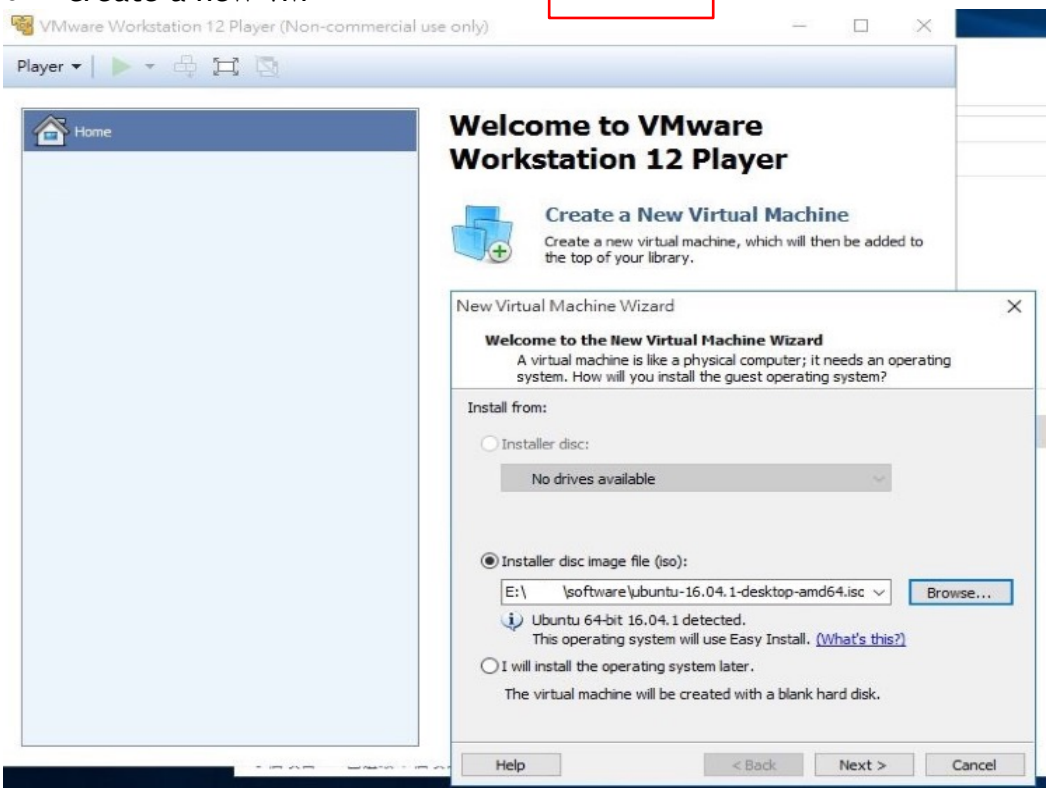
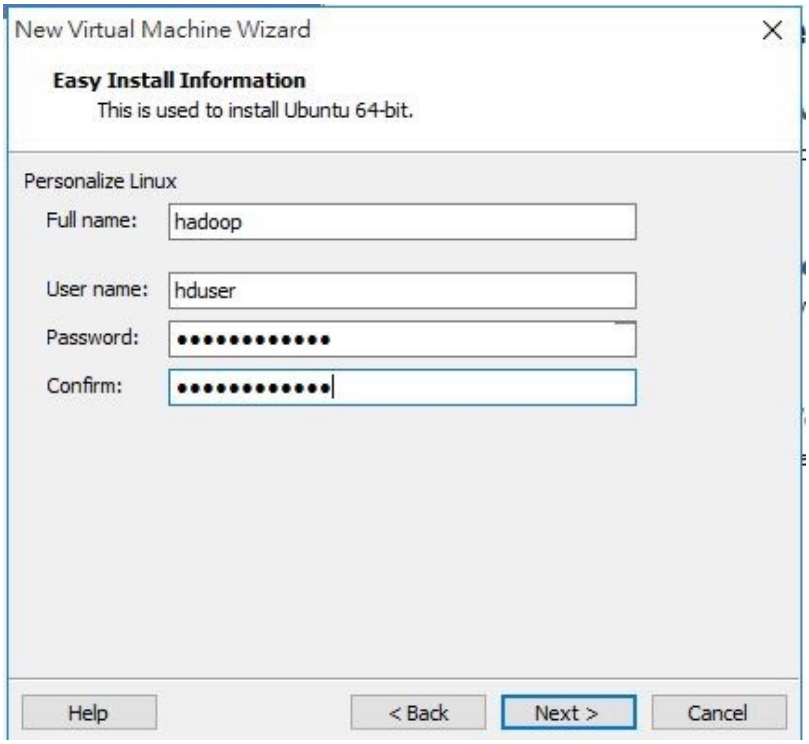
Hadoop Single Node Cluster Setup

