Large Scale Data Processing
CSE3025

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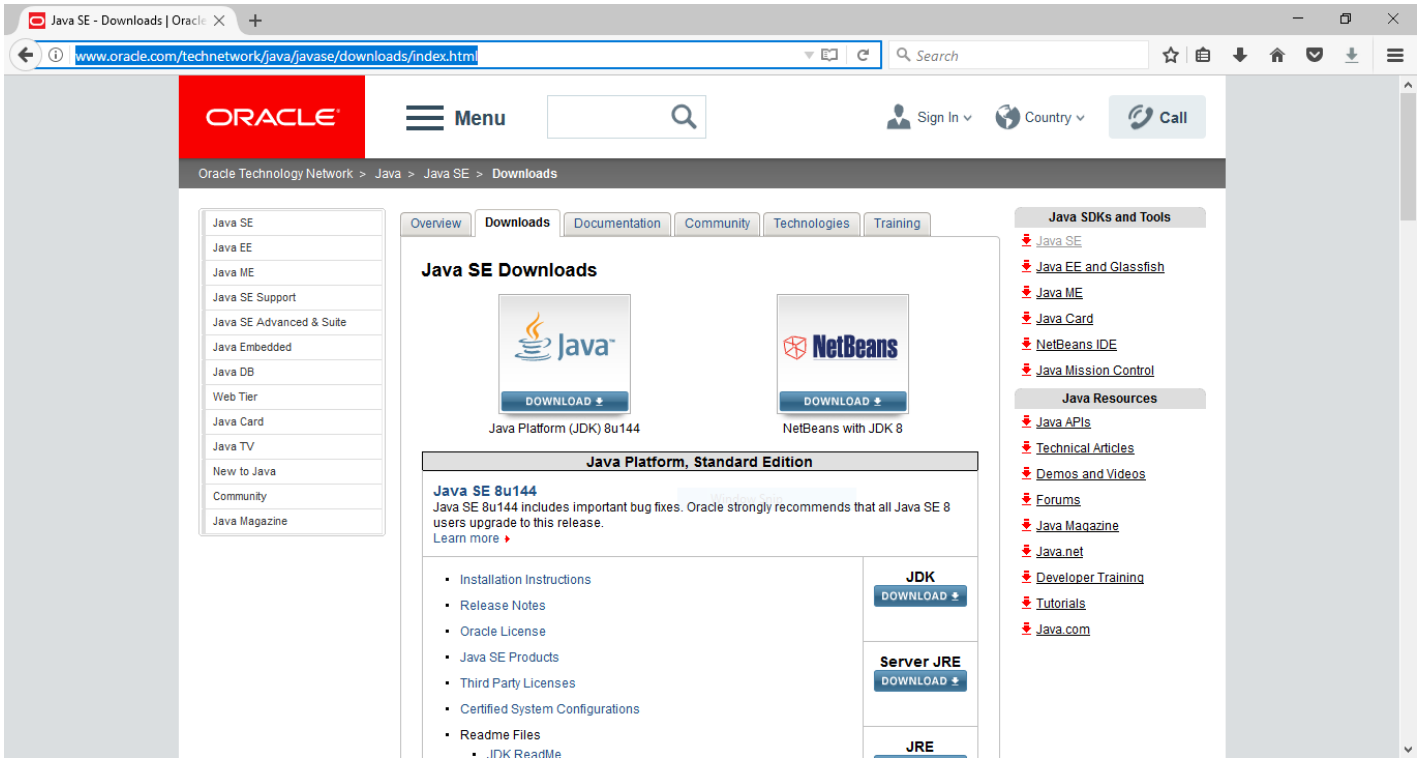
1. Hadoop Installation

- **ssh**
  - **Check whether ssh is working or not**
  - $ **ssh localhost**
  - if the result like connection refused on port 22 then start **ssh** service
  - command to check ssh service status in ubuntu
    - $ sudo systemctl status ssh
    - Now, check ssh
    - $ **ssh localhost** → if it shows any error, then install ssh
    - command to install ssh in ubuntu
    - $ **sudo apt install openssh-server**
    - check the ssh in machine

- **java**
  - **Check java version on your local machine**
  - command is $ **java -version**
  - if the java version is **openjdk**, then install oracle JDK
  - **procedure to install oracle java**
  - Download JDK-11 from Oracle jdk website http://www.oracle.com/technetwork/java/javase/downloads/index.html



- create a directory **in** /opt directory
  - command is $ **sudo mkdir -p /opt/java**
- change the permission of the directory
  - command is $ **sudo chmod 777 -R java**
- copy the jdk-x.x.x.gz into /opt/java directory
  - command is $ **cp /home/ragalayathvisra/Downloads/jdk-x.x.x.gz /opt/java**
- untar the jdk file
  - command is $ **tar -xvzf jdk-x.x.x.gz**
- change the permission of java directory
  - command is $ **sudo chmod 777 -R /opt/java/jdk-x.x.x**

