

Cluster Setup

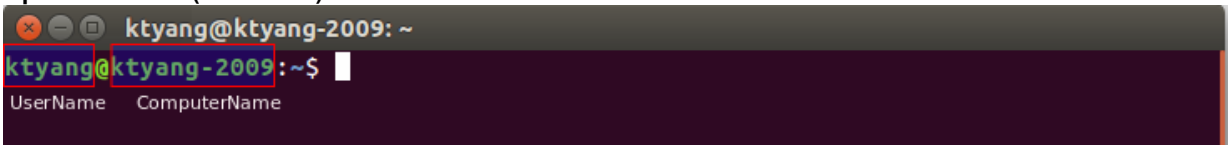
Materials: Two computers + One Router + Three Ethernet Cables

Explanation: If you have only one computer, it is also possible to establish a Hadoop Cluster using Virtual computers (e.g. installed by VirtualBox). Each computer must go through the [Single Node Setup](#) before this Cluster Setup. Computers are connected with each other via a Router which assigns an IP to each computer.

Computer name	IP address	Role
Captain-CentERdata	192.168.0.2	Master
Sailor01-CentERdata	192.168.0.10	Slave

Rename computers

- Open a terminal (Ctrl+Alt+T):



Explanation: As shown in the above figure, the computer name is "ktyang-2009" and the user name is "ktyang"

- Type in the following commands in the terminal:

```
sudo gedit /etc/hostname
sudo gedit /etc/hosts
```

Explanation: "gedit" is a command to edit a file (you can also use command: "vi", or "vim"). "sudo" means run the command with the security privileges of the superuser. Here, two files (i.e. "/etc/hostname " and "/etc/hosts") are open for editing.

- In the two files, replace any instances of the existing computer name (e.g. "ktyang-2009") with a new one (e.g. "Captain-CentERdata"). When complete run:

```
reboot # restart the computer activate the changes.
```

- After restarting the computer, open a terminal (Ctrl+Alt+T) to check whether the computer name has been changed:



Repeating the above steps to rename the other computer as "Sailor01-CentERdata".

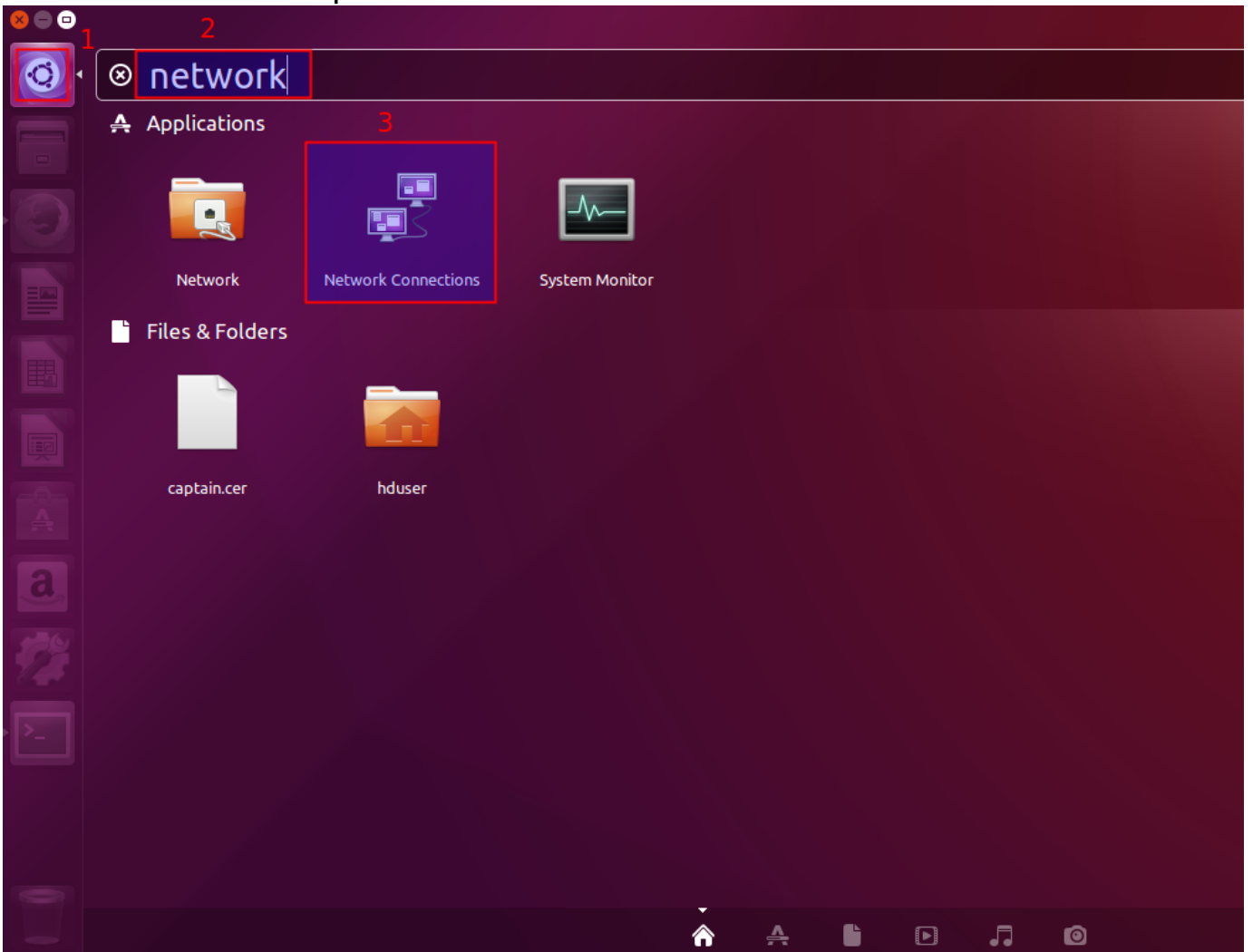
Connect computers

- Connecting computers with a router:

