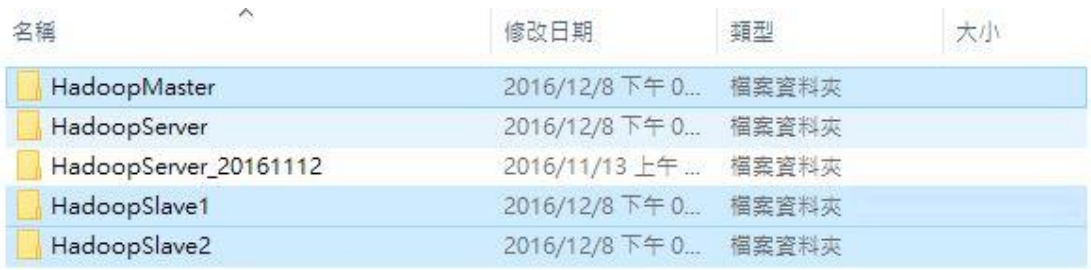
Hadoop Multi Nodes Cluster Setup

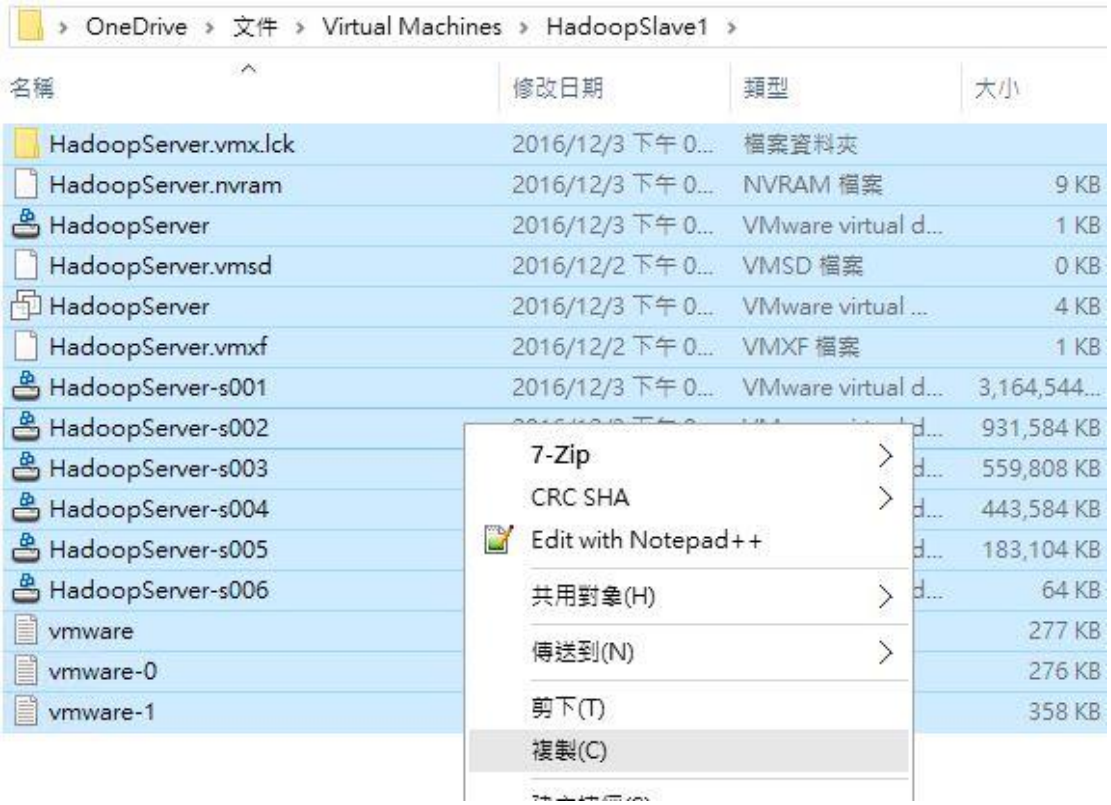
底下步驟將建立一個 Hadoop Multi Nodes Cluster，包含三個 VM

伺服器名稱	類別	HDFS	YARN
HadoopMaster	Master	NameNode	ResourceManager
HadoopSlave1	Node	DataNode	NodeManager
HadoopSlave2	Node	DataNode	NodeManager