- set the path for java in /etc/profile
  - command is $ **sudo gedit /etc/profile**
- Append the following lines in /etc/profile
  - **export JAVA_HOME=/opt/java/jdk-x.x.x**
  - **export PATH=$JAVA_HOME/bin:$PATH**
- restart the terminal
  - command is $ **. /etc/profile**
- check java version
  - command is $ **java -version**
- path setting details are set in java-install.sh **(personal file)** → It have the symbolic links of java
- Execute java-install.sh file in terminal
  - command to change the permission $ **sudo chmod 777 -R java-install.sh**
  - command to execute the file $ **sudo ./java-install.sh**
  - Then check the java version. The command is $ **java -version**

- Download latest hadoop (3.3.0) binary file from **http://hadoop.apache.org/releases.html**
- Let us assume it have downloaded in Download directory.
- create hadoop directory in /opt directory
  - The command is $ **sudo mkdir hadoop**
- Change the permissions of the directory
  - The command is $ **sudo chmod 777 -R hadoop**
- copy the hadoop-x.x.x.tar.gz into /opt/hadoop directory
  - The command is $ **cp /home/ragalayathvisra/Downloads/hadoop-x.x.x.tar.gz /opt/hadoop/**
- untar the file
  - command is $ **tar -xvzf hadoop-x.x.x.tar.gz**
- change the permission of **hadoop** directory
  - command is $ **sudo chmod 777 -R /opt/hadoop**

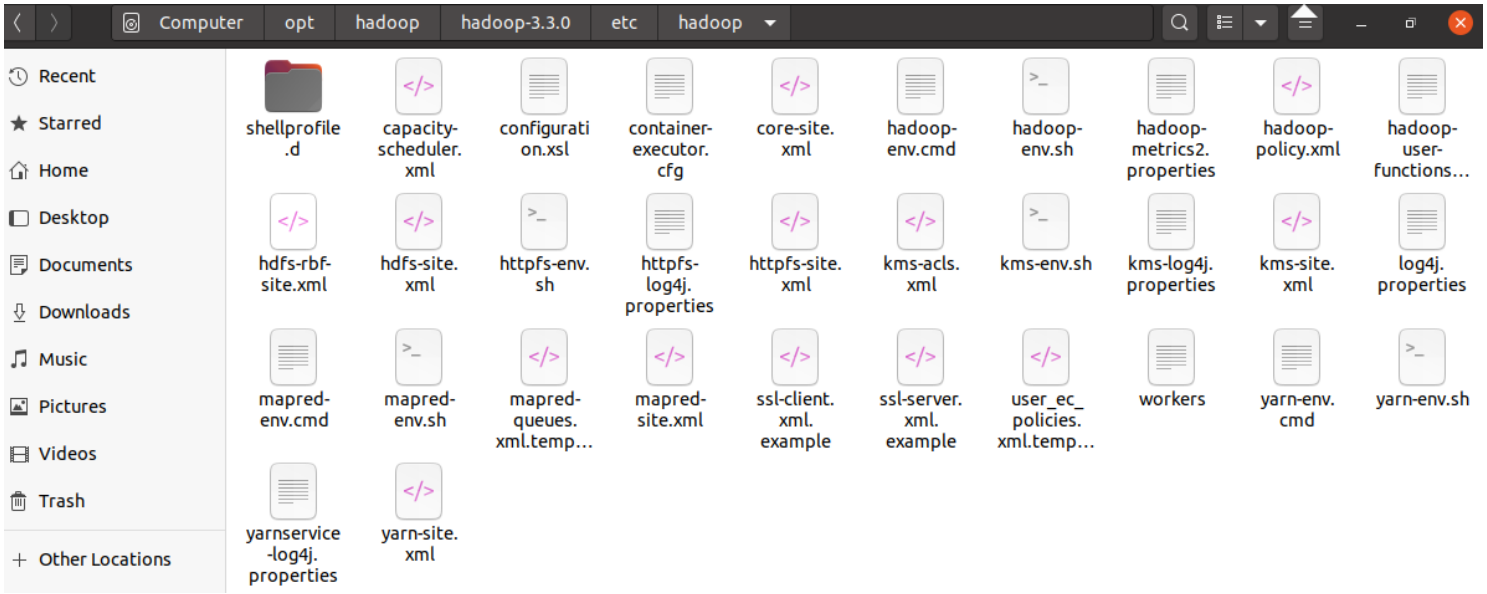
- open bashrc file for hadoop path setting
  - The command is $ **sudo gedit ~/.bashrc**
  - Append the Hadoop and java paths

```
#Hadoop Related Options
export HADOOP_HOME=/opt/hadoop/hadoop-3.3.0
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=$HADOOP_HOME
export HADOOP_OPTS="-Djava.library.path=$HADOOP_HOME/lib/native"
export HADOOP_COMMON_LIB_NATIVE_DIR=$HADOOP_HOME/lib/native
export PATH=$PATH:$HADOOP_HOME/sbin:$HADOOP_HOME/bin


#Java Related Options
export JAVA_HOME=/opt/java/jdk-11.0.9
export PATH=$PATH:$JAVA_HOME/bin
```