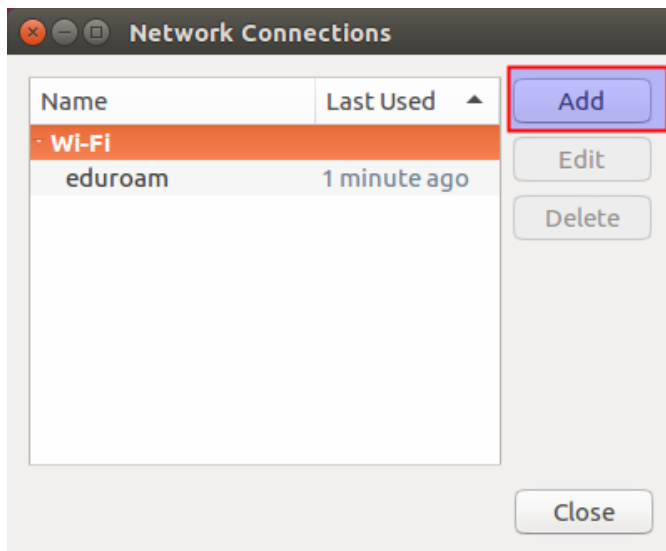


Normally, a Router contains one Internet port, and several Ethernet ports. The Internet port is connected with the Internet port on the wall. Each Ethernet port is connected with a computer.

- Set the IP address for each computer



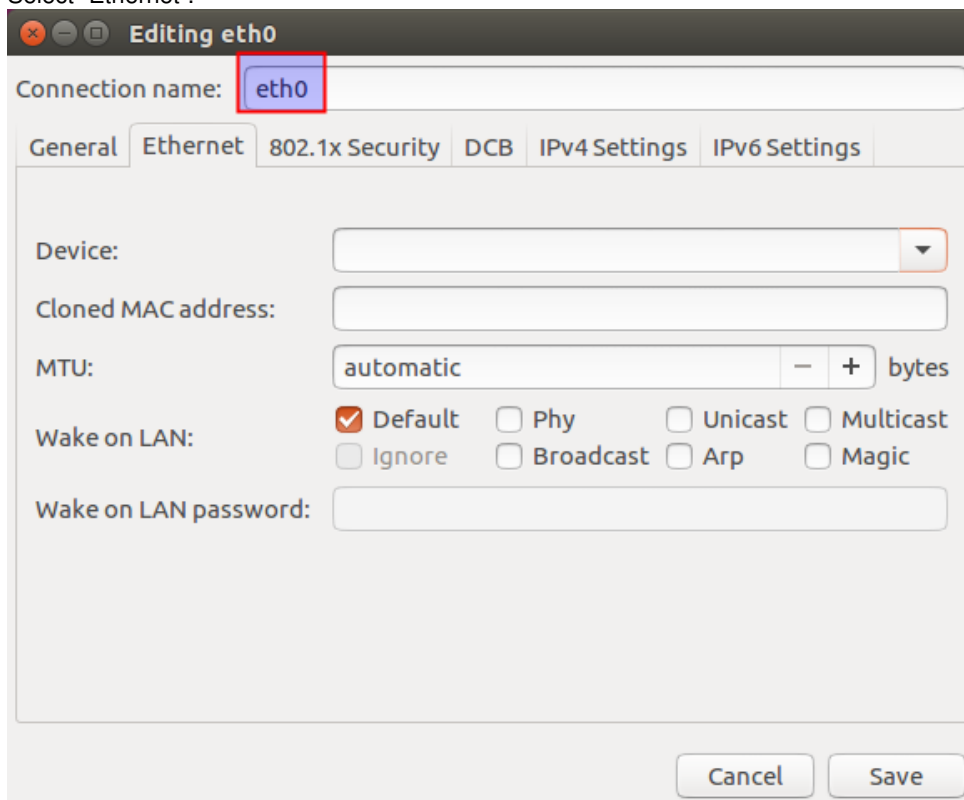
Click the "Search you computer" => Type in "network" => Click the "Network Connections".



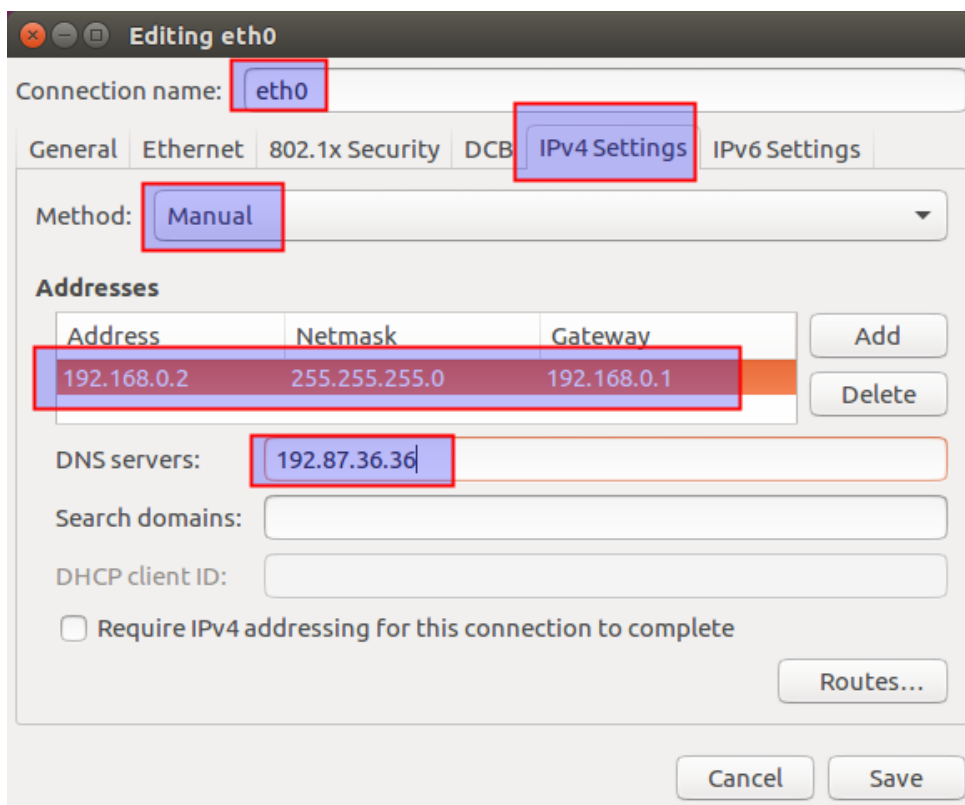
Click the "Add" button.



Select "Ethernet".



Create a network named "eth0".