1. install Ubuntu
   - 下載 Ubuntu，選擇最新的64位元桌面版本

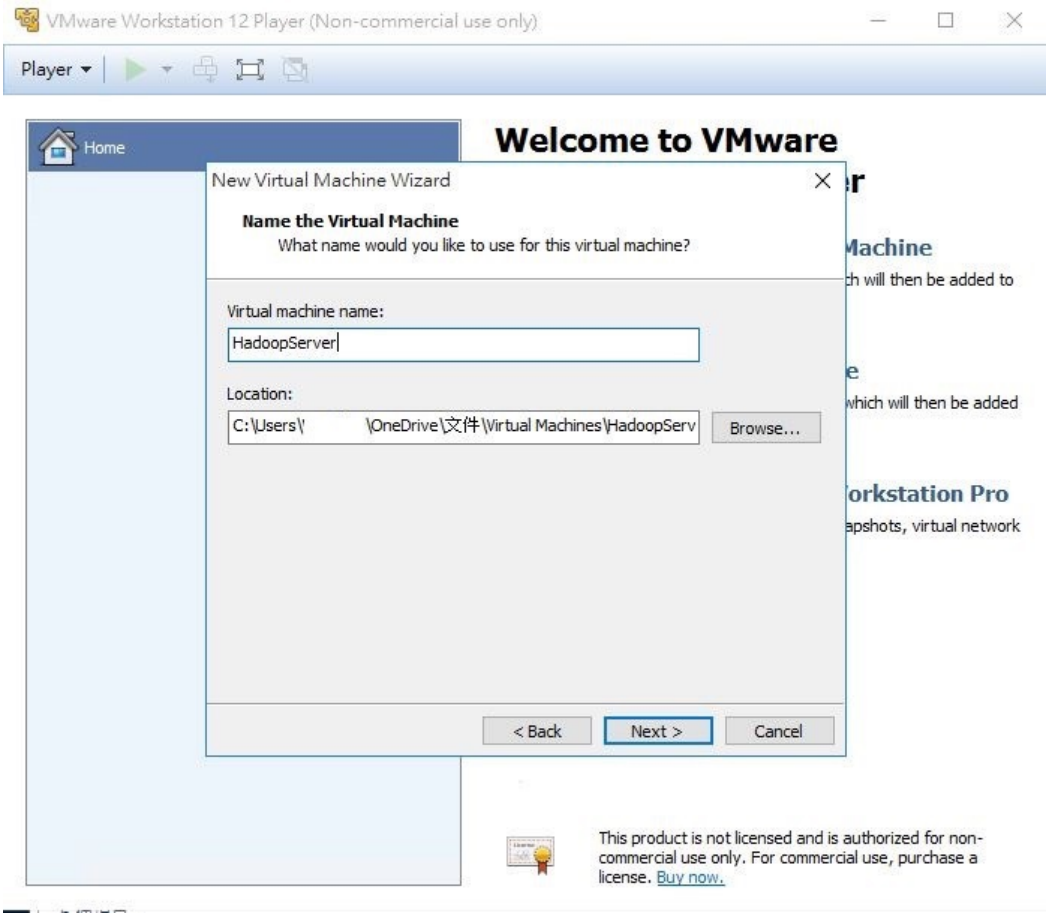
   - create a new VM



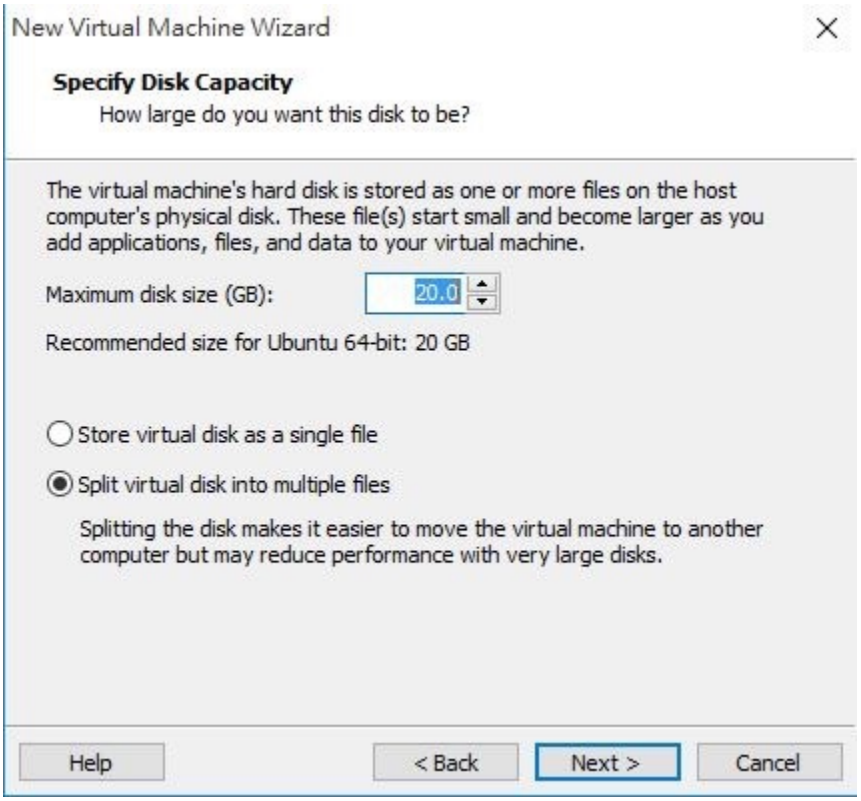
   - 輸入管理員帳密➔hduser / hduser

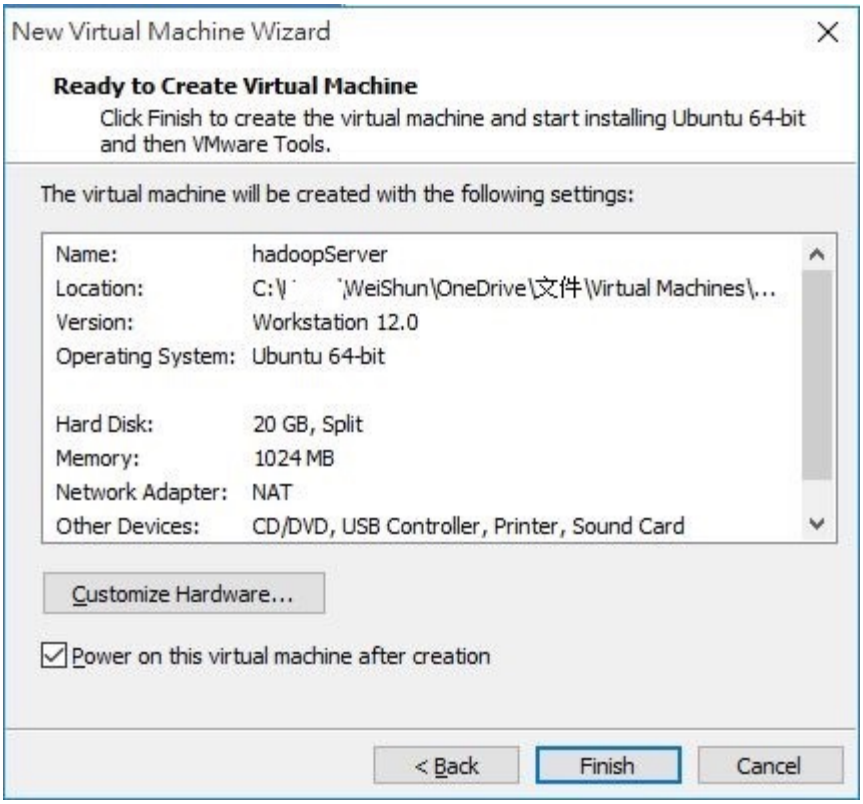


- 輸入伺服器名稱

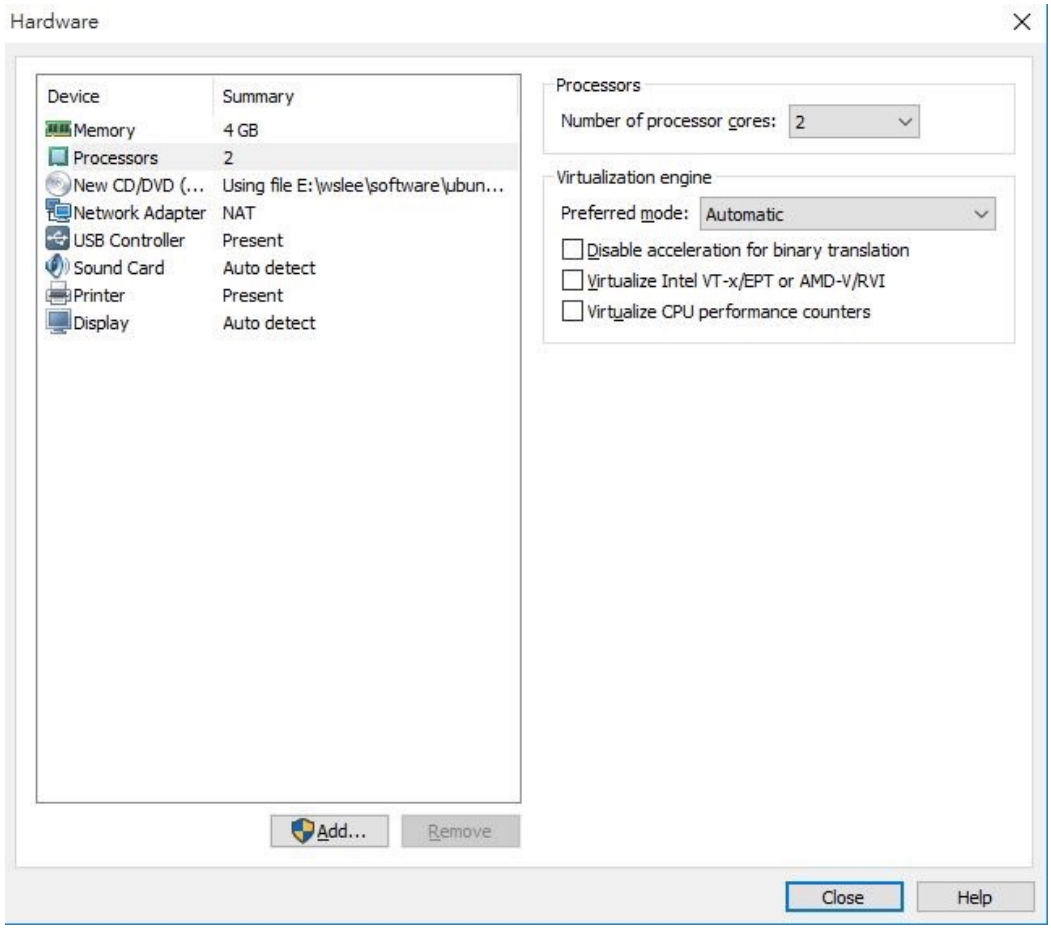


- 一個 VM 分配 20GB

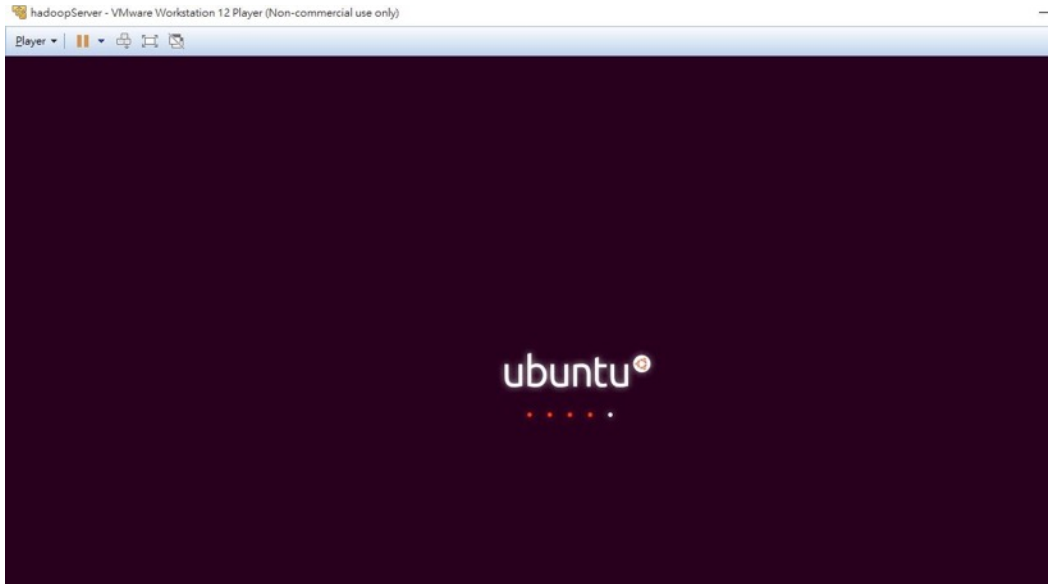


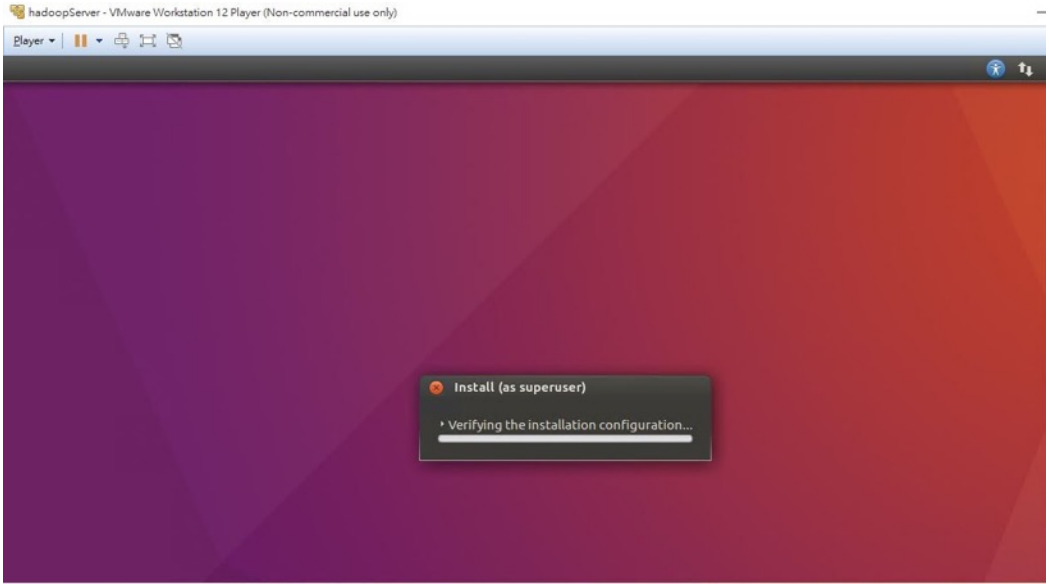


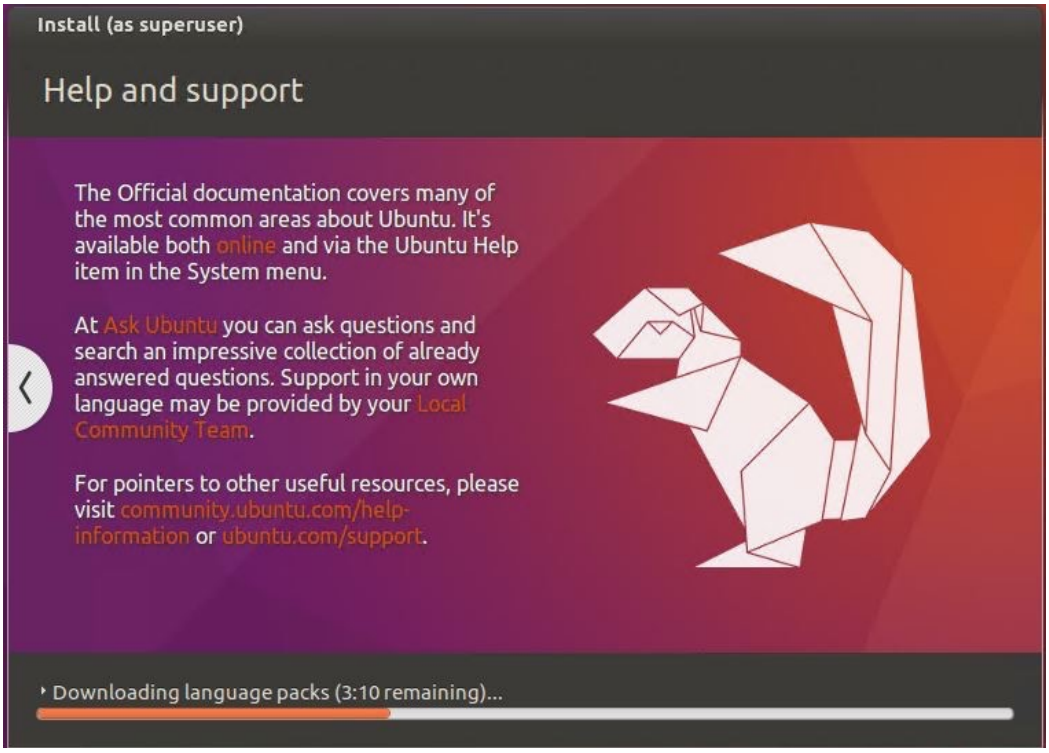
- 選擇 2 processors 和 4GB RAM

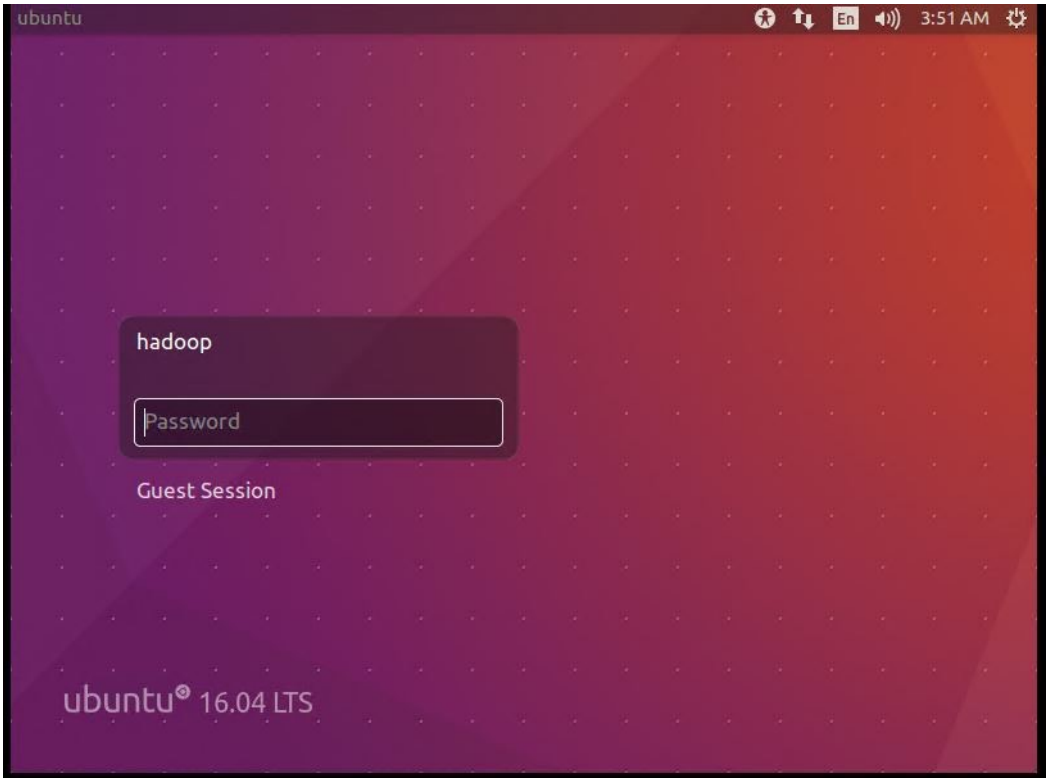

Hardware
Device
Summary
Memory
4 GB
Processors
2
New CD/DVD (...
Using file E:\wslee\software\ubun...
Network Adapter
NAT
USB Controller
Present
Sound Card
