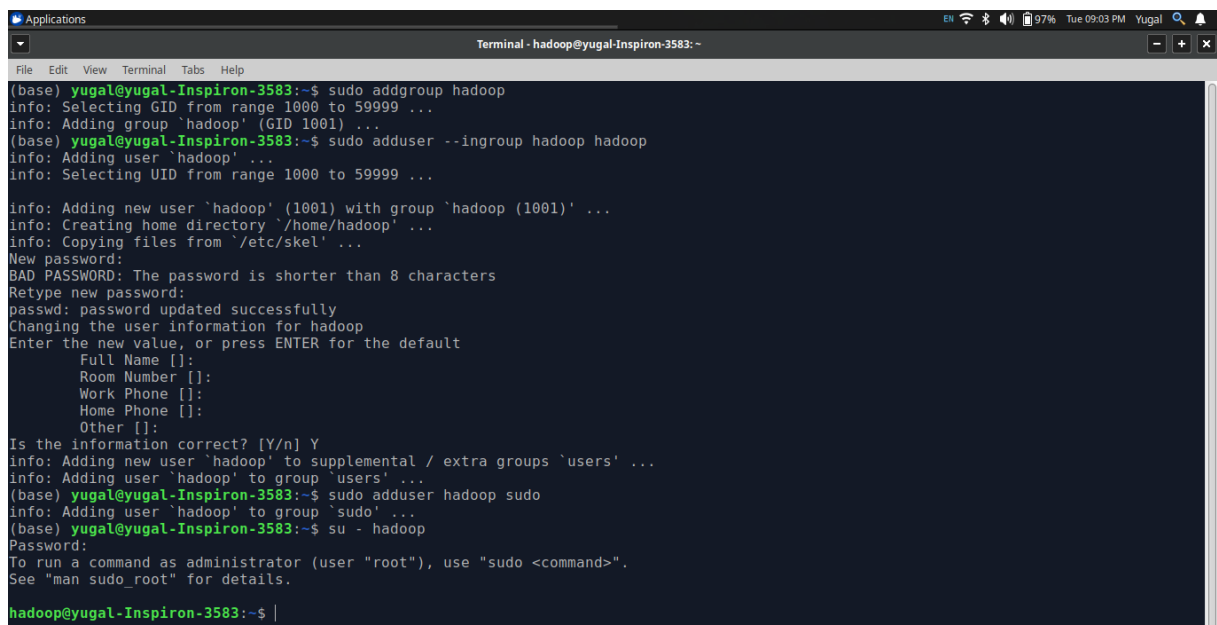
#### Create Hadoop User

```
sudo addgroup hadoop
```

```
sudo adduser --ingroup hadoop hadoop
```

```
sudo adduser hadoop sudo
```

```
su - hadoop
```

A terminal window titled 'Terminal - hadoop@yugal-Inspiron-3583: ~' showing the execution of commands to create a new user named 'hadoop'. The user runs 'sudo addgroup hadoop' and 'sudo adduser --ingroup hadoop hadoop'. The terminal output shows the group being added, the user being added with group 'hadoop', and the user's password being set. The user then runs 'su - hadoop' to switch to the 'hadoop' user.

```
(base) yugal@yugal-Inspiron-3583:~$ sudo addgroup hadoop
info: Selecting GID from range 1000 to 59999 ...
info: Adding group `hadoop' (GID 1001) ...
(base) yugal@yugal-Inspiron-3583:~$ sudo adduser --ingroup hadoop hadoop
info: Adding user `hadoop' ...
info: Selecting UID from range 1000 to 59999 ...

info: Adding new user `hadoop' (1001) with group `hadoop (1001)' ...
info: Creating home directory `/home/hadoop' ...
info: Copying files 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
info: Adding new user `hadoop' to supplemental / extra groups `users' ...
info: Adding user `hadoop' to group `users' ...
(base) yugal@yugal-Inspiron-3583:~$ sudo adduser hadoop sudo
info: Adding user `hadoop' to group `sudo' ...
(base) yugal@yugal-Inspiron-3583:~$ su - hadoop
Password:
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

hadoop@yugal-Inspiron-3583:~$ |
```

Figure 6: Create Hadoop User

## Download and Extract Hadoop

```
exit
sudo cp /home/yugal/Downloads/hadoop-3.3.0.tar.gz /home/hadoop/
sudo chown hadoop:hadoop /home/hadoop/hadoop-3.3.0.tar.gz
su - hadoop
ls
tar -xvzf hadoop-3.3.0.tar.gz
```