Manually set the IP address.
Restart the network:

```
sudo service network-manager restart
```

Check the ip configuration:

```
ifconfig
```

```
hduser@Captain-CentERdata: ~
hduser@Captain-CentERdata:~$ ifconfig
eno1    Link encap:Ethernet  HWaddr d4:be:d9:19:01:0f
        inet addr:192.168.0.2  Bcast:192.168.0.255  Mask:255.255.255.0
        inet6 addr: fe80::ae8:bdab:77fb:2e64/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:283 errors:0 dropped:0 overruns:0 frame:0
        TX packets:776 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:84184 (84.1 KB)  TX bytes:138720 (138.7 KB)
        Interrupt:20 Memory:e6e00000-e6e20000
```

It can be seen that the IP address of the Captain-CentERdata is set successfully.
Repeat the above steps to set the IP address of the Sailor01-CentERdata.
Testing on the Captain-CentERdata

```
ping 192.168.0.10 -c 4
```

ping is the command to test the connection of two IP addresses.
192.168.0.10 is the IP address of the Sailor01-CentERdata.
"-c 4" means transmitting 4 packets, and then stops automatically (otherwise, you need to press "Ctrl+X" to stop).

```
hduser@Captain-CentERdata: ~
hduser@Captain-CentERdata:~$ ping 192.168.0.10 -c 4
PING 192.168.0.10 (192.168.0.10) 56(84) bytes of data.
64 bytes from 192.168.0.10: icmp_seq=1 ttl=64 time=1.12 ms
64 bytes from 192.168.0.10: icmp_seq=2 ttl=64 time=0.561 ms
64 bytes from 192.168.0.10: icmp_seq=3 ttl=64 time=0.604 ms
64 bytes from 192.168.0.10: icmp_seq=4 ttl=64 time=0.306 ms

--- 192.168.0.10 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3001ms
rtt min/avg/max/mdev = 0.306/0.647/1.120/0.297 ms
hduser@Captain-CentERdata:~$
```

- **Enable password-free SSH between two computers:**

Turn off the Firewall on each computer using the following command:

```
sudo ufw disable
```

Check whether the Firewall is disabled successfully:

```
sudo ufw status
```

```
hduser@Captain-CentERdata: ~
hduser@Captain-CentERdata:~$ sudo ufw status
[sudo] password for hduser:
Status: inactive
hduser@Captain-CentERdata:~$
```

It shows that the status of the Firewall is inactive, therefore the Firewall is disabled successfully.

Mapping the IP addresses with the computer names:

On the Captain-CentERdata, edit the file "/etc/hosts" using the following command:

```
sudo gedit /etc/hosts
```

Put the following content of "/etc/hosts" as follows:

```
127.0.0.1    localhost

192.168.0.2   Captain-CentERdata
192.168.0.10  Sailor01-CentERdata
```

Copy the file "/etc/hosts" to Sailor01-CentERdata using the following command:

```
sudo scp /etc/hosts hduser@192.168.0.10:/etc/hosts
```

Test whether Captain-CentERdata can recognize Sailor01-CentERdata by running the following command:

```
ping Sailor01-CentERdata -c 4
```

Exchange keys between computers by running the following commands only on Captain-CentERdata

```
ssh-keygen -t rsa -P '' -f ~/.ssh/id_rsa
ssh-copy-id -i ~/.ssh/id_rsa.pub hduser@Captain-CentERdata
```

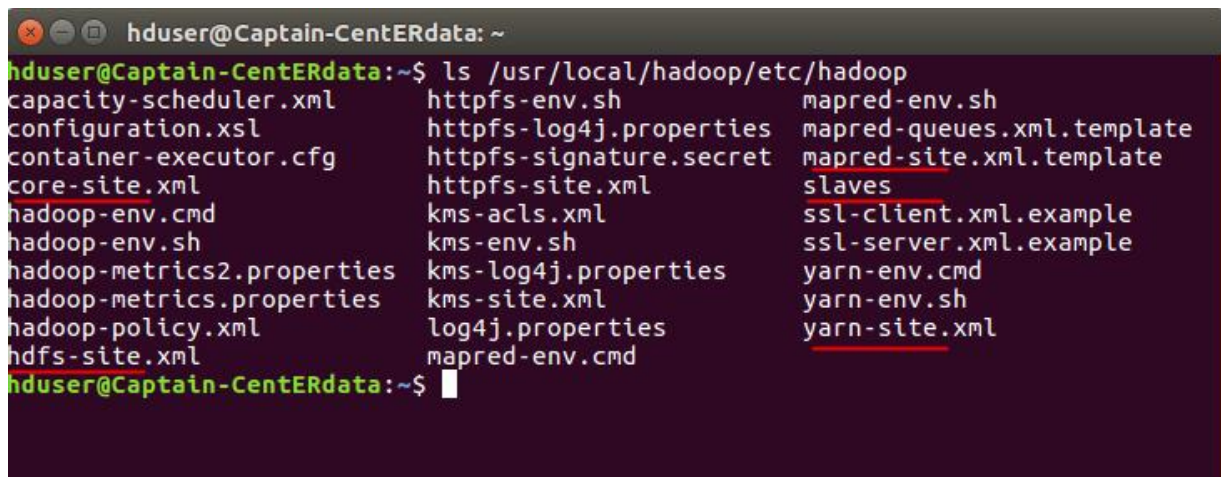


```
ssh-copy-id -i ~/.ssh/id_rsa.pub hduser@Sailor01-CentERdata
chmod 0600 ~/.ssh/authorized_keys
exit
```

- **Configuring the Hadoop files on Captain-CentERdata:**

There are totally 4 files to be configured: core-site.xml, hdfs-site.xml, mapred-site.xml, yarn-site.xml. All these files are in the directory of "/usr/local/hadoop/etc/hadoop".

```
ls /usr/local/hadoop/etc/hadoop # Display the content
```