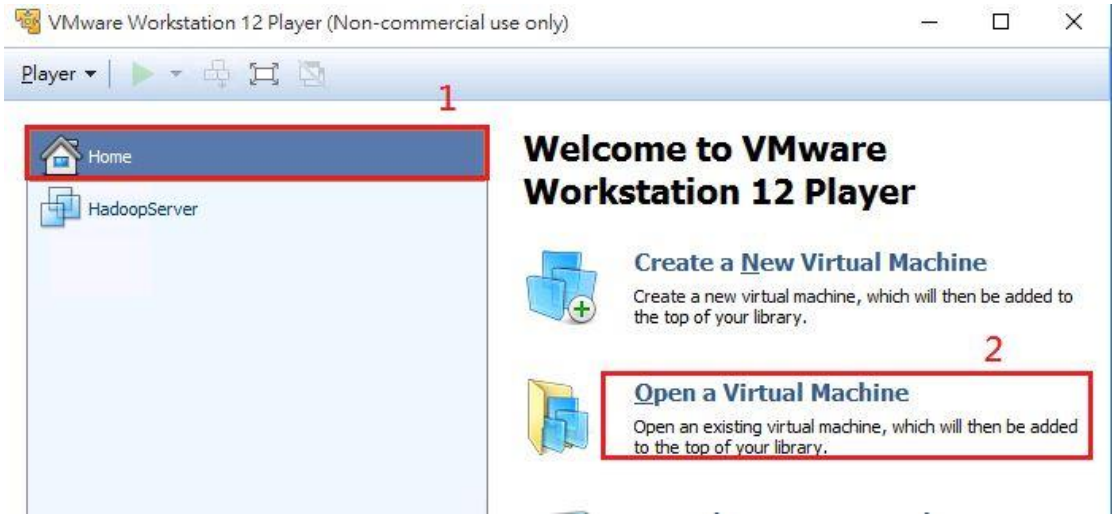
1. 複製 single node cluster 到 hadoopslave1
   - 若下為使用 VMWare 個人版的做法，若為專業版可以非常簡單的複製已存在的 VM
   - 先於 VM 儲存資料夾中建立要放置三個 VM 檔案的資料夾



   - 將之前建好的 single node cluster VM 資料夾中的檔案複製到 HadoopSlave1 中

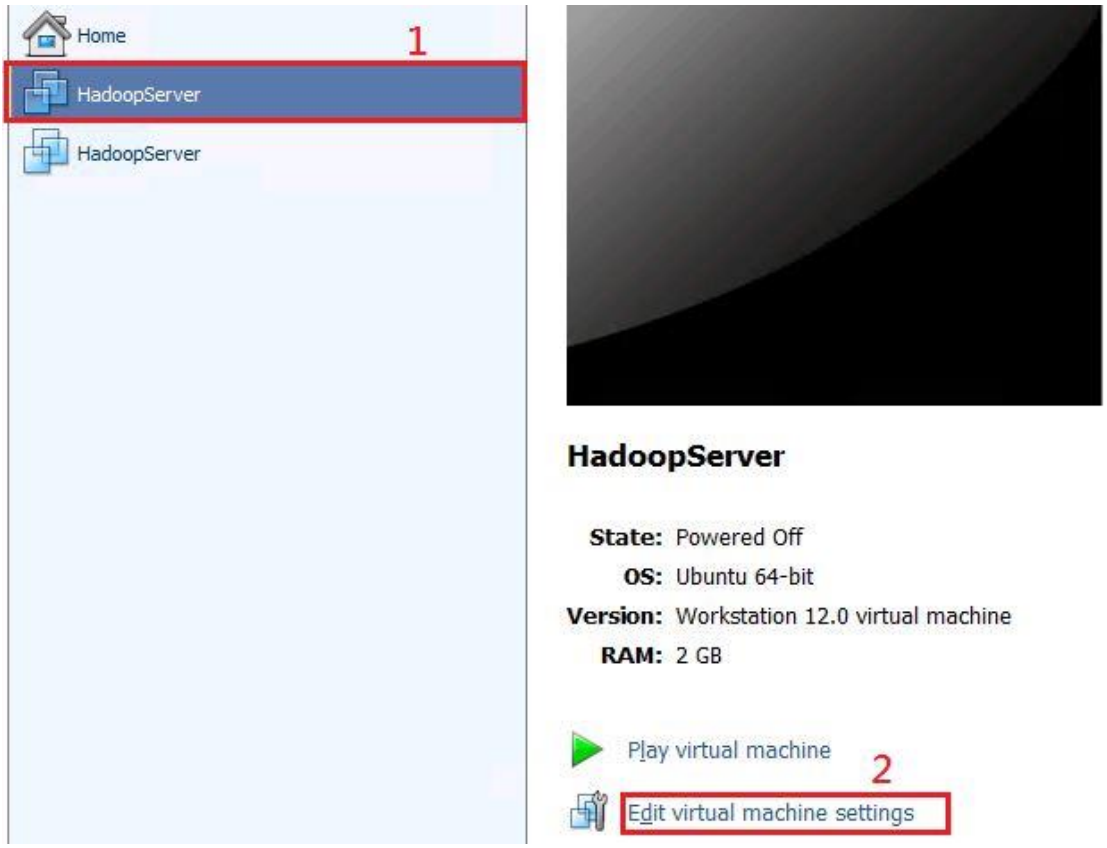


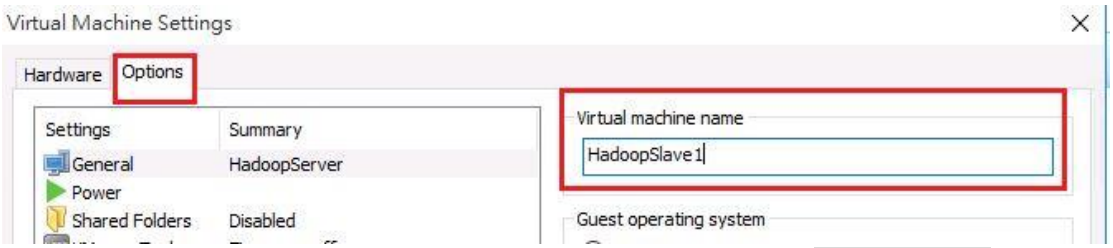
   - 到 VM 介面，選擇 [Home]➔[Open a Virtual Machine]