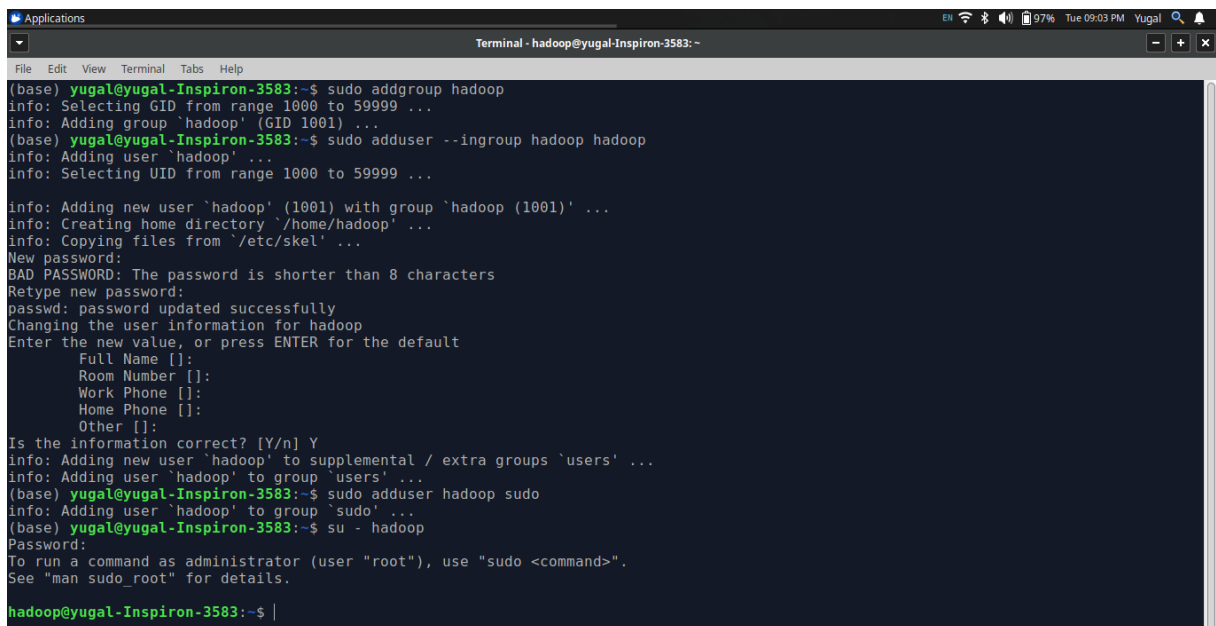
A terminal window titled "Terminal - hadoop@yugal-Inspiron-3583: ~" showing the process of creating a new user and group. The user runs 'sudo addgroup hadoop', which selects GID 1001. Then they run 'sudo adduser --ingroup hadoop hadoop', which prompts for a password. The password is rejected as being too short, and a new password is entered successfully. The user is then prompted for additional information like full name, room number, etc., and they press enter for defaults. Finally, they run 'sudo adduser hadoop sudo' to add the user to the sudo group, and then 'su - hadoop' to switch to the hadoop user. The prompt changes to 'hadoop@yugal-Inspiron-3583:~\$'.

Figure 7: Download and Extract Hadoop

## Moving Hadoop

```
mv hadoop-3.3.0 hadoop
ls
```

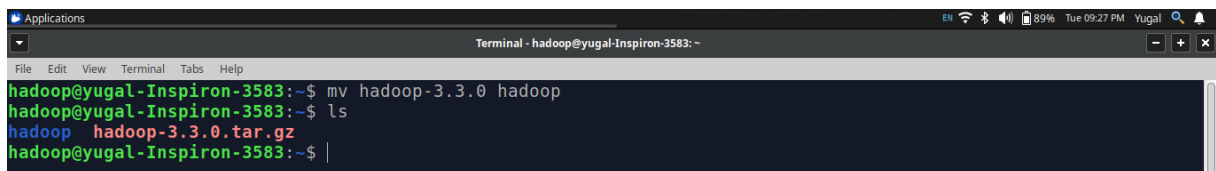
A terminal window titled "Terminal - hadoop@yugal-Inspiron-3583: ~" showing the user running 'mv hadoop-3.3.0 hadoop' to move the directory. Then they run 'ls' and the output shows 'hadoop' and 'hadoop-3.3.0.tar.gz' in the current directory. The prompt is 'hadoop@yugal-Inspiron-3583:~\$'.

Figure 8: Moving Hadoop

## 1.4 Step 4: Environment Variable Configuration

### .bashrc Modification

```
nano ~/.bashrc
```

```
% Add the following lines at the end of the file
export JAVA_HOME=/usr/lib/jvm/java-11-openjdk-amd64
export HADOOP_HOME=/home/hadoop/hadoop
export PATH=$PATH:$HADOOP_HOME/bin:$HADOOP_HOME/sbin
```

```
hadoop@yugal-Inspiron-3583:~$ readlink -f $(which java)
/usr/lib/jvm/java-11-openjdk-amd64/bin/java
hadoop@yugal-Inspiron-3583:~$ nano ~/.bashrc

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 PATH=$PATH:$HADOOP_HOME/bin:$HADOOP_HOME/sbin
```