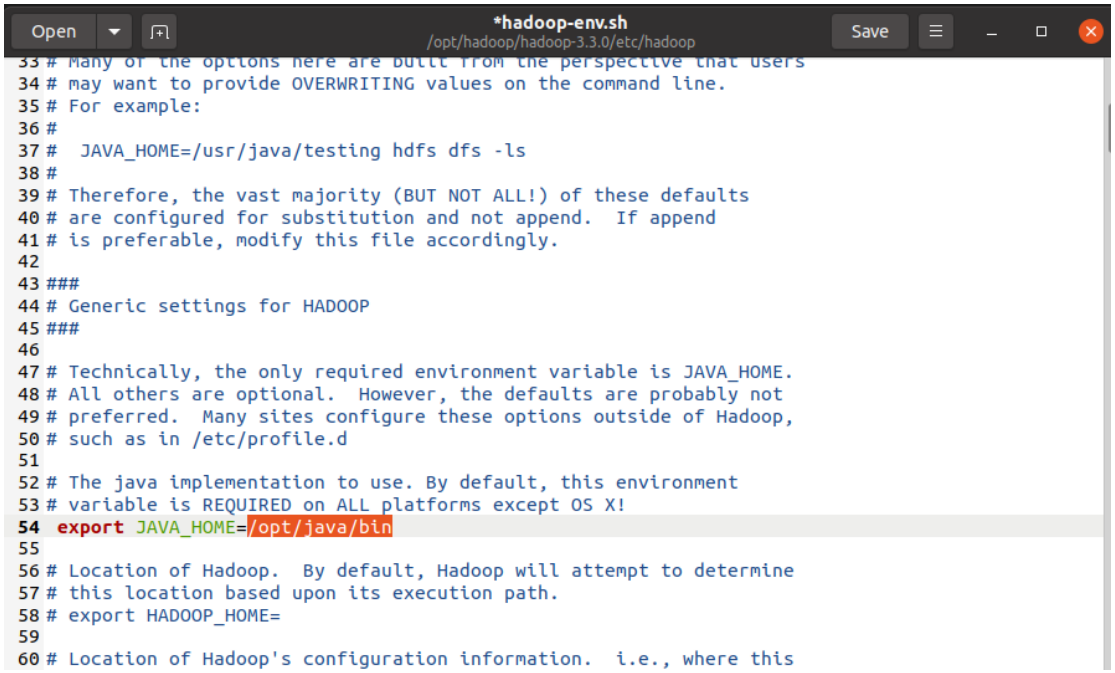
- Restart the terminal
  - command to restart is $**source ~/.bashrc**

- Go to hadoop directory for Configuration purpose. i.e /opt/hadoop/hadoop-3.3.0/etc/hadoop



- add java path in **hadoop_env.sh** file
- command to open hadoop_env.sh is $ **gedit hadoop_env.sh**

- add java path in **hadoop_env.sh** file
- command to open hadoop_env.sh is $ **gedit hadoop_env.sh** or you can directly open in notepad



- open **core-site.xml** for configuration purpose using notepad
- do the modification in core-site.xml as shown below, save and exit

Open core-site.xml /opt/hadoop/hadoop-3.3.0/etc/hadoop Save

```xml
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl" href="configuration.xsl"?>
<!--
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  limitations under the License. See accompanying LICENSE file.
-->

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

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

- open **hdfs-site.xml** for configuration purpose using notepad
- do the modification in hdfs-site.xml as shown below, save and exit

Open | *hdfs-site.xml /opt/hadoop/hadoop-3.3.0/etc/hadoop | Save

```
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 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:///opt/hadoop/hadoop_tmp/hdfs/namenode</value>
</property>
<property>
<name>dfs.datanode.data.dir</name>
<value>file:///opt/hadoop/hadoop_tmp/hdfs/datanode</value>
</property>
</configuration>
```

- open **mapred-site.xml** for configuration purpose using notepad
- do the modification in mapred-site.xml as shown below, save and exit

Open | mapred-site.xml /opt/hadoop/hadoop-3.3.0/etc/hadoop | Save

```xml
<?xml version="1.0"?>
<?xml-stylesheet type="text/xsl" href="configuration.xsl"?>
<!--
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  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
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  limitations under the License. See accompanying LICENSE file.
-->

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

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

- open **yarn-site.xml** for configuration purpose using notepad
- do the modification in yarn-site.xml as shown below, save and exit