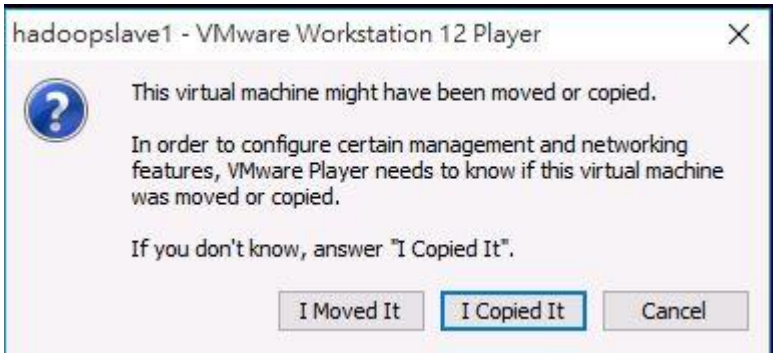
- 到 HadoopSlave1 資料夾選擇 configuration 檔

- 依步驟改變 VM 的名稱

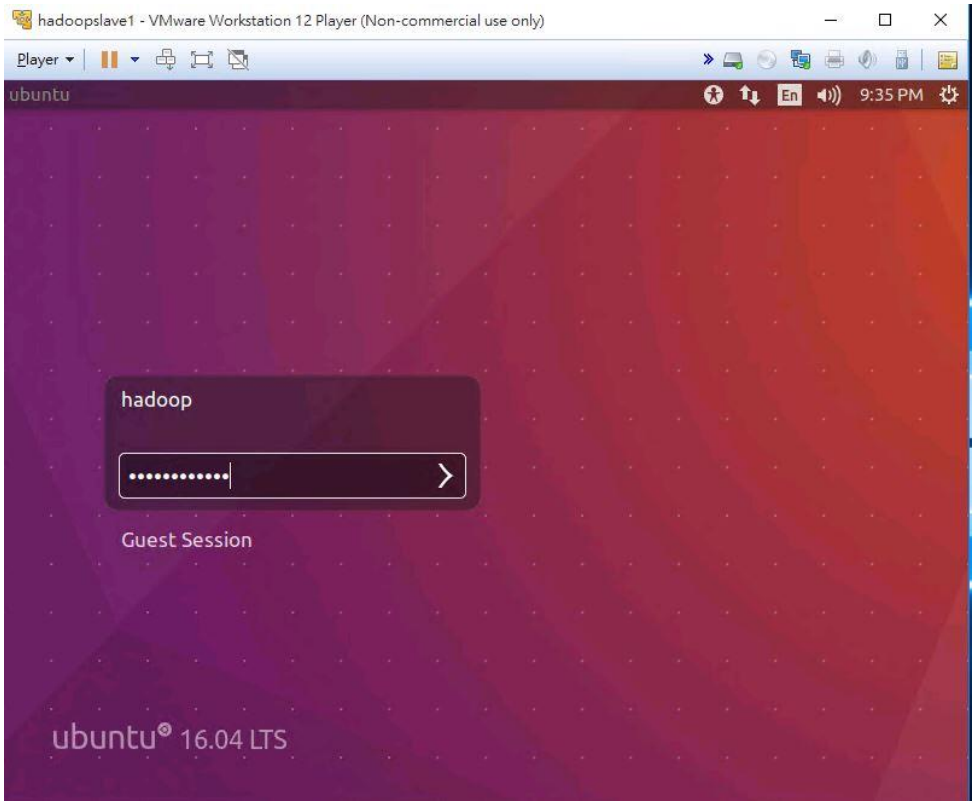




- 啟動 HadoopSlave1，VM 會發現 config 檔有異，選擇 I Copied It

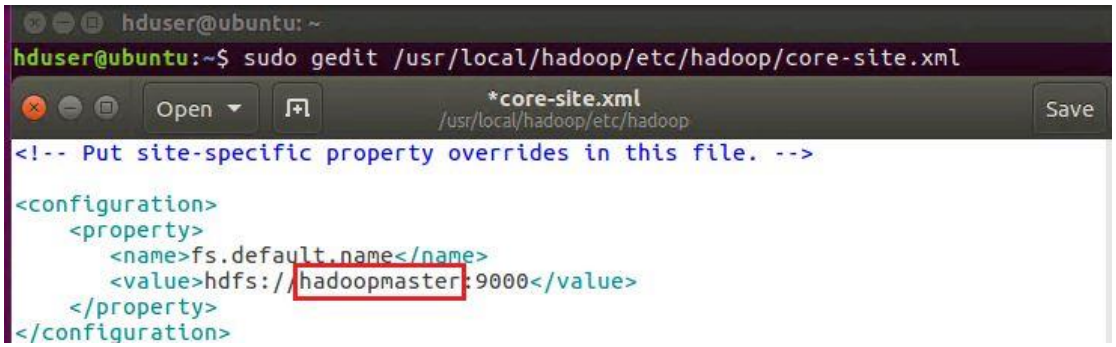


- 即可順利複製完成



2. 設定 HadoopSlave1
   - 啟動 HadoopSlave1 虛擬機
   - 編輯 hostname 主機名稱，執行 sudo gedit /etc/hostname