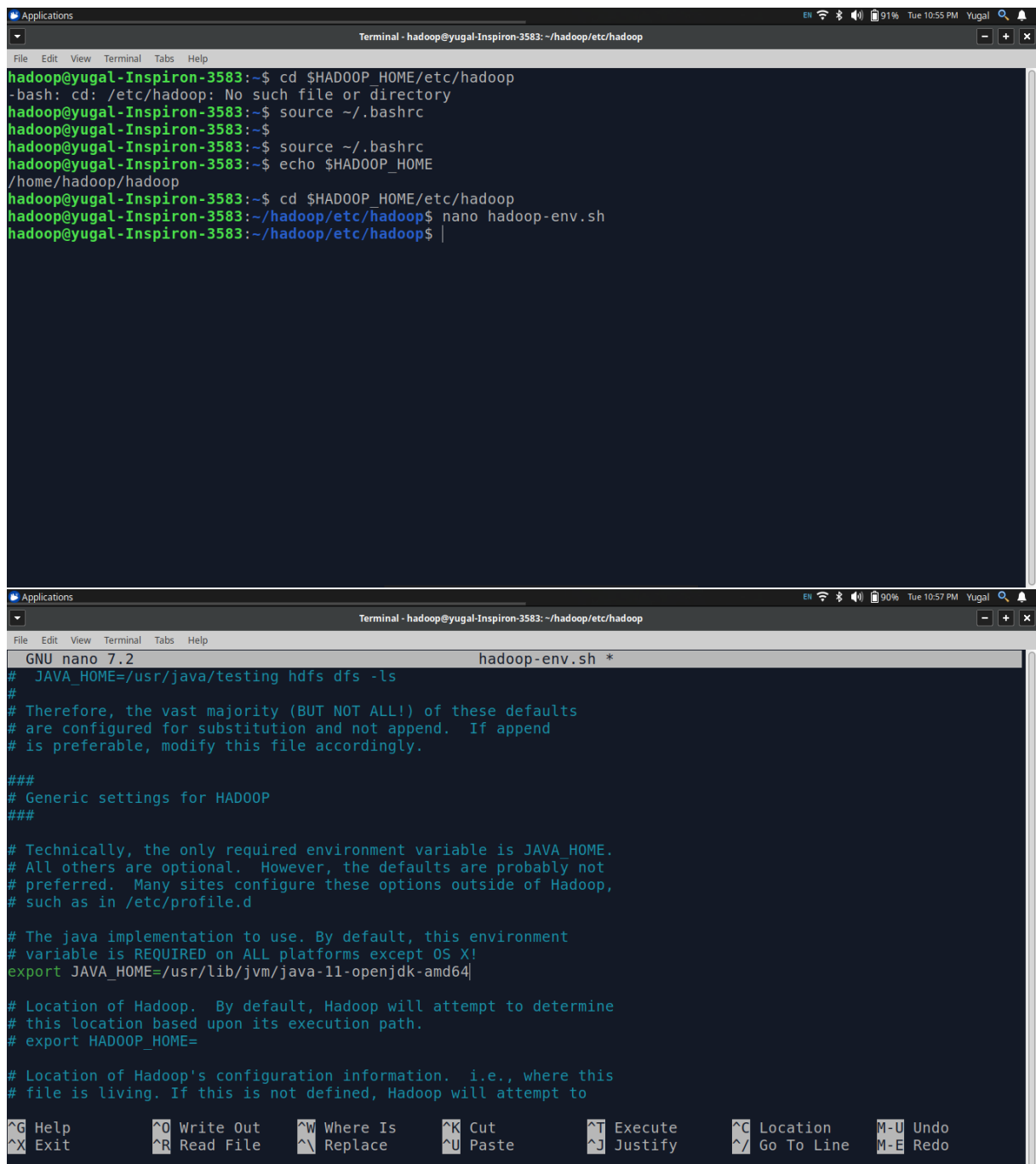
Figure 9: .bashrc Modification

## 1.5 Step 5: Hadoop XML Configuration Files

### hadoop-env.sh Modification

```
source ~/.bashrc
echo $HADOOP_HOME
/home/hadoop/hadoop
cd $HADOOP_HOME/etc/hadoop
ls
nano hadoop-env.sh
% Add the following lines at the path
export JAVA_HOME=/usr/lib/jvm/java-11-openjdk-amd64
```





```
hadoop@yugal-Inspiron-3583:~$ cd $HADOOP_HOME/etc/hadoop
-bash: cd: /etc/hadoop: No such file or directory
hadoop@yugal-Inspiron-3583:~$ source ~/.bashrc
hadoop@yugal-Inspiron-3583:~$ source ~/.bashrc
hadoop@yugal-Inspiron-3583:~$ echo $HADOOP_HOME
/home/hadoop/hadoop
hadoop@yugal-Inspiron-3583:~$ cd $HADOOP_HOME/etc/hadoop
hadoop@yugal-Inspiron-3583:~/hadoop/etc/hadoop$ nano hadoop-env.sh
hadoop@yugal-Inspiron-3583:~/hadoop/etc/hadoop$

GNU nano 7.2 hadoop-env.sh *
# JAVA_HOME=/usr/java/testing hdfs dfs -ls
#
# 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!
export JAVA_HOME=/usr/lib/jvm/java-11-openjdk-amd64
#
# 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
^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
```