A terminal window titled 'hduser@Captain-CentERdata: ~' shows the command 'ls /usr/local/hadoop/etc/hadoop' being executed. The output lists various Hadoop configuration files and scripts in three columns. The files include capacity-scheduler.xml, configuration.xml, container-executor.cfg, core-site.xml, hadoop-env.cmd, hadoop-env.sh, hadoop-metrics2.properties, hadoop-metrics.properties, hadoop-policy.xml, hdfs-site.xml, httpfs-env.sh, httpfs-log4j.properties, httpfs-signature.secret, httpfs-site.xml, kms-acls.xml, kms-env.sh, kms-log4j.properties, kms-site.xml, log4j.properties, mapred-env.cmd, mapred-env.sh, mapred-queues.xml.template, mapred-site.xml.template, slaves, ssl-client.xml.example, ssl-server.xml.example, yarn-env.cmd, yarn-env.sh, and yarn-site.xml. The prompt 'hduser@Captain-CentERdata:~\$' is visible at the bottom.

core-site.xml

```
sudo gedit /usr/local/hadoop/etc/hadoop/core-site.xml
```

The content of **core-site.xml** is as follows:

```
<configuration>
  <property>
    <name>fs.defaultFS</name>
    <value>hdfs://Captain-CentERdata:9000</value>
  </property>
  <property>
    <name>hadoop.tmp.dir</name>
    <value>file:/home/hduser/hdtmp</value>
    <description>Abase for other temporary directories.</description>
  </property>
</configuration>
```

hdfs-site.xml

```
sudo gedit /usr/local/hadoop/etc/hadoop/hdfs-site.xml
```

The content of **hdfs-site.xml** is as follows:

```
<configuration>
  <property>
    <name>dfs.namenode.secondary.http-address</name>
    <value>Captain-CentERdata:50090</value>
  </property>
  <property>
    <name>dfs.replication</name>
```

```

        <value>1</value>
    </property>
    <property>
        <name>dfs.namenode.name.dir</name>
        <value>file:/home/hduser/hdtmp/dfs/name</value>
    </property>
    <property>
        <name>dfs.datanode.data.dir</name>
        <value>file:/home/hduser/hdtmp/dfs/data</value>
    </property>
</configuration>

```

mapred-site.xml

```

sudo cp /usr/local/hadoop/etc/hadoop/mapred-site.xml.template /usr/
local/hadoop/etc/hadoop/mapred-site.xml
sudo gedit /usr/local/hadoop/etc/hadoop/mapred-site.xml

```

The content of **mapred-site.xml** is as follows:

```

<configuration>
    <property>
        <name>mapreduce.framework.name</name>
        <value>yarn</value>
    </property>
    <property>
        <name>mapreduce.jobhistory.address</name>
        <value>Captain-CentERdata:10020</value>
    </property>
    <property>
        <name>mapreduce.jobhistory.webapp.address</name>
        <value>Captain-CentERdata:19888</value>
    </property>
    <property>
        <name>mapreduce.job.ubertask.enable</name>
        <value>true</value>
    </property>
</configuration>

```

yarn-site.xml

```

sudo gedit /usr/local/hadoop/etc/hadoop/yarn-site.xml

```

The content of **yarn-site.xml** is as follows:

```

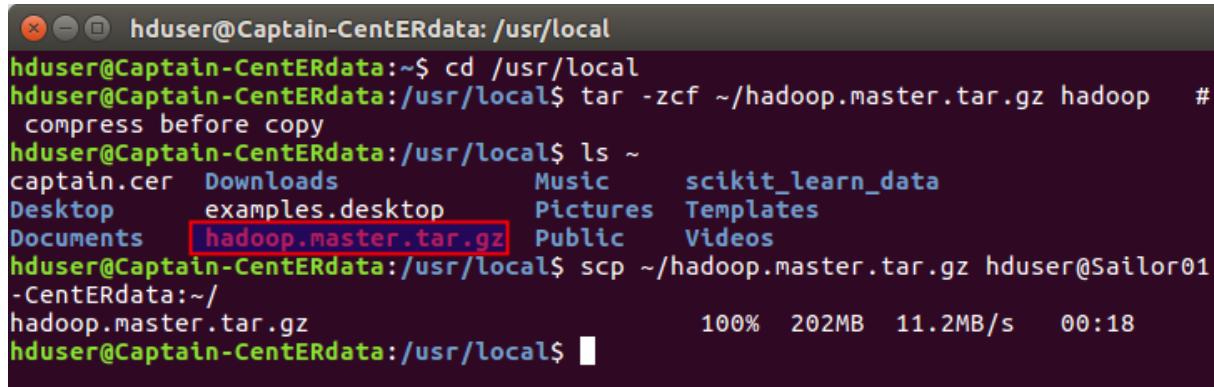
<configuration>
    <property>
        <name>yarn.resourcemanager.hostname</name>
        <value>Captain-CentERdata</value>
    </property>
    <property>
        <name>yarn.nodemanager.aux-services</name>
        <value>mapreduce_shuffle</value>
    </property>
</configuration>

```

- Copy the Hadoop configuration files from Captain-CentERdata to other computers (e.g. Sailor01-CentERdata):