- 編輯 core-site.xml，執行 `sudo gedit /usr/local/hadoop/etc/hadoop/core-site.xml`，指定 NameNode 位置，將原本設定 localhost 處改為 hadoopmaster



- 編輯 yarn-site.xml，執行 `sudo gedit /usr/local/hadoop/etc/hadoop/yarn-site.xml`，設定 RresourceManager 的屬性，輸入以下指令

```
<property>
      <name>yarn.resourcemanager.resource-tracker.address</name>
      <value>hadoopmaster:8025</value>
</property>
<property>
       <name>yarn.resourcemanager.scheduler.address</name>
       <value>hadoopmaster:8030</value>
</property>
      <property>
            <name>yarn.resourcemanager.address</name>
            <value>hadoopmaster:8050</value>
       </property>
```

```
hduser@ubuntu:~$ sudo gedit /usr/local/hadoop/etc/hadoop/yarn-site.xml
```

Open ▾ *yarn-site.xml /usr/local/hadoop/etc/hadoop Save

```
    <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.ShuffleHandler</value>
    </property>
    <property>
       <name>yarn.resourcemanager.resource-tracker.address</name>
       <value>hadoopmaster:8025</value>
    </property>
    <property>
       <name>yarn.resourcemanager.scheduler.address</name>
       <value>hadoopmaster:8030</value>
    </property>
    <property>
       <name>yarn.resourcemanager.address</name>
       <value>hadoopmaster:8050</value>
    </property>
</configuration>
```

- 編輯 mapred-site.xml，執行 `sudo gedit /usr/local/hadoop/etc/hadoop/mapred-site.xml`，設定監控 MapReduce 的 JobTracker 工作分配狀況，將將原本設定 localhost 處改為 hadoopmaster

```
hduser@ubuntu: ~
hduser@ubuntu:~$ sudo gedit /usr/local/hadoop/etc/hadoop/mapred-site.xml
```

Open ▾ *mapred-site.xml /usr/local/hadoop/etc/hadoop Save

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

<configuration>
    <property>
        <name>mapred.job.tracker</name>
        <value>hadoopmaster:54311</value>
    </property>
</configuration>
```

- 編輯 hdfs-site.xml，執行 `sudo gedit /usr/local/hadoop/etc/hadoop/hdfs-site.xml`，設定 HDFS 分散式檔案組態

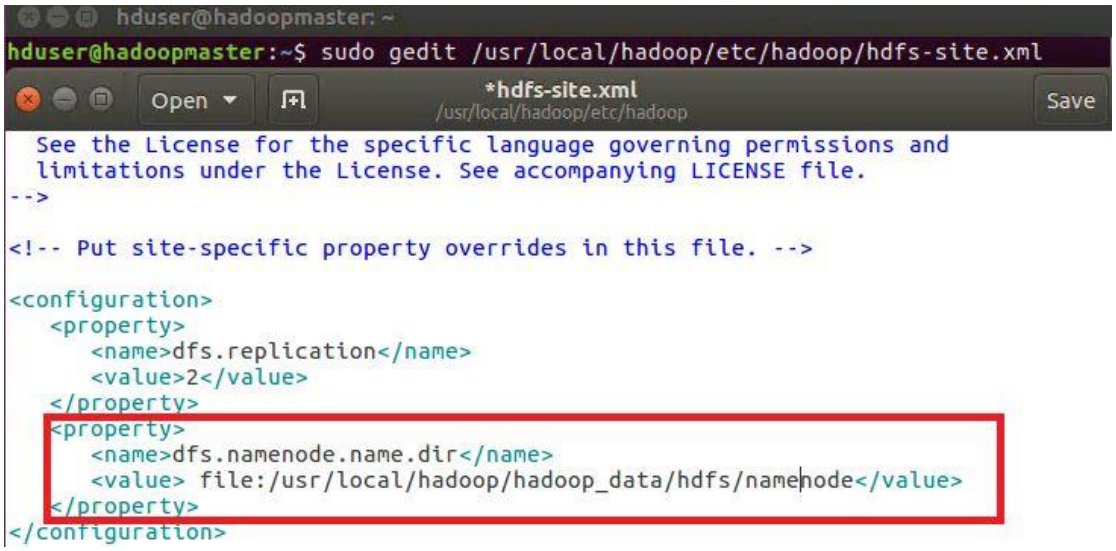
```
hduser@ubuntu:~$ sudo gedit /usr/local/hadoop/etc/hadoop/hdfs-site.xml
```

Open | hdfs-site.xml /usr/local/hadoop/etc/hadoop | Save

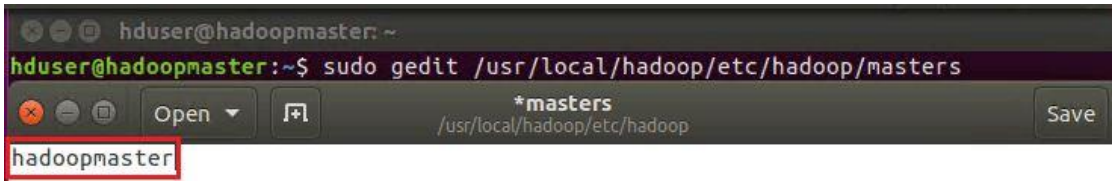
```
<!-- Put site-specific property overrides in this file. -->