Figure 10: hadoop-env.sh Modification

## core-site.xml Modification

nano core-site.xml

% Add the following property inside <configuration> tag

<property>

<name>fs.defaultFS</name>

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

</property>

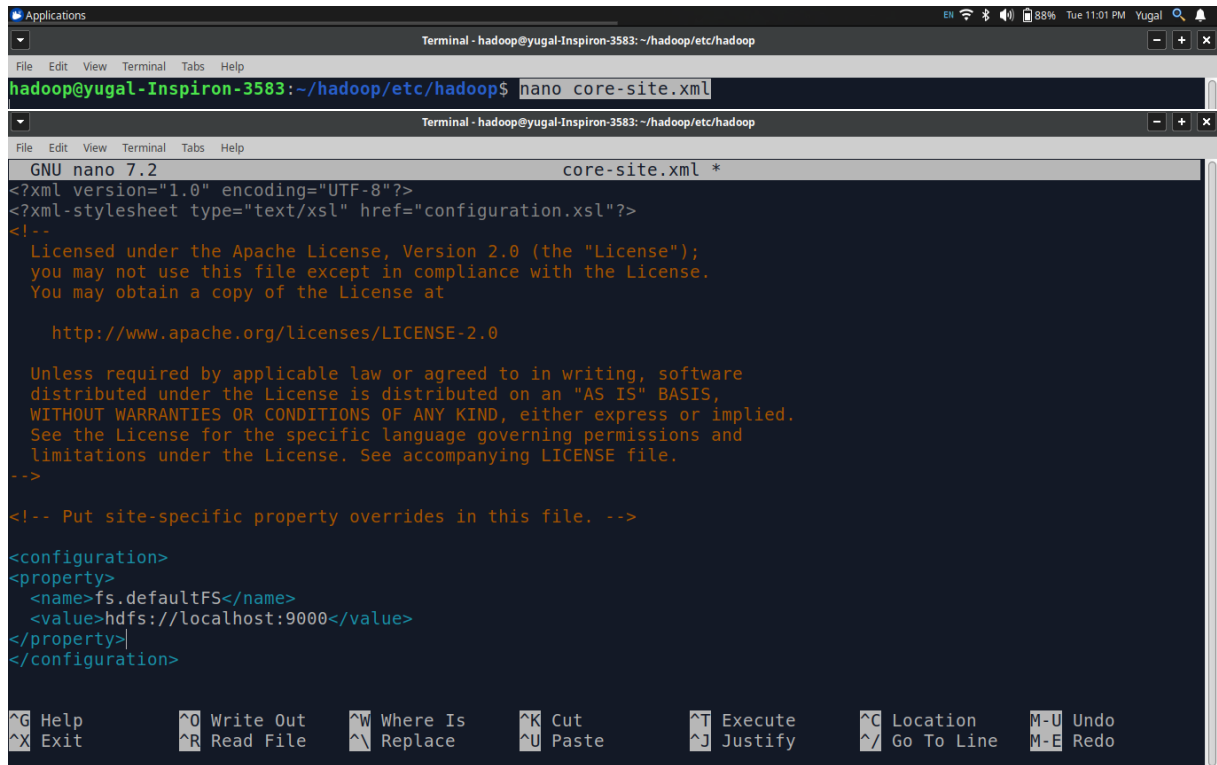


Figure 11: core-site.xml Modification

## hdfs-site.xml Modification

nano hdfs-site.xml

% Add the following property inside <configuration> tag

<property>

<name>dfs.replication</name>

<value>1</value>

</property>

<property>

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

<value>file:///home/hadoop/hdfs/namenode</value>

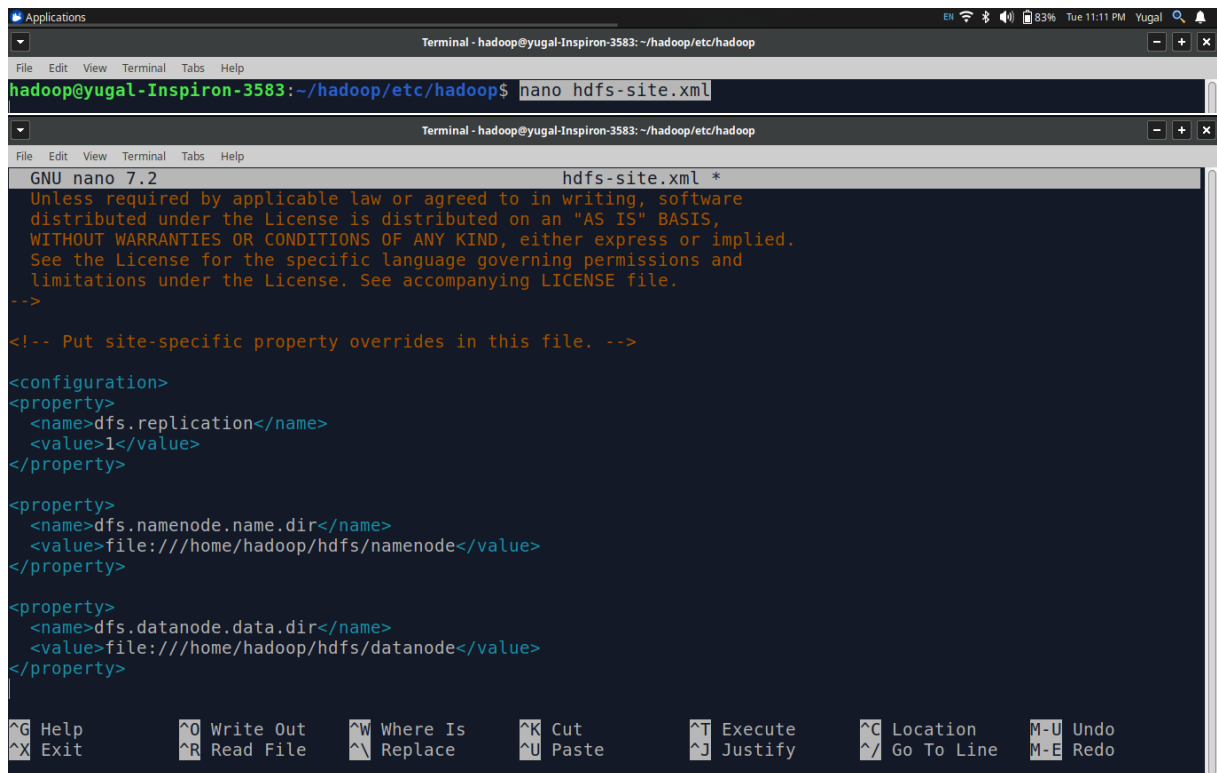
</property>

<property>

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

<value>file:///home/hadoop/hdfs/datanode</value>

</property>



```
hadoop@yugal-Inspiron-3583: ~/hadoop/etc/hadoop$ nano hdfs-site.xml

GNU nano 7.2 hdfs-site.xml *
Unless required by applicable law or agreed to in writing, software
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>dfs.replication</name>
  <value>1</value>
</property>