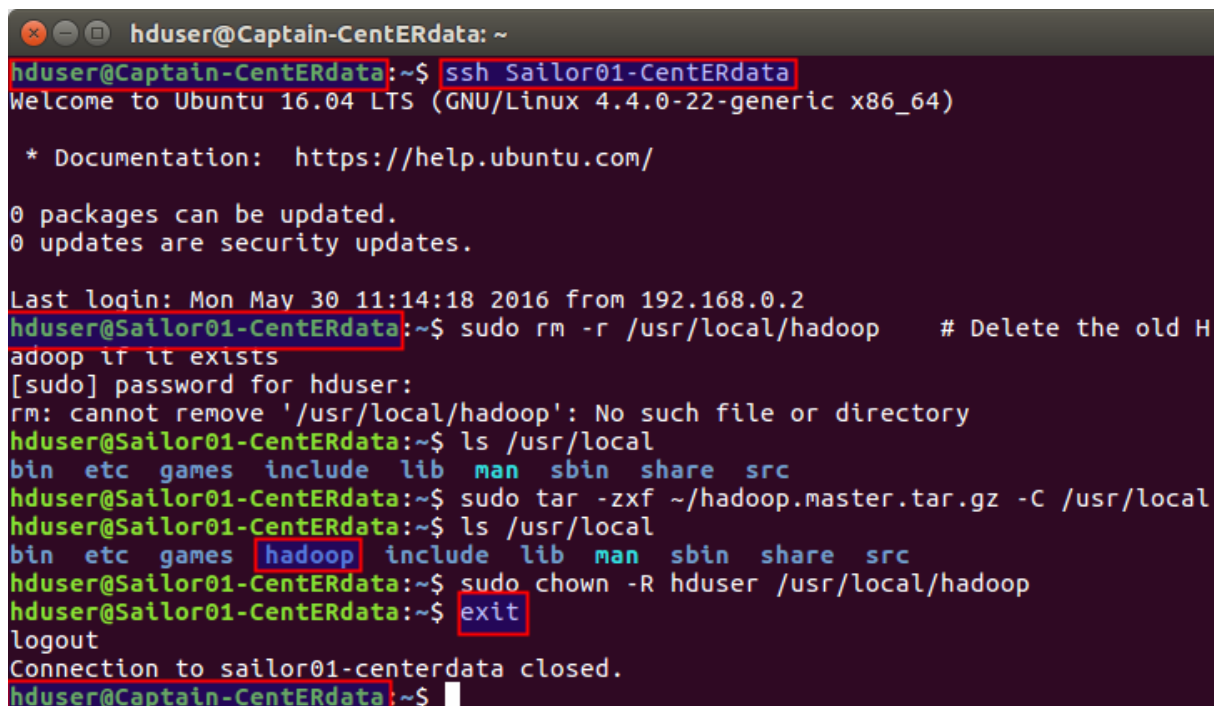
Run the following command on the Captain-CentERdata:

```
cd /usr/local
tar -zcf ~/hadoop.master.tar.gz hadoop # compress before copy
scp ~/hadoop.master.tar.gz hduser@Sailor01-CentERdata:~/
```



```
hduser@Captain-CentERdata: /usr/local
hduser@Captain-CentERdata:~$ cd /usr/local
hduser@Captain-CentERdata:/usr/local$ tar -zcf ~/hadoop.master.tar.gz hadoop #
compress before copy
hduser@Captain-CentERdata:/usr/local$ ls ~
captain.cer Downloads Music scikit_learn_data
Desktop examples.desktop Pictures Templates
Documents hadoop.master.tar.gz Public Videos
hduser@Captain-CentERdata:/usr/local$ scp ~/hadoop.master.tar.gz hduser@Sailor01
-CentERdata:~/
hadoop.master.tar.gz 100% 202MB 11.2MB/s 00:18
hduser@Captain-CentERdata:/usr/local$
```

```
ssh Sailor01-CentERdata
sudo rm -r /usr/local/hadoop # Delete the old Hadoop if it exists
sudo tar -zxf ~/hadoop.master.tar.gz -C /usr/local
# -z(--gzip);-x(--extract);-f(--file);-C(--directory)
sudo chown -R hduser /usr/local/hadoop # -R(--recursively)
exit
```



```
hduser@Captain-CentERdata: ~
hduser@Captain-CentERdata:~$ ssh Sailor01-CentERdata
Welcome to Ubuntu 16.04 LTS (GNU/Linux 4.4.0-22-generic x86_64)

* Documentation: https://help.ubuntu.com/

0 packages can be updated.
0 updates are security updates.

Last login: Mon May 30 11:14:18 2016 from 192.168.0.2
hduser@Sailor01-CentERdata:~$ sudo rm -r /usr/local/hadoop # Delete the old H
adoop if it exists
[sudo] password for hduser:
rm: cannot remove '/usr/local/hadoop': No such file or directory
hduser@Sailor01-CentERdata:~$ ls /usr/local
bin etc games include lib man sbin share src
hduser@Sailor01-CentERdata:~$ sudo tar -zxf ~/hadoop.master.tar.gz -C /usr/local
hduser@Sailor01-CentERdata:~$ ls /usr/local
bin etc games hadoop include lib man sbin share src
hduser@Sailor01-CentERdata:~$ sudo chown -R hduser /usr/local/hadoop
hduser@Sailor01-CentERdata:~$ exit
logout
Connection to sailor01-centerdata closed.
hduser@Captain-CentERdata:~$
```

- **Run the Hadoop:**

Run the following command on the Captain-CentERdata:

Set the slaves and masters (Only on Captain-CentERdata)

slaves

```
sudo gedit /usr/local/hadoop/etc/hadoop/slaves
```

The content of slaves is as follows:

Sailor01-CentERdata

masters

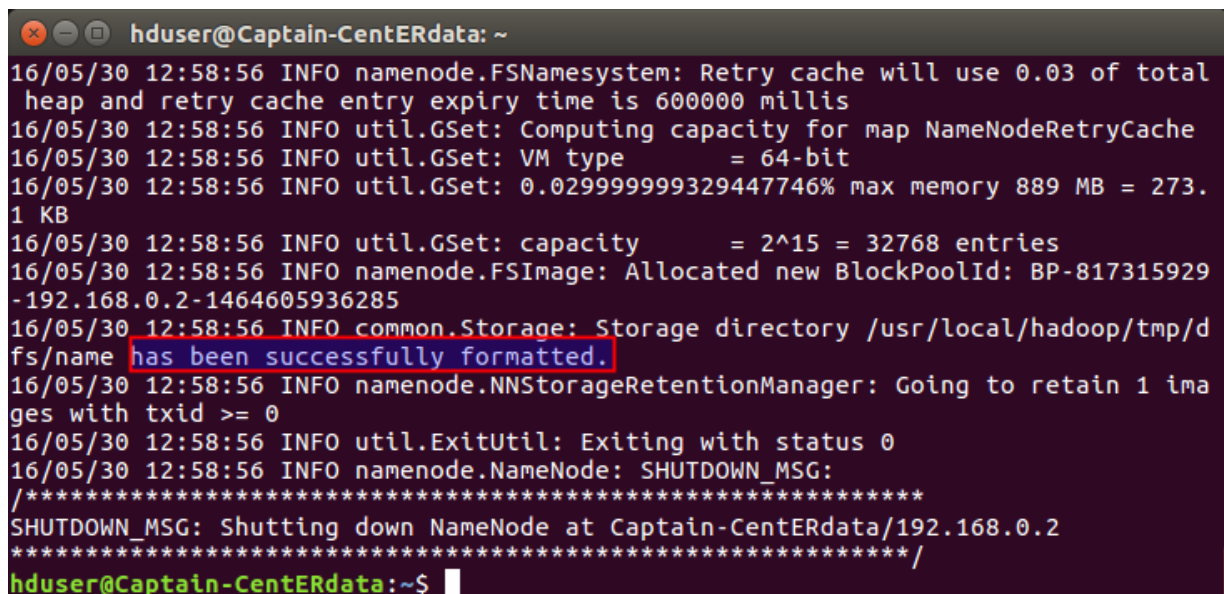
```
sudo gedit /usr/local/hadoop/etc/hadoop/masters
```