<configuration>
   <property>
      <name>dfs.replication</name>
      <value>2</value>
   </property>
   <property>
      <name>dfs.datanode.data.dir</name>
      <value> file:/usr/local/hadoop/hadoop_data/hdfs/datanode</value>
   </property>
</configuration>
```

- 將 HadoopSlave1 關機

3. 複製 HadoopSlave1 的虛擬虛設定檔，來產生 HadoopMaster、HadoopSlave2 等兩台虛擬機，修改 /etc/hostname 內的伺服器名稱分別為 hadoopmaster 和 hadoopslave2，設定完之後，虛擬機需重開。
4. 設定 HadoopMaster 伺服器
   - 編輯 hostname 主機名稱，執行 sudo gedit /etc/hostname，檔案內填入 **hadoopmaster**
   - 重開機 HadoopMaster
   - 編輯 hdfs-site.xml，執行 sudo gedit /usr/local/hadoop/etc/hadoop/hdfs-site.xml，設定 NameNode 資料夾



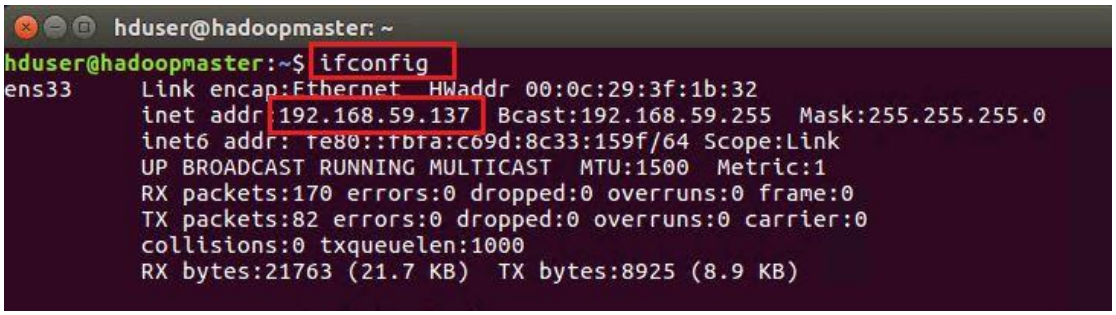
- 編輯 masters，執行 `sudo gedit /usr/local /hadoop/etc/hadoop/masters`，告訴 Hadoop 那一台伺服器為 NameNode



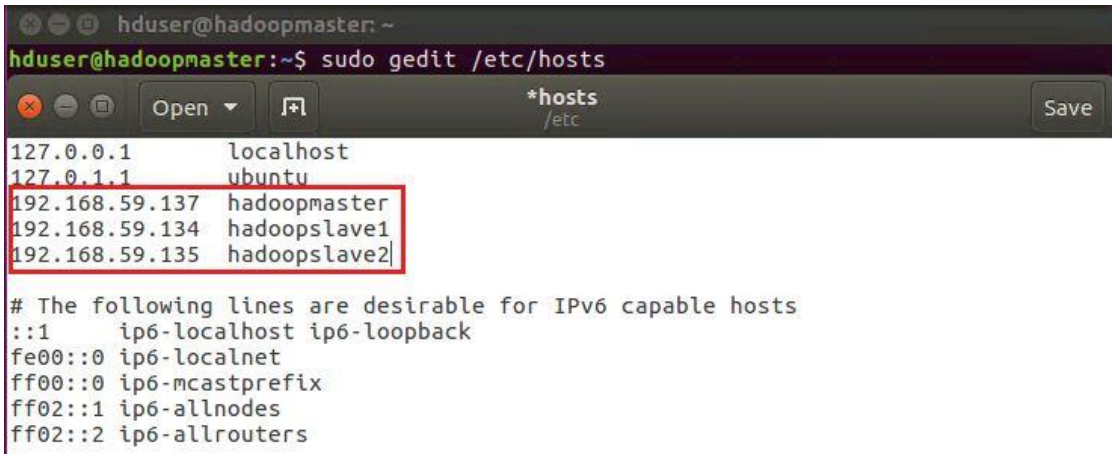
- 編輯 slaves，執行 `sudo gedit /usr/local /hadoop/etc/hadoop/slaves`，告訴 Hadoop 那些伺服器為 DataNode

5. 設定各節點主機名稱和相應的 IP 位址
   - 啟動三台虛擬機

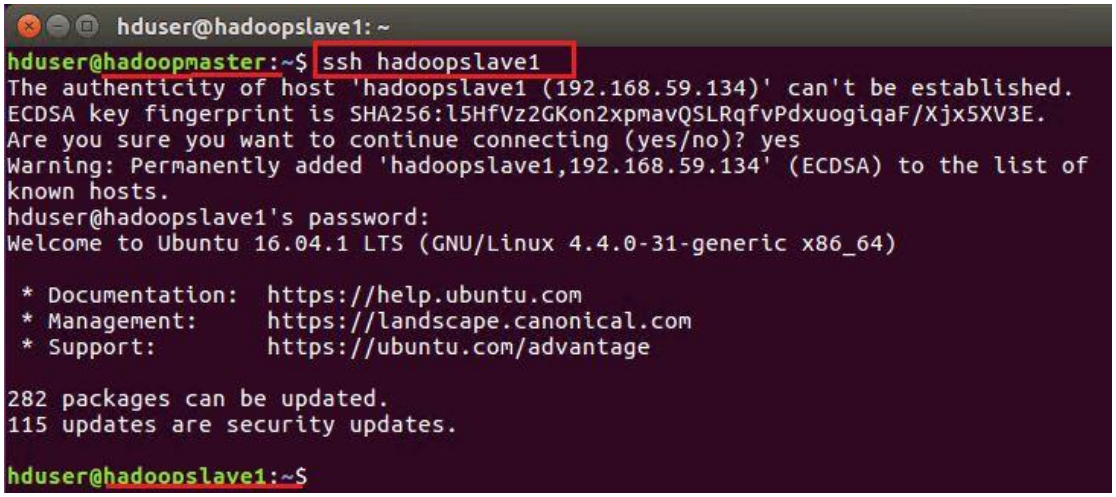