Open | *yarn-site.xml /opt/hadoop/hadoop-3.3.0/etc/hadoop | Save

```xml
<?xml version="1.0"?>
<!--
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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.
-->
<configuration>
<property>
<name>yarn.nodemanager.aux-services</name>
<value>mapreduce_shuffle</value>
</property>
<property>
<name>yarn.nodemanager.vmem-check-enabled</name>
<value>false</value>
</property>
</configuration>
```
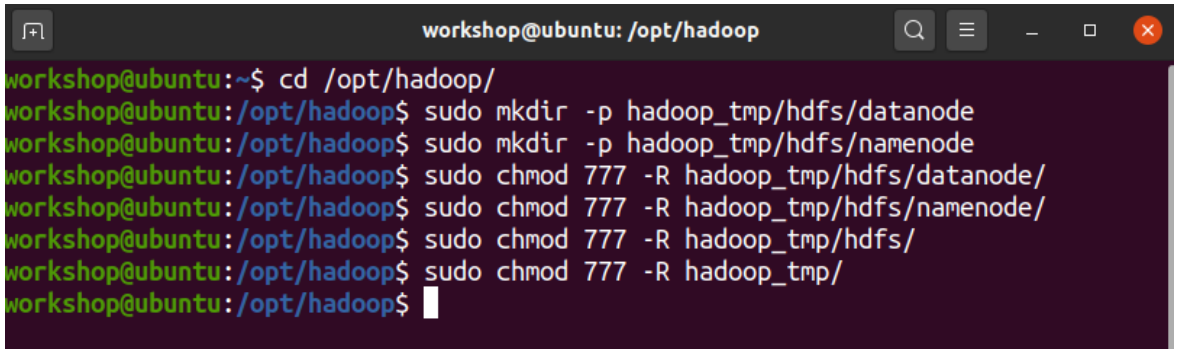
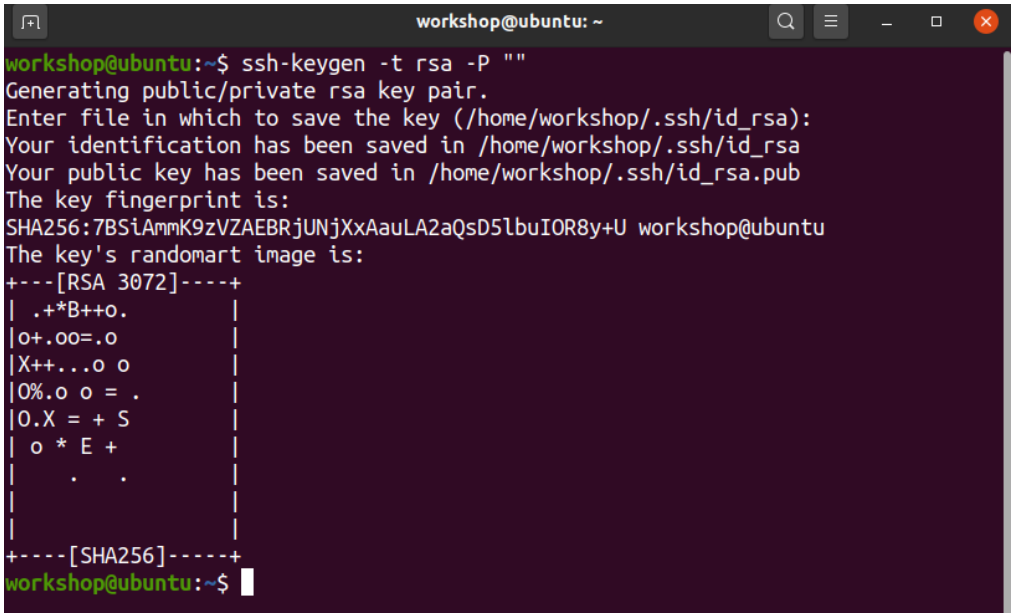

- we need to create directories for namenode and datanode, which are specified in hdfs-site.xml
- The following commands are for creating namenode, Datanode and permission settings



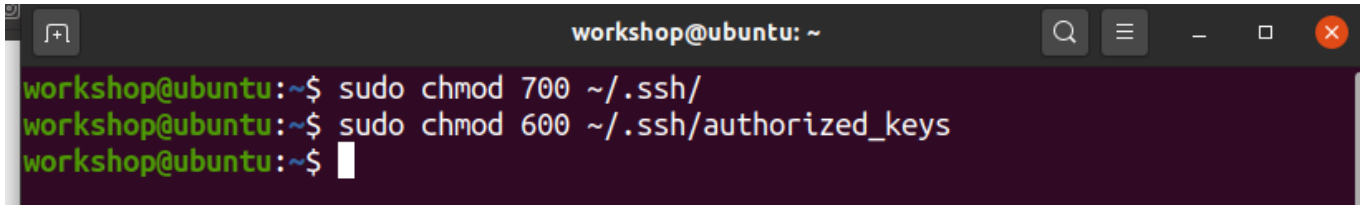
- Hadoop requires SSH access to manage its nodes, i.e. remote machines plus your local machine if you want to use Hadoop on it
- Commands is to create an RSA key pair with an empty password.