The content of masters is as follows:

Captain-CentERdata

Format the name node

```
hdfs namenode -format # This command is need to be run only once.
```



A terminal window titled 'hduser@Captain-CentERdata: ~' displays the output of the 'hdfs namenode -format' command. The output consists of several informational messages from the Hadoop NameNode, including details about the retry cache, GSet capacity, VM type, and the allocation of a new BlockPoolId. The key message, 'fs/name has been successfully formatted.', is highlighted with a red box. The terminal concludes with a 'SHUTDOWN_MSG' indicating the NameNode is shutting down at the specified IP address. The prompt 'hduser@Captain-CentERdata:~\$' is visible at the bottom.

```
16/05/30 12:58:56 INFO namenode.FSNamesystem: Retry cache will use 0.03 of total
heap and retry cache entry expiry time is 600000 millis
16/05/30 12:58:56 INFO util.GSet: Computing capacity for map NameNodeRetryCache
16/05/30 12:58:56 INFO util.GSet: VM type          = 64-bit
16/05/30 12:58:56 INFO util.GSet: 0.029999999329447746% max memory 889 MB = 273.
1 KB
16/05/30 12:58:56 INFO util.GSet: capacity          = 2^15 = 32768 entries
16/05/30 12:58:56 INFO namenode.FSImage: Allocated new BlockPoolId: BP-817315929
-192.168.0.2-1464605936285
16/05/30 12:58:56 INFO common.Storage: Storage directory /usr/local/hadoop/tmp/d
fs/name has been successfully formatted.
16/05/30 12:58:56 INFO namenode.NNStorageRetentionManager: Going to retain 1 ima
ges with txid >= 0
16/05/30 12:58:56 INFO util.ExitUtil: Exiting with status 0
16/05/30 12:58:56 INFO namenode.NameNode: SHUTDOWN_MSG:
/*****
SHUTDOWN_MSG: Shutting down NameNode at Captain-CentERdata/192.168.0.2
*****/
hduser@Captain-CentERdata:~$
```

Start dfs and yarn

```
start-dfs.sh && start-yarn.sh
hadoop-daemon.sh start datanode # start datanode
mr-jobhistory-daemon.sh start historyserver
```

Use the following command to see the process:

```
jps
```

```

hduser@Captain-CentERdata: ~
hduser@Captain-CentERdata:~$ start-dfs.sh
Starting namenodes on [Captain-CentERdata]
Captain-CentERdata: starting namenode, logging to /usr/local/hadoop/logs/hadoop-
hduser-namenode-Captain-CentERdata.out
Sailor01-CentERdata: starting datanode, logging to /usr/local/hadoop/logs/hadoop
-hduser-datanode-Sailor01-CentERdata.out
Starting secondary namenodes [Captain-CentERdata]
Captain-CentERdata: starting secondarynamenode, logging to /usr/local/hadoop/log
s/hadoop-hduser-secondarynamenode-Captain-CentERdata.out
hduser@Captain-CentERdata:~$ start-yarn.sh
starting yarn daemons
starting resourcemanager, logging to /usr/local/hadoop/logs/yarn-hduser-resource
manager-Captain-CentERdata.out
Sailor01-CentERdata: starting nodemanager, logging to /usr/local/hadoop/logs/yar
n-hduser-nodemanager-Sailor01-CentERdata.out
hduser@Captain-CentERdata:~$ mr-jobhistory-daemon.sh start historyserver
starting historyserver, logging to /usr/local/hadoop/logs/mapred-hduser-historys
erver-Captain-CentERdata.out
hduser@Captain-CentERdata:~$ jps
7203 Jps
6680 SecondaryNameNode
7160 JobHistoryServer
6873 ResourceManager
6492 NameNode
hduser@Captain-CentERdata:~$