   - 分別至各虛擬機中，執行 `ifconfig`，取得伺服器 IP



- 至各虛擬機中，編輯/etc/hosts，執行 sudo gedit /etc/hosts，將節點主稱和ＩＰ位址填入



6. Master 連線至 slave1、slave2 建立 HDFS 目錄
   - 切換至 HadoopMaster 伺服器
   - 由 HadoopMaster 經過 SSH 連至 HadoopSlave1，執行 ssh hadoopslave1，注意連線成功後會如圖紅線標示

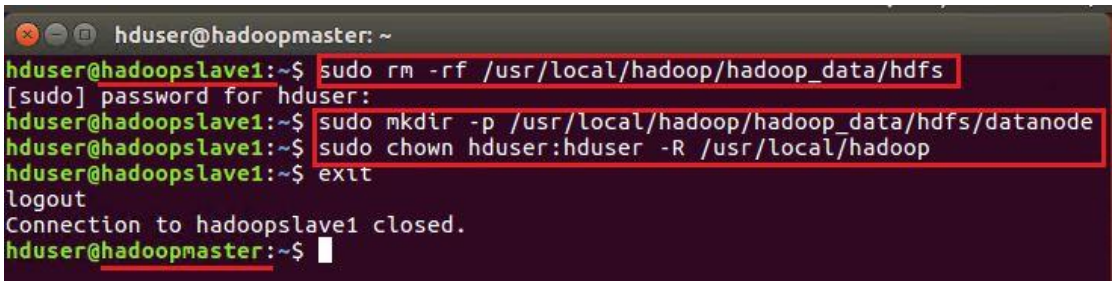


   - 執行
     i. 移除 hdfs 目錄，sudo rm -rf /usr/local/hadoop/hadoop_data/hdfs

ii. 建立 DataNode 儲存目錄，`mkdir -p /usr/local/hadoop/hadoop_data/hdfs/datanode`

iii. 修改目錄擁有者，`sudo chown -R hduser:hduser /usr/local/hadoop/`

iv. 中斷連線

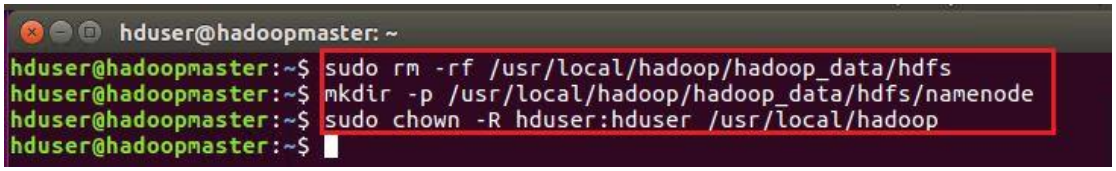


- 重複上述步驟，設定 hadoopslave2
- 建立 NameNode HDFS 目錄

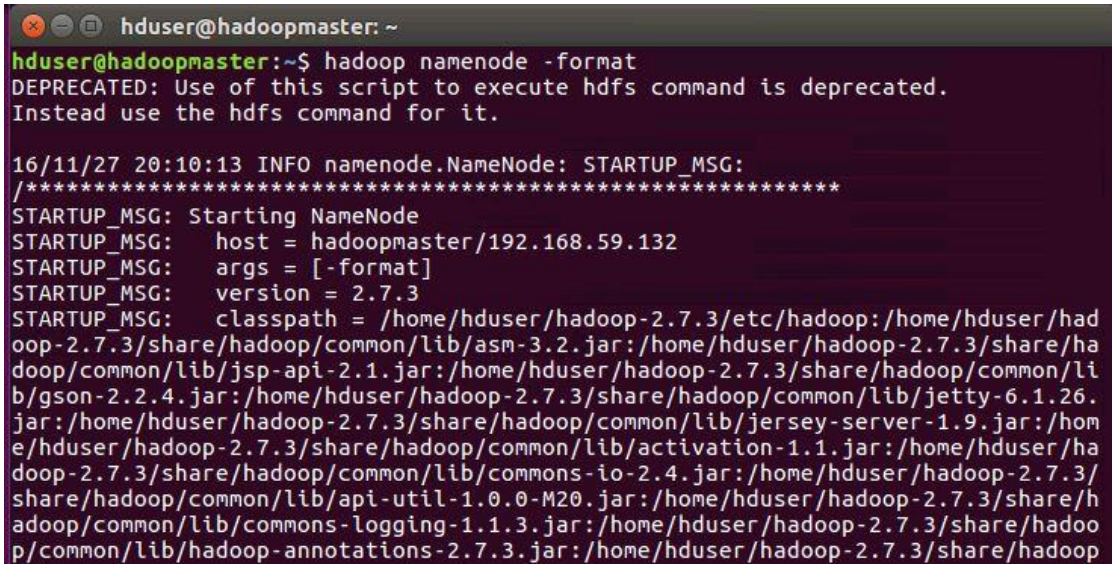
i. 首先刪除 HDFS 目錄，執行 `sudo rm -rf /usr/local/hadoop/hadoop_data/hdfs`

ii. 建立 NameNode 目錄，執行 `mkdir -p /usr/local/hadoop/hadoop_data/hdfs/namenode`

iii. 修改目錄擁有者，`sudo chown -R hduser:hduser /usr/local/hadoop/`



- 格式化 HDFS 目錄，執行 `hadoop namenode -format`



7. 啟動 Hadoop Multi Nodes Cluster

- 切換至 HadoopMaster
- 執行 start-all.sh