- we have to enable SSH access to local machine with this newly created key.
- The commands is

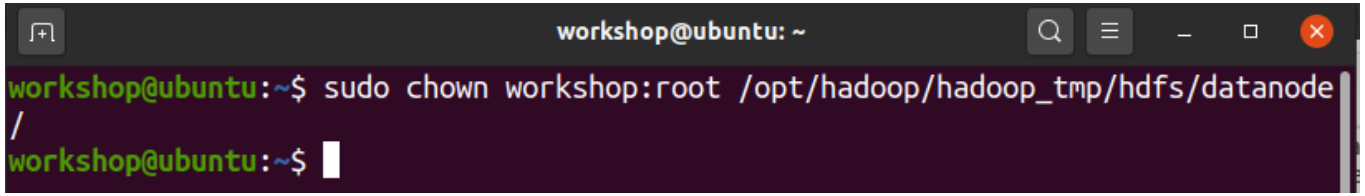
```
workshop@ubuntu: ~
workshop@ubuntu:~$ cat /home/workshop/.ssh/id_rsa.pub >> /home/workshop/.ssh/aut
horized_keys
workshop@ubuntu:~$
```

- command to passwordless promt
- $ **sudo chmod 700 ∽ ⁄.ssh⁄**
- $ **sudo chmod 600 ∽ ⁄.ssh⁄authorized_keys**



- We need to change the permissions of datanode
- The following command is used

sudo chown workshop:root /opt/Hadoop/hadoop_tmp/hdfs/datanode



- Now we need to format the namenode
- The following commands is used to format the namenode

vitchennai@localhost:~

File Edit View Search Terminal Help

```
[vitchennai@localhost ~]$ hdfs namenode -format
17/07/21 00:13:11 INFO namenode.NameNode: STARTUP_MSG:
/************************************************************
STARTUP_MSG: Starting NameNode
STARTUP_MSG:   user = vitchennai
STARTUP_MSG:   host = localhost/127.0.0.1
STARTUP_MSG:   args = [-format]
STARTUP_MSG:   version = 2.8.0
STARTUP_MSG:   classpath = /opt/hadoop/hadoop-2.8.0/etc/hadoop:/opt/hadoop/hadoo
p-2.8.0/share/hadoop/common/lib/httpclient-4.5.2.jar:/opt/hadoop/hadoop-2.8.0/sh
are/hadoop/common/lib/jersey-core-1.9.jar:/opt/hadoop/hadoop-2.8.0/share/hadoop/
common/lib/mockito-all-1.8.5.jar:/opt/hadoop/hadoop-2.8.0/share/hadoop/common/li
b/guava-11.0.2.jar:/opt/hadoop/hadoop-2.8.0/share/hadoop/common/lib/commons-math
3-3.1.1.jar:/opt/hadoop/hadoop-2.8.0/share/hadoop/common/lib/jackson-mapper-asl-
1.9.13.jar:/opt/hadoop/hadoop-2.8.0/share/hadoop/common/lib/api-util-1.0.0-M20.j
ar:/opt/hadoop/hadoop-2.8.0/share/hadoop/common/lib/commons-io-2.4.jar:/opt/hado
op/hadoop-2.8.0/share/hadoop/common/lib/jackson-xc-1.9.13.jar:/opt/hadoop/hadoop
-2.8.0/share/hadoop/common/lib/jetty-util-6.1.26.jar:/opt/hadoop/hadoop-2.8.0/sh
are/hadoop/common/lib/xmlenc-0.52.jar:/opt/hadoop/hadoop-2.8.0/share/hadoop/comm
on/lib/asm-3.2.jar:/opt/hadoop/hadoop-2.8.0/share/hadoop/common/lib/stax-api-1.0
-2.jar:/opt/hadoop/hadoop-2.8.0/share/hadoop/common/lib/jcip-annotations-1.0.jar
:/opt/hadoop/hadoop-2.8.0/share/hadoop/common/lib/gson-2.2.4.jar:/opt/hadoop/had
oop-2.8.0/share/hadoop/common/lib/java-xmlbuilder-0.4.jar:/opt/hadoop/hadoop-2.8
.0/share/hadoop/common/lib/commons-beanutils-1.7.0.jar:/opt/hadoop/hadoop-2.8.0/
```