Auto detect
Printer
Present
Display
Auto detect
Add...
Remove
Processors
Number of processor cores:
2
Virtualization engine
Preferred mode:
Automatic
Disable acceleration for binary translation
Virtualize Intel VT-x/EPT or AMD-V/RVI
Virtualize CPU performance counters
Close
Help

- 安装中~


hadoopServer - VMware Workstation 12 Player (Non-commercial use only)
Player
ubuntu


hadoopServer - VMware Workstation 12 Player (Non-commercial use only)
Player
Install (as superuser)
Verifying the installation configuration...


Install (as superuser)
Help and support
The Official documentation covers many of the most common areas about Ubuntu. It's available both online and via the Ubuntu Help item in the System menu.
At Ask Ubuntu you can ask questions and search an impressive collection of already answered questions. Support in your own language may be provided by your Local Community Team.
For pointers to other useful resources, please visit community.ubuntu.com/help-information or ubuntu.com/support.
Downloading language packs (3:10 remaining)...



2. install Java JDK
    - 開啟一個terminal，輸入 sudo apt-get install default-jdk，讓 apt-get 去抓最新的JDK

```
hduser@ubuntu: ~
hduser@ubuntu:~$ sudo apt-get install default-jdk
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  ca-certificates-java default-jdk-headless default-jre default-jre-headless