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

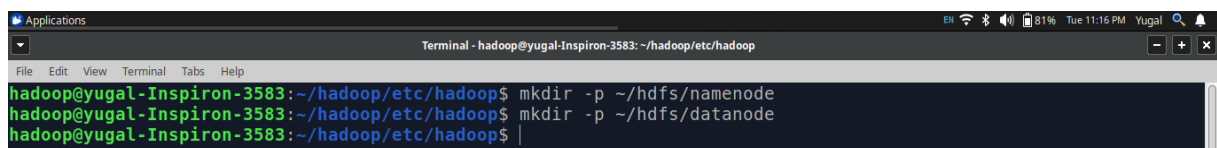
<property>
  <name>dfs.datanode.data.dir</name>
  <value>file:///home/hadoop/hdfs/datanode</value>
</property>

^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
```

Figure 12: hdfs-site.xml Modification

## Creating Folder for NameNode and DataNode

```
mkdir -p ~/hdfs/namenode
mkdir -p ~/hdfs/datanode
```

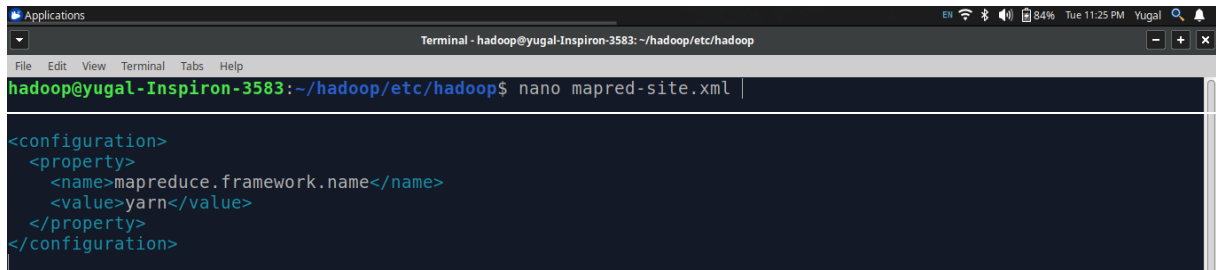


```
hadoop@yugal-Inspiron-3583: ~/hadoop/etc/hadoop$ mkdir -p ~/hdfs/namenode
hadoop@yugal-Inspiron-3583: ~/hadoop/etc/hadoop$ mkdir -p ~/hdfs/datanode
hadoop@yugal-Inspiron-3583: ~/hadoop/etc/hadoop$
```

Figure 13: Creating Folder for NameNode and DataNode

## mapred-site.xml Modification

```
nano mapred-site.xml
% Add the following property inside <configuration> tag
<property>
  <name>mapreduce.framework.name</name>
  <value>yarn</value>
</property>
```

A terminal window titled 'Terminal - hadoop@yugal-Inspiron-3583: ~/hadoop/etc/hadoop' shows the command 'nano mapred-site.xml' being executed. The nano editor displays the following XML content:

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

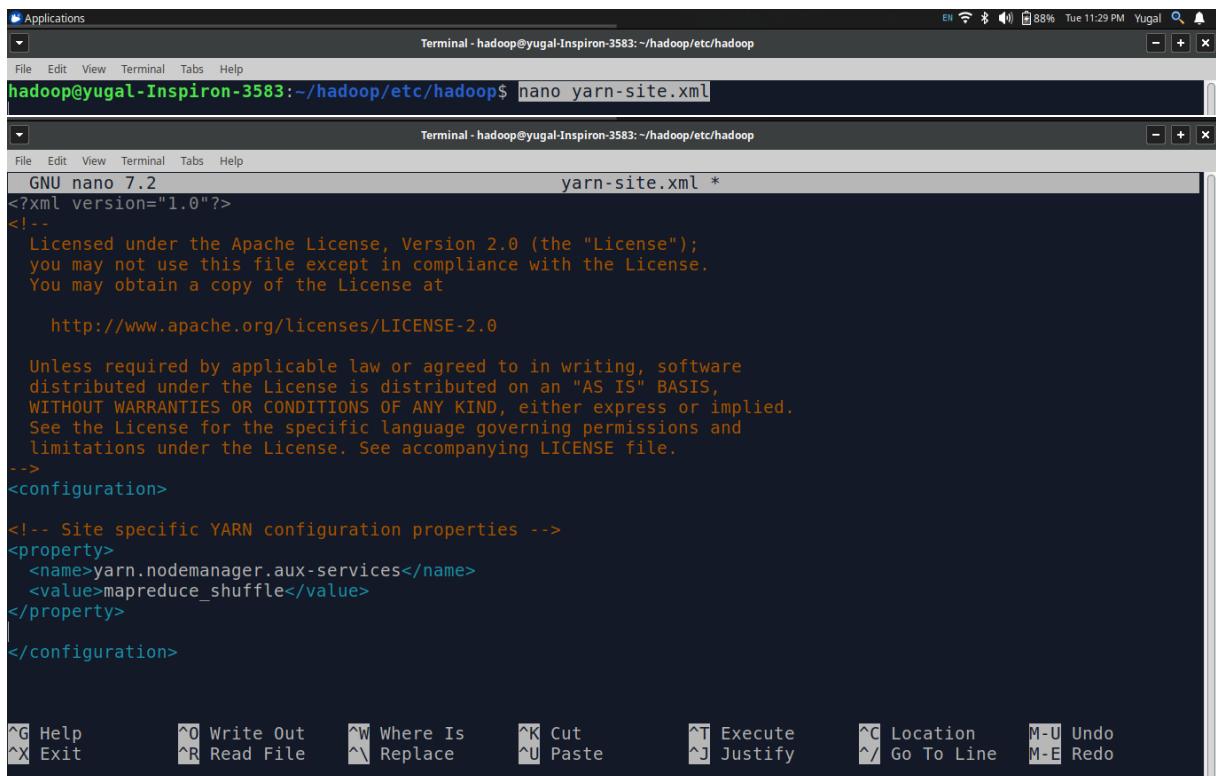
Figure 14: mapred-site.xml Modification

## yarn-site.xml Modification

nano yarn-site.xml

% Add the following property inside <configuration> tag

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

A terminal window titled 'Terminal - hadoop@yugal-Inspiron-3583: ~/hadoop/etc/hadoop' shows the command 'nano yarn-site.xml' being executed. The nano editor displays the following XML content:

```
GNU nano 7.2 yarn-site.xml *
<?xml version="1.0"?>
<!--
Licensed under the Apache License, Version 2.0 (the "License");
you may not use this file except in compliance with the License.
You may obtain a copy of the License at

    http://www.apache.org/licenses/LICENSE-2.0

Unless required by applicable law or agreed to in writing, software
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>

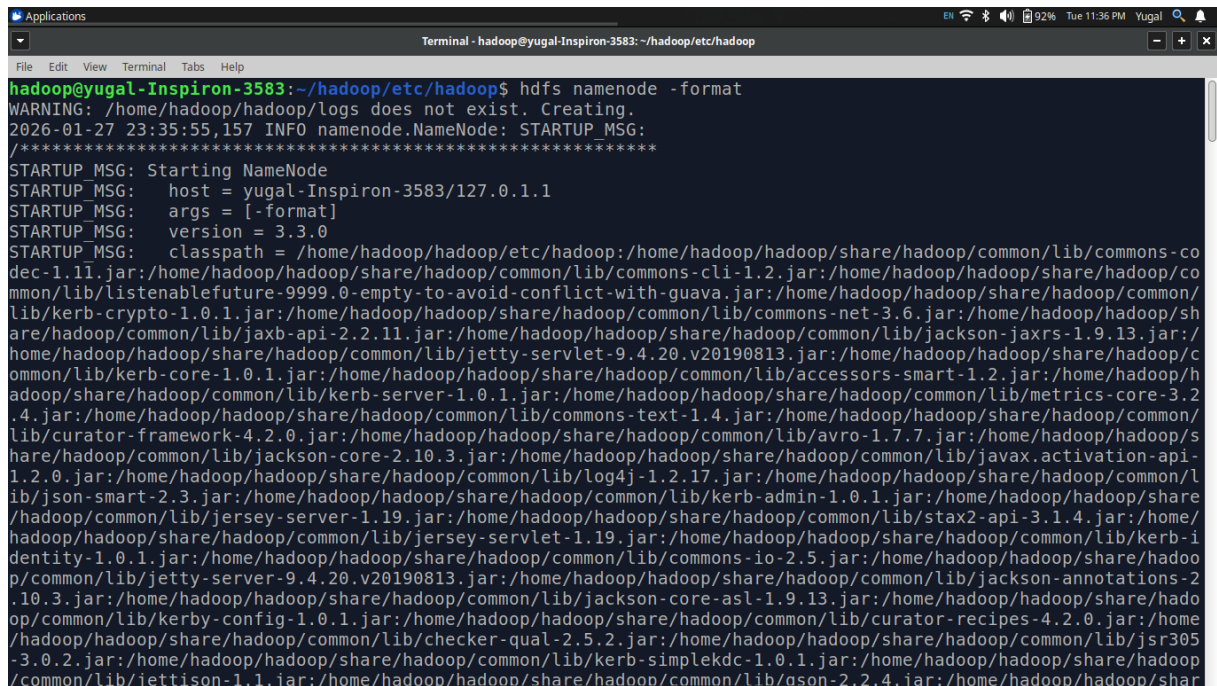
<!-- Site specific YARN configuration properties -->
<property>
  <name>yarn.nodemanager.aux-services</name>
  <value>mapreduce_shuffle</value>
</property>
</configuration>
```