- **Hadoop-3.3.0 installation has completed**
- **Check the Hadoop status**

- Now start the Hadoop Distributed File System
- The following commands (**start-dfs.sh**) is used for this

```
vitchennai@localhost:~
File  Edit  View  Search  Terminal  Help
SHUTDOWN_MSG: Shutting down NameNode at localhost/127.0.0.1
************************************************************/
[vitchennai@localhost ~]$ clear

[vitchennai@localhost ~]$ start-dfs.sh
Starting namenodes on [localhost]
The authenticity of host 'localhost (::1)' can't be established.
ECDSA key fingerprint is SHA256:T+LJOwDpd/6JnpGRbHJo0pru46r8l7kYDJM+tomWm3E.
ECDSA key fingerprint is MD5:bb:a4:e7:bb:13:1f:59:f1:18:41:9f:c8:60:93:5f:bd.
Are you sure you want to continue connecting (yes/no)? yes
localhost: Warning: Permanently added 'localhost' (ECDSA) to the list of known hosts.
vitchennai@localhost's password:
localhost: starting namenode, logging to /opt/hadoop/hadoop-2.8.0/logs/hadoop-vitchenna
i-namenode-localhost.localdomain.out
vitchennai@localhost's password:
localhost: starting datanode, logging to /opt/hadoop/hadoop-2.8.0/logs/hadoop-vitchenna
i-datanode-localhost.localdomain.out
Starting secondary namenodes [0.0.0.0]
The authenticity of host '0.0.0.0 (0.0.0.0)' can't be established.
ECDSA key fingerprint is SHA256:T+LJOwDpd/6JnpGRbHJo0pru46r8l7kYDJM+tomWm3E.
ECDSA key fingerprint is MD5:bb:a4:e7:bb:13:1f:59:f1:18:41:9f:c8:60:93:5f:bd.
Are you sure you want to continue connecting (yes/no)? yes
0.0.0.0: Warning: Permanently added '0.0.0.0' (ECDSA) to the list of known hosts.
vitchennai@0.0.0.0's password:

0.0.0.0: starting secondarynamenode, logging to /opt/hadoop/hadoop-2.8.0/logs/hadoop-vi
tchennai-secondarynamenode-localhost.localdomain.out
[vitchennai@localhost ~]$
```

- Now check the background process for hadoop distributed file system

vitchennai@localhost:~

File Edit View Search Terminal Help

```
[vitchennai@localhost ~]$ jps
75251 Jps
75011 SecondaryNameNode
74783 DataNode
74590 NameNode
[vitchennai@localhost ~]$
```

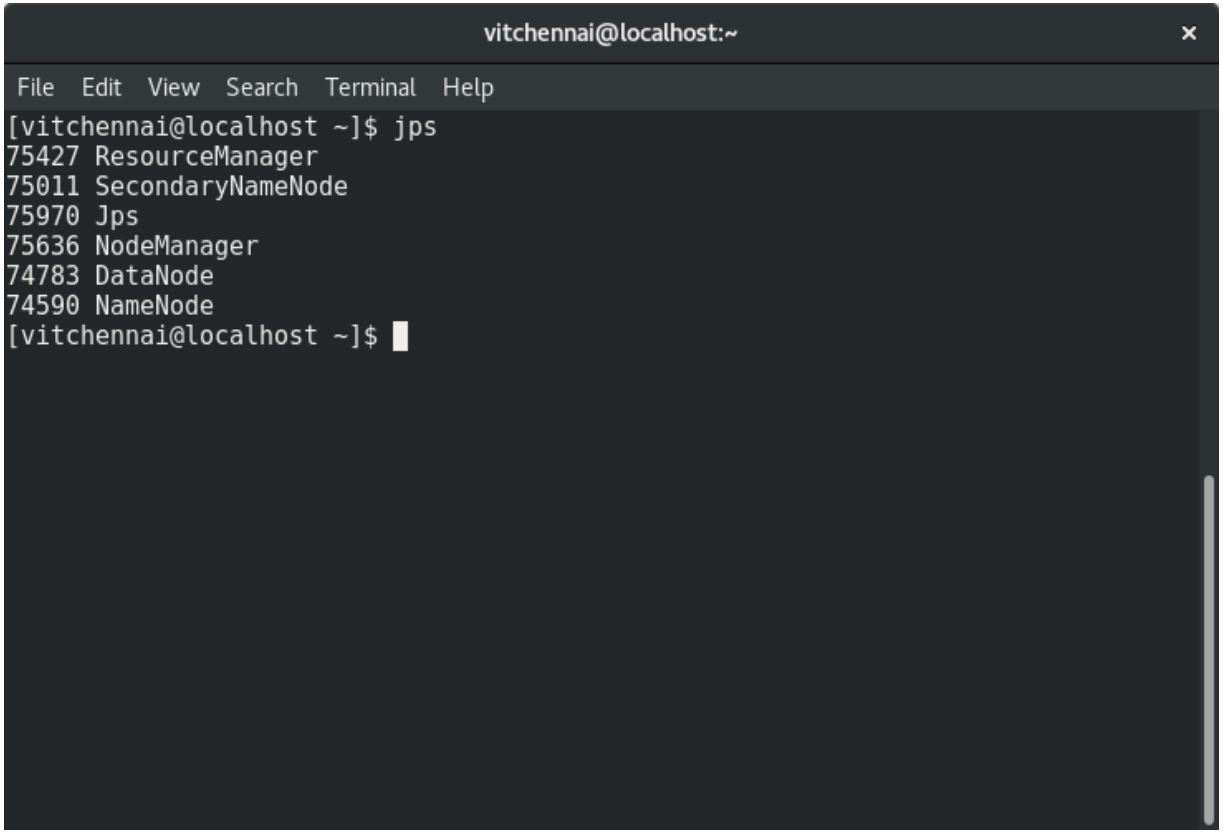
- Now start yarn resources for hadoop
- The following commands (**start-yarn.sh**) is used for this