  fonts-dejavu-extra java-common libbonobo2-0 libbonobo2-common libgif7
  libgnome-2-0 libgnome2-common libgnomevfs2-0 libgnomevfs2-common libice-dev
  liborbit-2-0 libpthread-stubs0-dev libsm-dev libx11-dev libx11-doc
  libxau-dev libxcb1-dev libxdmcp-dev libxt-dev openjdk-8-jdk
  openjdk-8-jdk-headless openjdk-8-jre openjdk-8-jre-headless
  x11proto-core-dev x11proto-input-dev x11proto-kb-dev xorg-sgml-doctools
  xtrans-dev
```

- 安裝完畢，可試著輸入 java -version 和 javac -version 檢查

```
hduser@ubuntu:~$ java -version
openjdk version "1.8.0_111"
OpenJDK Runtime Environment (build 1.8.0_111-8u111-b14-2ubuntu0.16.04.2-b14)
OpenJDK 64-Bit Server VM (build 25.111-b14, mixed mode)
hduser@ubuntu:~$ javac -version
javac 1.8.0_111
```

- 輸入 sudo update-alternatives --display java 取得JDK的安裝路徑

```
hduser@ubuntu: ~
hduser@ubuntu:~$ update-alternatives --display java
java - auto mode
  link best version is /usr/lib/jvm/java-8-openjdk-amd64/jre/bin/java
  link currently points to /usr/lib/jvm/java-8-openjdk-amd64/jre/bin/java
  link java is /usr/bin/java
  slave java.1.gz is /usr/share/man/man1/java.1.gz
/usr/lib/jvm/java-8-openjdk-amd64/jre/bin/java - priority 1081
  slave java.1.gz: /usr/lib/jvm/java-8-openjdk-amd64/jre/man/man1/java.1.gz
hduser@ubuntu:~$
```