```

Use the following command to see whether all the DataNode is running properly:

```
hdfs dfsadmin -report
```

```

hduser@Captain-CentERdata: ~
hduser@Captain-CentERdata:~$ hdfs dfsadmin -report
Configured Capacity: 488030355456 (454.51 GB)
Present Capacity: 457653862400 (426.22 GB)
DFS Remaining: 457653837824 (426.22 GB)
DFS Used: 24576 (24 KB)
DFS Used%: 0.00%
Under replicated blocks: 0
Blocks with corrupt replicas: 0
Missing blocks: 0
Missing blocks (with replication factor 1): 0

-----
Live datanodes (1):

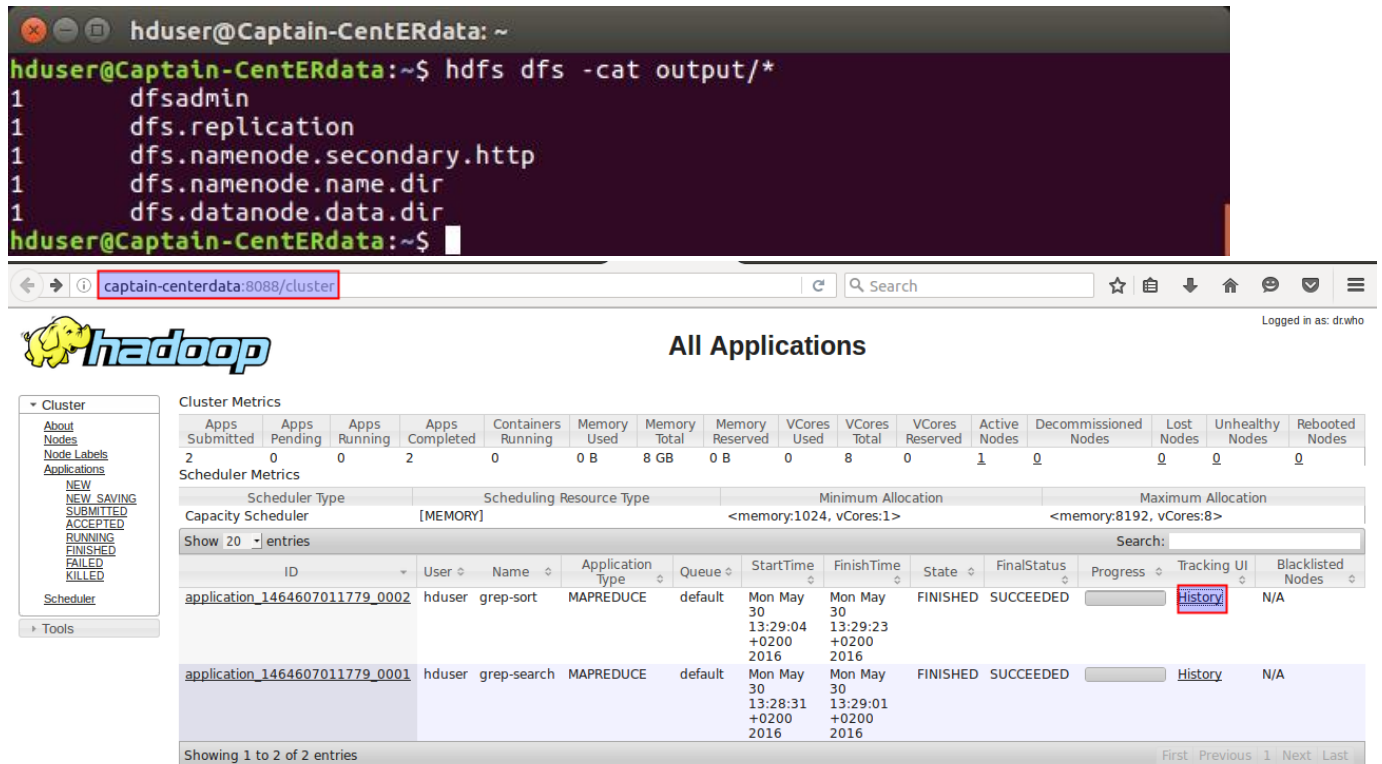
Name: 192.168.0.10:50010 (Sailor01-CentERdata)
Hostname: Sailor01-CentERdata
Decommission Status : Normal
Configured Capacity: 488030355456 (454.51 GB)
DFS Used: 24576 (24 KB)
Non DFS Used: 30376493056 (28.29 GB)
DFS Remaining: 457653837824 (426.22 GB)
DFS Used%: 0.00%
DFS Remaining%: 93.78%
Configured Cache Capacity: 0 (0 B)
Cache Used: 0 (0 B)
Cache Remaining: 0 (0 B)
Cache Used%: 100.00%
Cache Remaining%: 0.00%
Xceivers: 1

```

- Examples-grep:

```
hdfs dfs -mkdir -p input
```

```
hdfs dfs -put /usr/local/hadoop/etc/hadoop/*.xml input
hdfs dfs -ls input
hadoop jar /usr/
local/hadoop/share/hadoop/mapreduce/hadoop-mapreduce-examples-*.jar grep input output '
dfs[a-z.]+'
hdfs dfs -cat output/*
```



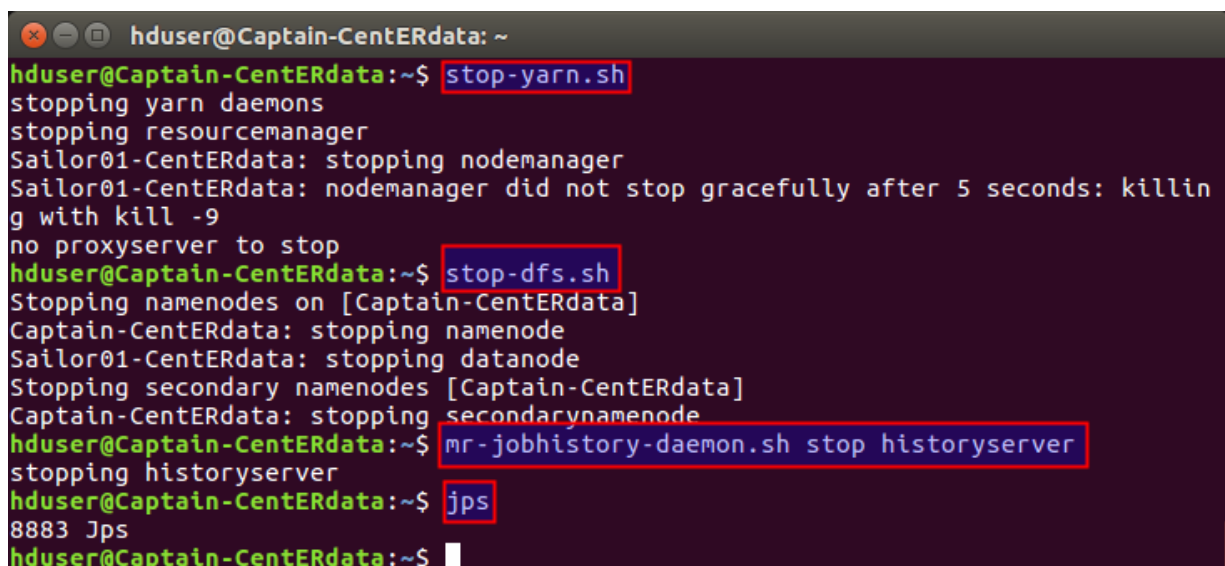
The screenshot shows a terminal window with the command `hdfs dfs -cat output/*` being executed. The output shows the contents of the `output` directory, including `dfsadmin`, `dfs.replication`, `dfs.namenode.secondary.http`, `dfs.namenode.name.dir`, and `dfs.datanode.data.dir`.