Figure 15: yarn-site.xml Modification

## 1.6 Step 6: Format NameNode & Start Hadoop Services

### Format NameNode

```
hdfs namenode -format
```



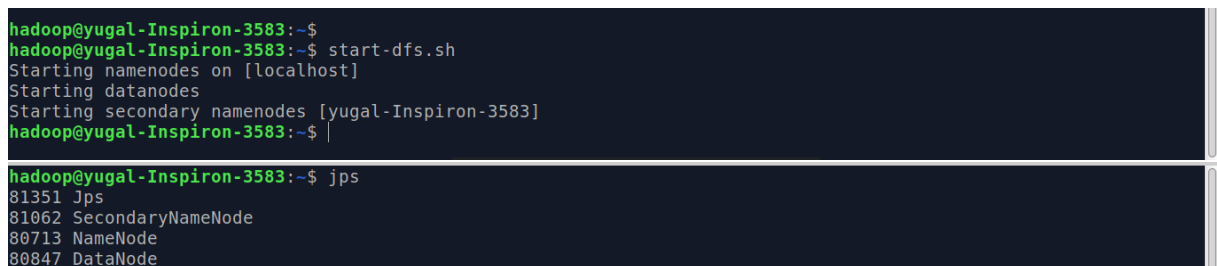
```
Applications
Terminal - hadoop@yugal-Inspiron-3583: ~/hadoop/etc/hadoop
File Edit View Terminal Tabs Help
hadoop@yugal-Inspiron-3583:~/hadoop/etc/hadoop$ hdfs namenode -format
WARNING: /home/hadoop/hadoop/logs does not exist. Creating.
2026-01-27 23:35:55,157 INFO namenode.NameNode: STARTUP_MSG:
/*****
STARTUP_MSG: Starting NameNode
STARTUP_MSG:   host = yugal-Inspiron-3583/127.0.1.1
STARTUP_MSG:   args = [-format]
STARTUP_MSG:   version = 3.3.0
STARTUP_MSG:   classpath = /home/hadoop/hadoop/etc/hadoop:/home/hadoop/hadoop/share/hadoop/common/lib/commons-codec-1.11.jar:/home/hadoop/hadoop/share/hadoop/common/lib/commons-cli-1.2.jar:/home/hadoop/hadoop/share/hadoop/common/lib/listenablefuture-9999.0-empty-to-avoid-conflict-with-guava.jar:/home/hadoop/hadoop/share/hadoop/common/lib/kerb-crypto-1.0.1.jar:/home/hadoop/hadoop/share/hadoop/common/lib/commons-net-3.6.jar:/home/hadoop/hadoop/share/hadoop/common/lib/jaxb-api-2.2.11.jar:/home/hadoop/hadoop/share/hadoop/common/lib/jackson-jaxrs-1.9.13.jar:/home/hadoop/hadoop/share/hadoop/common/lib/jetty-servlet-9.4.20.v20190813.jar:/home/hadoop/hadoop/share/hadoop/common/lib/kerb-core-1.0.1.jar:/home/hadoop/hadoop/share/hadoop/common/lib/accessors-smart-1.2.jar:/home/hadoop/hadoop/share/hadoop/common/lib/kerb-server-1.0.1.jar:/home/hadoop/hadoop/share/hadoop/common/lib/metrics-core-3.2.4.jar:/home/hadoop/hadoop/share/hadoop/common/lib/commons-text-1.4.jar:/home/hadoop/hadoop/share/hadoop/common/lib/curator-framework-4.2.0.jar:/home/hadoop/hadoop/share/hadoop/common/lib/avro-1.7.7.jar:/home/hadoop/hadoop/share/hadoop/common/lib/jackson-core-2.10.3.jar:/home/hadoop/hadoop/share/hadoop/common/lib/javax.activation-api-1.2.0.jar:/home/hadoop/hadoop/share/hadoop/common/lib/log4j-1.2.17.jar:/home/hadoop/hadoop/share/hadoop/common/lib/json-smart-2.3.jar:/home/hadoop/hadoop/share/hadoop/common/lib/kerb-admin-1.0.1.jar:/home/hadoop/hadoop/share/hadoop/common/lib/jersey-server-1.19.jar:/home/hadoop/hadoop/share/hadoop/common/lib/stax2-api-3.1.4.jar:/home/hadoop/hadoop/share/hadoop/common/lib/jersey-servlet-1.19.jar:/home/hadoop/hadoop/share/hadoop/common/lib/kerb-identity-1.0.1.jar:/home/hadoop/hadoop/share/hadoop/common/lib/commons-io-2.5.jar:/home/hadoop/hadoop/share/hadoop/common/lib/jetty-server-9.4.20.v20190813.jar:/home/hadoop/hadoop/share/hadoop/common/lib/jackson-annotations-2.10.3.jar:/home/hadoop/hadoop/share/hadoop/common/lib/jackson-core-asl-1.9.13.jar:/home/hadoop/hadoop/share/hadoop/common/lib/kerby-config-1.0.1.jar:/home/hadoop/hadoop/share/hadoop/common/lib/curator-recipes-4.2.0.jar:/home/hadoop/hadoop/share/hadoop/common/lib/checker-qual-2.5.2.jar:/home/hadoop/hadoop/share/hadoop/common/lib/jsr305-3.0.2.jar:/home/hadoop/hadoop/share/hadoop/common/lib/kerb-simplekdc-1.0.1.jar:/home/hadoop/hadoop/share/hadoop/common/lib/jettison-1.1.jar:/home/hadoop/hadoop/share/hadoop/common/lib/gson-2.2.4.jar:/home/hadoop/hadoop/share
```

Figure 16: Format NameNode

### Start Hadoop Services

```
start-dfs.sh
```

```
jps
```



```
hadoop@yugal-Inspiron-3583:~$ start-dfs.sh
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [yugal-Inspiron-3583]
hadoop@yugal-Inspiron-3583:~$ jps
81351 Jps
81062 SecondaryNameNode
80713 NameNode
80847 DataNode
```

Figure 17: Start Hadoop Services

### Start YARN Services

```
start-yarn.sh
```

```
jps
```

The image shows a terminal window and a web browser. The terminal window displays the following commands and output:

```

hadoop@yugal-Inspiron-3583:~$ jps
81351 Jps
81062 SecondaryNameNode
80713 NameNode
80847 DataNode
hadoop@yugal-Inspiron-3583:~$ start-yarn.sh
Starting resourcemanager
Starting nodemanagers
hadoop@yugal-Inspiron-3583:~$ jps
81792 NodeManager
82355 Jps
81670 ResourceManager
81062 SecondaryNameNode
80713 NameNode
80847 DataNode
hadoop@yugal-Inspiron-3583:~$ |