vitchennai@localhost:~

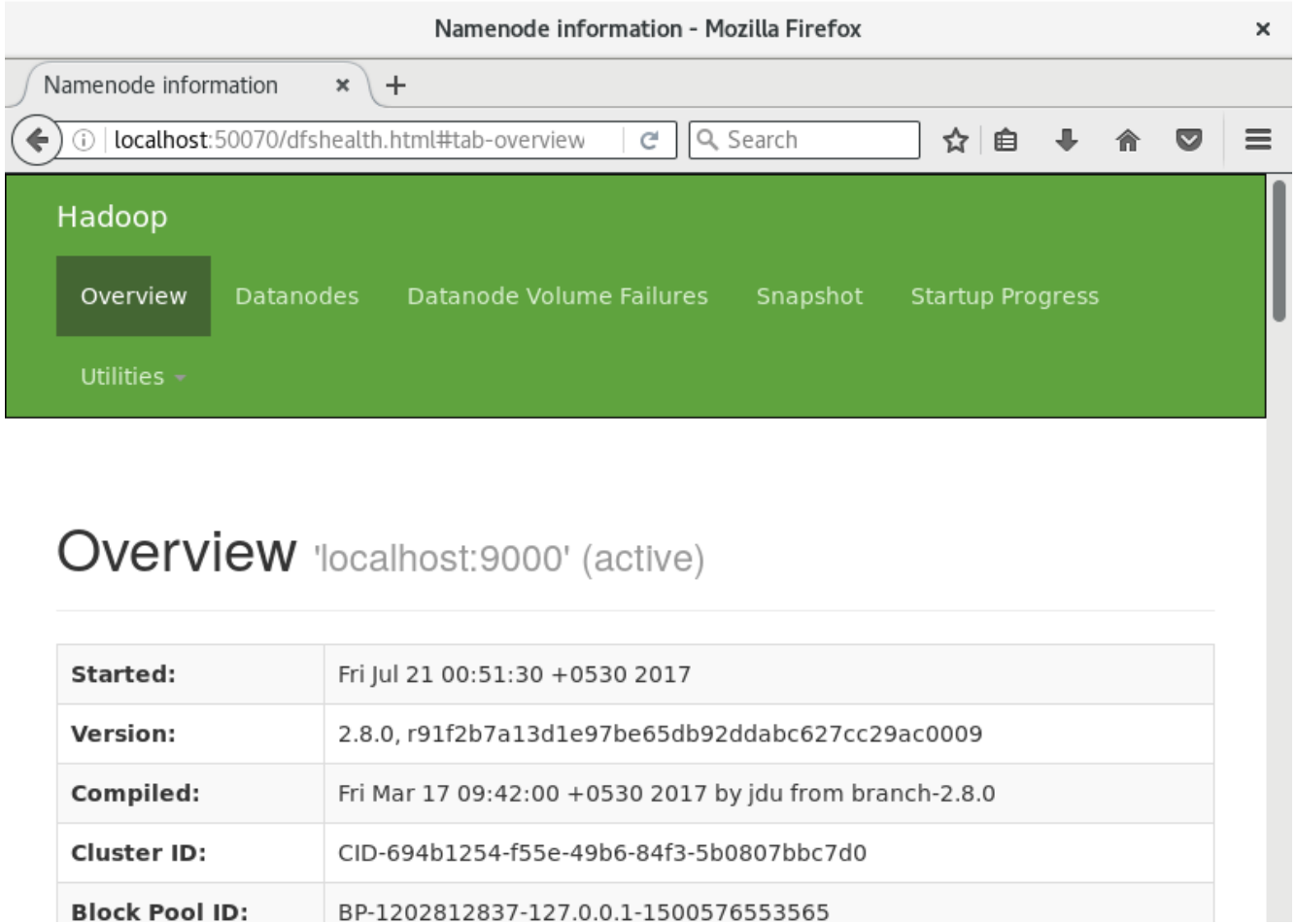
File Edit View Search Terminal Help

```
[vitchennai@localhost ~]$ start-yarn.sh
starting yarn daemons
starting resourcemanager, logging to /opt/hadoop/hadoop-2.8.0/logs/yarn-vitchenn
ai-resourcemanager-localhost.localdomain.out
vitchennai@localhost's password:
localhost: starting nodemanager, logging to /opt/hadoop/hadoop-2.8.0/logs/yarn-v
itchennai-nodemanager-localhost.localdomain.out
[vitchennai@localhost ~]$
```