```
hduser@hadoopmaster: ~
hduser@hadoopmaster:~$ start-all.sh
This script is Deprecated. Instead use start-dfs.sh and start-yarn.sh
Starting namenodes on [hadoopmaster]
The authenticity of host 'hadoopmaster (192.168.59.137)' can't be established.
ECDSA key fingerprint is SHA256:l5HfVz2GKon2xpmavQSLRqfvPdxuogiqaF/Xjx5XV3E.
Are you sure you want to continue connecting (yes/no)? yes
hadoopmaster: Warning: Permanently added 'hadoopmaster,192.168.59.137' (ECDSA) t
o the list of known hosts.
hadoopmaster: starting namenode, logging to /usr/local/hadoop/logs/hadoop-hduser
-namenode-hadoopmaster.out
hadoopslave2: starting datanode, logging to /usr/local/hadoop/logs/hadoop-hduser
-datanode-hadoopslave2.out
hadoopslave1: starting datanode, logging to /usr/local/hadoop/logs/hadoop-hduser
-datanode-hadoopslave1.out
```

```
starting yarn daemons
starting resourcemanager, logging to /usr/local/hadoop/logs/yarn-hduser-resource
manager-hadoopmaster.out
hadoopslave1: starting nodemanager, logging to /usr/local/hadoop/logs/yarn-hduse
r-nodemanager-hadoopslave1.out
hadoopslave2: starting nodemanager, logging to /usr/local/hadoop/logs/yarn-hduse
r-nodemanager-hadoopslave2.out
```

- 查看 HadoopMaster 所執行的行程，輸入 jps

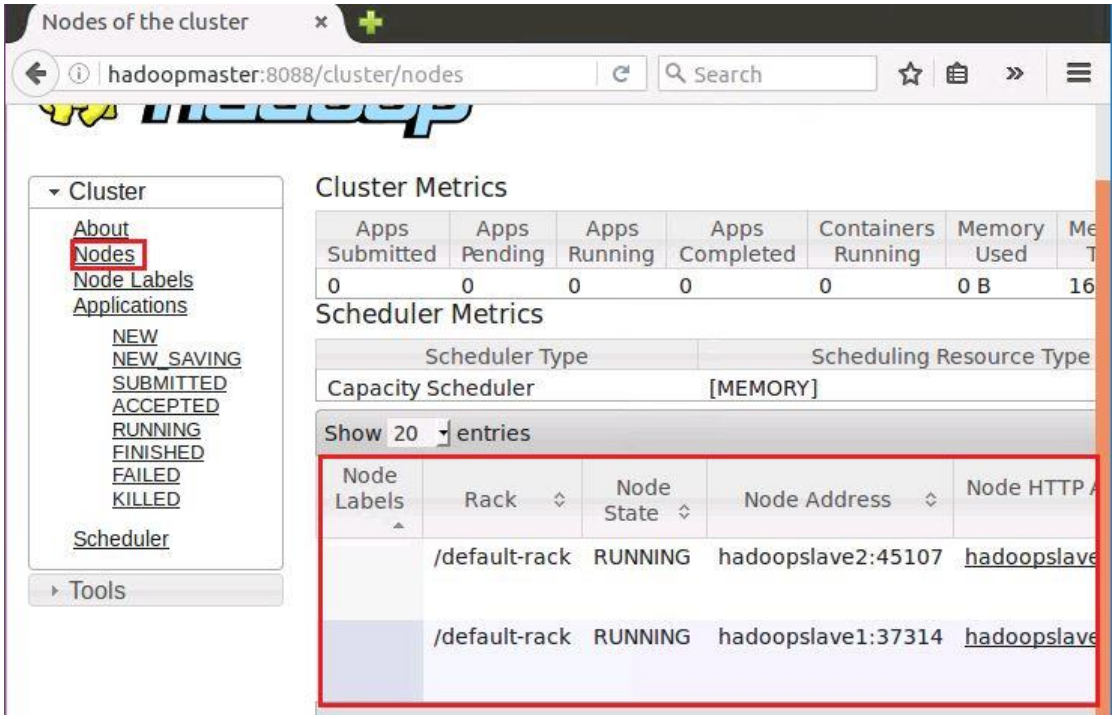
```
hduser@hadoopmaster: ~
hduser@hadoopmaster:~$ jps
33605 ResourceManager
33240 NameNode
33883 Jps
33454 SecondaryNameNode
hduser@hadoopmaster:~$
```

- 查看 HadoopSlave1、HadoopSlave2 的行程，輸入 jps