```

The web browser shows the Hadoop Overview page for 'localhost:9000' (active). The page includes a table with the following information:

Started:	Tue Jan 27 23:49:34 +0530 2026
Version:	3.3.0, raa96f1871bfd858f9bac59cf2a81ec470da649af
Compiled:	Tue Jul 07 00:14:00 +0530 2020 by brahma from branch-3.3.0
Cluster ID:	CID-7d9aa263-5957-4992-9da1-32c648d8341c
Block Pool ID:	BP-1685072063-127.0.1.1-1769537156943

The Summary section shows the following information:

- 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 119.44 MB of 616 MB Heap Memory. Max Heap Memory is 3.88 GB.
- Non Heap Memory used 53.86 MB of 56.5 MB Committed Non Heap Memory. Max Non Heap Memory is <unbounded>.

Figure 18: Start YARN Services

## 1.7 Step 7: HDFS Operations

```

% Create a test file
echo "Hello Big Data" > file.txt
% Make directory in HDFS
hdfs dfs -mkdir /data

```

```

% Upload file to HDFS
hdfs dfs -put file.txt /data
% List files
hdfs dfs -ls /data
% Check blocks & replication
hdfs fsck /data/file.txt -files -blocks
% Change permission
hdfs dfs -chmod 777 /data/file.txt
% Delete file
hdfs dfs -rm /data/file.txt
hdfs dfs -ls /data

```

```

Applications
Terminal - hadoop@yugal-Inspiron-3583: ~
File Edit View Terminal Tabs Help
hadoop@yugal-Inspiron-3583:~$ echo "Hello Big Data" > file.txt
hadoop@yugal-Inspiron-3583:~$ hdfs dfs -mkdir /data
hadoop@yugal-Inspiron-3583:~$ hdfs dfs -put file.txt /data
hadoop@yugal-Inspiron-3583:~$ hdfs dfs -ls /data
Found 1 items
-rw-r--r-- 1 hadoop supergroup      15 2026-01-28 00:50 /data/file.txt
hadoop@yugal-Inspiron-3583:~$ hdfs fsck /data/file.txt -files -blocks
Connecting to namenode via http://localhost:9870/fscck?ugi=hadoop&files=1&blocks=1&path=%2Fdata%2Ffile.txt
FSCK started by hadoop (auth:SIMPLE) from /127.0.0.1 for path /data/file.txt at Wed Jan 28 00:51:19 IST 2026

/data/file.txt 15 bytes, replicated: replication=1, 1 block(s): OK
0. BP-1685072063-127.0.1.1-1769537156943:blk_1073741825_1001 len=15 Live_repl=1

Status: HEALTHY
Number of data-nodes: 1
Number of racks:      1
Total dirs:           0
Total symlinks:       0

```

Figure 19: HDFS Operation 1

```

Erasure Coded Block Groups:
Total size:      0 B
Total files:     0
Total block groups (validated): 0
Minimally erasure-coded block groups: 0
Over-erasure-coded block groups: 0
Under-erasure-coded block groups: 0
Unsatisfactory placement block groups: 0
Average block group size: 0.0
Missing block groups: 0
Corrupt block groups: 0
Missing internal blocks: 0
Blocks queued for replication: 0
FSCK ended at Wed Jan 28 00:51:19 IST 2026 in 37 milliseconds

The filesystem under path '/data/file.txt' is HEALTHY
hadoop@yugal-Inspiron-3583:~$ hdfs dfs -chmod 777 /data/file/txt
chmod: '/data/file/txt': No such file or directory
hadoop@yugal-Inspiron-3583:~$ hdfs dfs -rm /data/file.txt

```

Figure 20: HDFS Operation 2

**Browse Directory**

/data

Show 25 entries Search:

Permission	Owner	Group	Size	Last Modified	Replication	Block Size	Name
-rwxrwxrwx	hadoop	supergroup	15 B	Jan 28 00:50	1	128 MB	file.txt

Showing 1 to 1 of 1 entries

Previous 1 Next

Hadoop, 2020.

Figure 21: HDFS Result 1

**hadoop** SUBMITTED Applications

Cluster Metrics

Apps Submitted	Apps Pending	Apps Running	Apps Completed	Containers Running	Memory Used
0	0	0	0	0	0 B

Cluster Nodes Metrics

Active Nodes	Decommissioning Nodes	Decommissioned Nodes	Lost Nodes
1	0	0	0

Scheduler Metrics

Scheduler Type	Scheduling Resource Type	Minimum Allocation
Capacity Scheduler	[memory-mb (unit=Mi), vcores]	<memory:1024, vCores:1>

Show 20 entries

ID	User	Name	Application Type	Application Tags	Queue	Application Priority	StartTime	LaunchTime	FinishTime	State	FinalStatus
No data available in table											

Showing 0 to 0 of 0 entries

Figure 22: HDFS Result 2



## **1.8 Result**

Hadoop was successfully installed and configured in pseudo-distributed mode, and various HDFS operations were performed successfully.

## **1.9 Conclusion**

This experiment provided hands-on experience in setting up a Big Data environment using Hadoop and understanding the working of HDFS through practical command execution.