3. Install SSH
   - 之後連線到其他伺服器時可重複輸入密碼
   - 輸入 sudo apt-get install ssh 安裝 SSH

```
hduser@ubuntu: ~
hduser@ubuntu:~$ sudo apt-get install ssh
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  ncurses-term openssh-client openssh-server openssh-sftp-server ssh-import-id
Suggested packages:
  ssh-askpass libpam-ssh keychain monkeysphere rssh molly-guard
The following NEW packages will be installed:
  ncurses-term openssh-server openssh-sftp-server ssh ssh-import-id
The following packages will be upgraded:
  openssh-client
1 upgraded, 5 newly installed, 0 to remove and 280 not upgraded.
Need to get 643 kB/1,230 kB of archives.
After this operation, 5,244 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```

   - 安裝 rsync，輸入 sudo apt-get install rsync

```
hduser@ubuntu: ~
hduser@ubuntu:~$ sudo apt-get install rsync
Reading package lists... Done
Building dependency tree
Reading state information... Done
rsync is already the newest version (3.1.1-3ubuntu1).
rsync set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 280 not upgraded.
hduser@ubuntu:~$
```

   - 輸入 ssh-keygen -t rsa -P ‘’產生 public/private key pair

```
hduser@ubuntu:~$ ssh-keygen -t rsa -P ""
Generating public/private rsa key pair.
Enter file in which to save the key (/home/hduser/.ssh/id_rsa):
Created directory '/home/hduser/.ssh'.
Your identification has been saved in /home/hduser/.ssh/id_rsa.
Your public key has been saved in /home/hduser/.ssh/id_rsa.pub.
The key fingerprint is:
SHA256:QgwqWXtLOboiz0soDZQ8rAkLg91iTBpp5oX+/SAwU58 hduser@ubuntu
The key's randomart image is:
+---[RSA 2048]----+
|..+ .            |
|=%.* +           |
|&*X B +          |
|=%.= E           |
|= * o . S        |
| + + o .         |
|= + . o          |
|o=     .         |
|  +.             |
+----[SHA256]-----+
```

- 查看產生的SSH key，輸入 ll ~/.ssh

```
hduser@ubuntu:~$ ll ~/.ssh
total 16
drwx------  2 hduser hduser 4096 Dec  3 11:54 ./
drwxr-xr-x 16 hduser hduser 4096 Dec  3 11:54 ../
-rw-------  1 hduser hduser  672 Dec  3 11:54 id_dsa
-rw-r--r--  1 hduser hduser  603 Dec  3 11:54 id_dsa.pub
hduser@ubuntu:~$
```

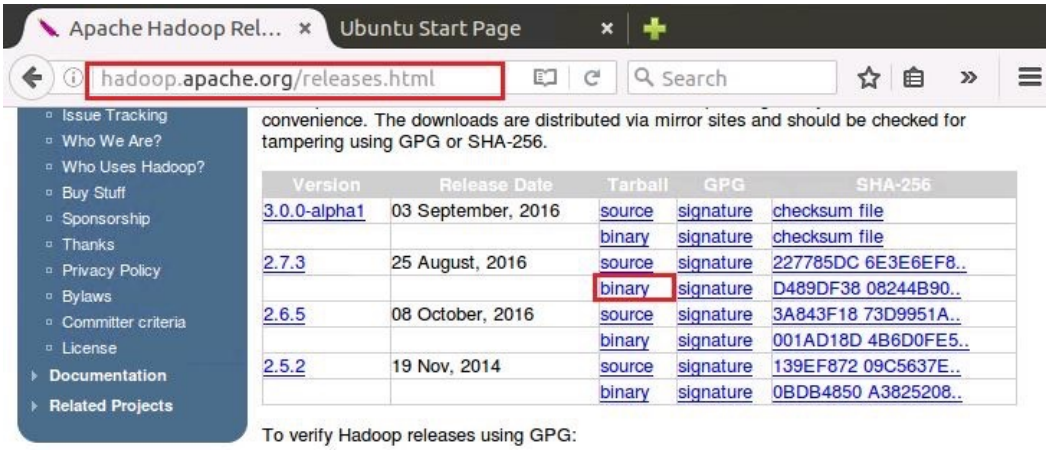
- 輸入 cat $HOME/.ssh/id_rsa.pub >> $HOME /.ssh/authorized_keys 設定 key