```
hduser@hadoopmaster: ~
hduser@hadoopmaster:~$ ssh hadoopslave1
Welcome to Ubuntu 16.04.1 LTS (GNU/Linux 4.4.0-31-generic x86_64)

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

276 packages can be updated.
109 updates are security updates.

Last login: Sun Nov 27 19:52:55 2016 from 192.168.59.132
hduser@hadoopslave1:~$ jps
6273 Jps
6106 NodeManager
5980 DataNode
hduser@hadoopslave1:~$ exit
logout
Connection to hadoopslave1 closed.
hduser@hadoopmaster:~$
```

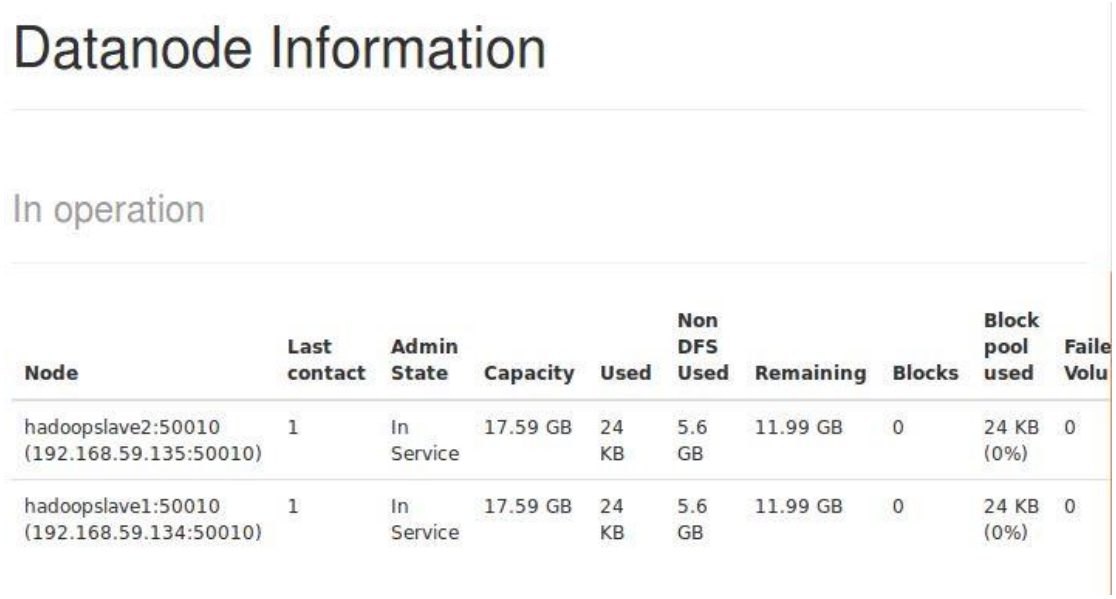
- 開啟 Hadoop ResourceManager Web 介面，開啟瀏覽器，輸入 http://hadoopmaster:8088，可看到如下畫面

- 查看已執行的節點，於瀏覽器➔Nodes，可看到目前有三個節點



- 開啟 NameNode HDFS Web 介面，於瀏覽器，輸入 http://hadoopmaster:50070

- 查看 DataNodes



8. 欲結束 Hadoop，執行 `stop-all.sh`