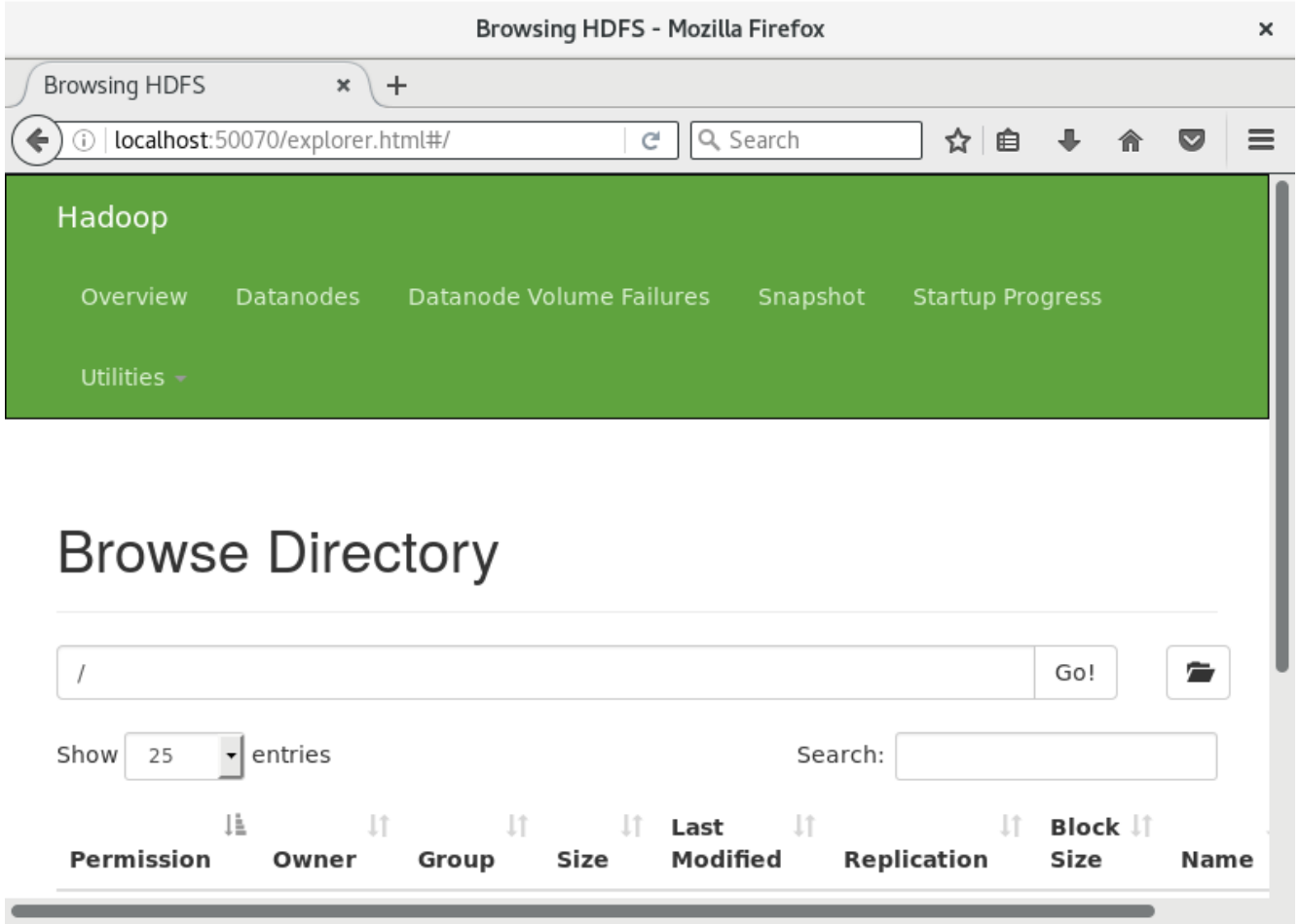
- The total number of daemons to execute hadoop-3.3.0 on local machine are
- **NameNode**
- **DataNode**
- **SecondaryNameNode**
- **NodeManager**
- **ResourceManager**
- we have to use **jps** command to check



- **UI view of Hadoop**
- Open **http://localhost:9870** in browser → Namenode



- Click on **Utilities** menu bar and then click on **Browse File System**



- The commands that are used to stop hadoop: $**stop-dfs.sh** and $**stop-yarn.sh**