Below the terminal is the Hadoop web interface, specifically the 'All Applications' page. The page shows a table of running applications. The table has columns for ID, User, Name, Application Type, Queue, Start Time, Finish Time, State, Final Status, Progress, Tracking UI, and Blacklisted Nodes. Two applications are listed:

ID	User	Name	Application Type	Queue	Start Time	Finish Time	State	Final Status	Progress	Tracking UI	Blacklisted Nodes
application_1464607011779_0002	hduser	grep-sort	MAPREDUCE	default	Mon May 30 13:29:04 +0200 2016	Mon May 30 13:29:23 +0200 2016	FINISHED	SUCCEEDED		History	N/A
application_1464607011779_0001	hduser	grep-search	MAPREDUCE	default	Mon May 30 13:28:31 +0200 2016	Mon May 30 13:29:01 +0200 2016	FINISHED	SUCCEEDED		History	N/A

- Close the Hadoop cluster:

```
stop-yarn.sh && stop-dfs.sh
mr-jobhistory-daemon.sh stop historyserver
```



The screenshot shows a terminal window with the following commands and output:

```
hduser@Captain-CentERdata: ~$ stop-yarn.sh
stopping yarn daemons
stopping resourcemanager
Sailor01-CentERdata: stopping nodemanager
Sailor01-CentERdata: nodemanager did not stop gracefully after 5 seconds: killing with kill -9
no proxyserver to stop
hduser@Captain-CentERdata: ~$ stop-dfs.sh
Stopping namenodes on [Captain-CentERdata]
Captain-CentERdata: stopping namenode
Sailor01-CentERdata: stopping datanode
Stopping secondary namenodes [Captain-CentERdata]
Captain-CentERdata: stopping secondarynamenode
hduser@Captain-CentERdata: ~$ mr-jobhistory-daemon.sh stop historyserver
stopping historyserver
hduser@Captain-CentERdata: ~$ jps
8883 Jps
hduser@Captain-CentERdata: ~$
```

For more examples, please go to [Hadoop examples](#)

Trouble shoot

Problem: Name node is in safe mode. Can not delete /user/hduser/grep-temp

```
hdfs dfsadmin -safemode leave # Force the namenode to leave safe mode
hdfs fsck # Sort out any inconsistencies crept in the hdfs
```

Problem: sign_and_send_pubkey: signing failed: agent refused operation

Cause: package **ssh** does not support well the function "ssh-copy-id"

Solution: remove **ssh**, install **openssh-server**, clean the residual packages

```
sudo apt-get remove ssh # Remove ssh
sudo apt-get install openssh-server # Install openssh-server
sudo apt autoremove
# Remove packages that were automatically installed to satisfy dependencies for some package and that are no more needed.
sudo apt autoclean # Clear out the local repository of retrieved package files.
sudo reboot
```

Problem: Configured Capacity: 0 (0 B)

Cause: DataNode can not be activated

Solution: delete the folder `"/home/hduser/hdtmp/dfs/data/"` on each machine

```
stop-dfs.sh && stop-yarn.sh # Stop Hadoop # First stop the cluster
sudo rm -r -f /home/hduser/hdtmp/dfs/data/
# Delete the folder "/home/hduser/hdtmp/dfs/data/", please note that this command should run all machines.
start-dfs.sh && start-yarn.sh # Start Hadoop
jps # Check the nodes to see whether DataNode is activated
```

Problem: Captain-CentERdata:9000 failed on connection exception

Cause: `/home/hduser/hdtmp/dfs/name` in the Master machine has been destroyed.

Solution:

```
stop-dfs.sh && stop-yarn.sh # Stop Hadoop # First stop the cluster
hdfs namenode -format # Format the name node. This command is need to be run only once.
start-dfs.sh && start-yarn.sh # Start Hadoop
hdfs dfsadmin -report # Report Hadoop
```

Problem: When running "hdfs dfsadmin -report", get error "9000 failed on connection exception"

Solution: on the following command on Captain-CentERdata

```
sudo chown -R hduser /usr/local/hadoop
```

Problem: datanode crashes

Solution: restart datanode

```
hadoop-daemon.sh start datanode
```

Reference

1. https://www.tutorialspoint.com/hadoop/hadoop_multi_node_cluster.htm
2. <http://www.powerxing.com/install-hadoop-cluster/>
3. <http://www.michael-noll.com/tutorials/running-hadoop-on-ubuntu-linux-multi-node-cluster/>
4. <https://chawlasumit.wordpress.com/2015/03/09/install-a-multi-node-hadoop-cluster-on-ubuntu-14-04/>
5. <http://fibrevillage.com/mobile/storage/628-how-to-add-a-new-datanode-to-a-running-hadoop-cluster>
6. <http://doctuts.readthedocs.io/en/latest/hadoop.html>
7. <https://tecadmin.net/set-up-hadoop-multi-node-cluster-on-centos-redhat/#>
8. <http://arturmkrtyan.com/how-to-setup-multi-node-hadoop-2-yarn-cluster>
9. <http://www.quuxlabs.com/tutorials/running-hadoop-on-ubuntu-linux-multi-node-cluster/>
10. <http://pingax.com/install-apache-hadoop-ubuntu-cluster-setup/>

Files

ComputerName.png	10.8 KB	05/22/2016	Kai-Tao Yang
ComputerNameNew.png	11.7 KB	05/22/2016	Kai-Tao Yang
Computer-connection-router.jpg	121 KB	05/25/2016	Kai-Tao Yang
network-add.png	15.8 KB	05/29/2016	Kai-Tao Yang
network-eth0.png	36.2 KB	05/29/2016	Kai-Tao Yang
network-captain.png	44.3 KB	05/29/2016	Kai-Tao Yang
network-captain-success.png	42.8 KB	05/29/2016	Kai-Tao Yang
network-add-ethernet.png	22.5 KB	05/29/2016	Kai-Tao Yang
network-ping-from-captain.png	53.2 KB	05/29/2016	Kai-Tao Yang
network-find-app.png	139 KB	05/29/2016	Kai-Tao Yang
firewall-inactive.png	17.7 KB	05/29/2016	Kai-Tao Yang
Hadoop-5-files.png	51.7 KB	05/30/2016	Kai-Tao Yang
Hadoop-compress-scp.png	55.1 KB	05/30/2016	Kai-Tao Yang
Hadoop-access-Sailor01.png	84.3 KB	05/30/2016	Kai-Tao Yang
Hadoop-format-successful.png	84.5 KB	05/30/2016	Kai-Tao Yang
Hadoop-start.png	91.2 KB	05/30/2016	Kai-Tao Yang
Hadoop-report.png	101 KB	05/30/2016	Kai-Tao Yang
Hadoop-stop.png	63.6 KB	05/30/2016	Kai-Tao Yang
Hadoop-output.png	26 KB	05/30/2016	Kai-Tao Yang
Hadoop-website.png	101 KB	05/30/2016	Kai-Tao Yang