```
hduser@ubuntu:~$ cat $HOME/.ssh/id_rsa.pub
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQCq3BD/8BABDIu8Etksi05gp4XlGkOaz7rXTp9iLKp8
DclJBBwC09L7pcPwnIjkLX0hZ0xBZdPzPjLgYgWzrKKiFNcEFTllWw128pDFQTfwD+YwZtXFtLfH0LSx
mTkI/VT0CiJgsbbeuiJFAVA0wtudHM+PRndkvDatyLBbO+i6FjWaVap0aYUtpY3DHl1SK/pTNrr7oZoH
g3T2YwuHLNO10+7aDS5jSr7849lFPSc0NnGPkLeGz1iUNUFLwnrOpG4XOCiSaVl5cahtsSEb3+VlMqZC
RFyde13mMQ3widCAYe2DG0irJ+XmDkebYlGiWN6Wi+tnL+NupUmvOLvrZN6v hduser@ubuntu
hduser@ubuntu:~$ cat $HOME/.ssh/id_rsa.pub >> $HOME/.ssh/authorized_keys
```

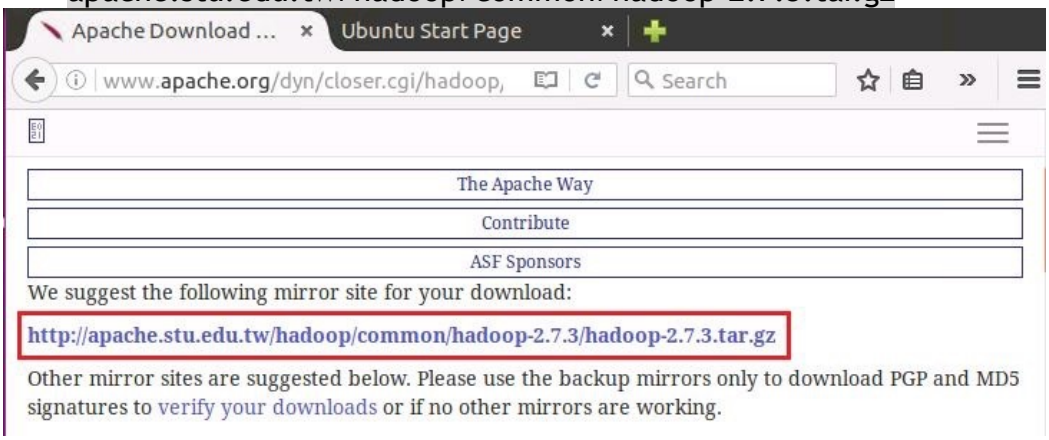
- 啟動SSH ssh localhost

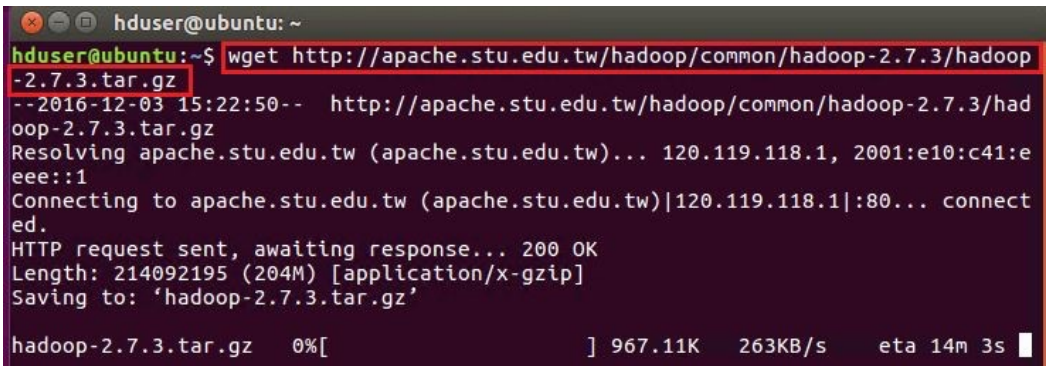
```
hduser@ubuntu:~$ ssh localhost
The authenticity of host 'localhost (127.0.0.1)' can't be established.
ECDSA key fingerprint is SHA256:wN0apnZoV21KYAfdRRk/+r0WU9BVJKCjH91g/oYvk04.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'localhost' (ECDSA) to the list of known hosts.
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

236 packages can be updated.
82 updates are security updates.


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.
```

4. Install Hadoop
   - 連線至 Hadoop (網址)

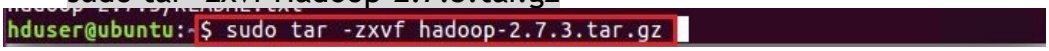


- 下載最新版 Hadoop-2.7.3.tar.gz，輸入 wget http://apache.stu.edu.tw/hadoop/common/hadoop-2.7.3.tar.gz

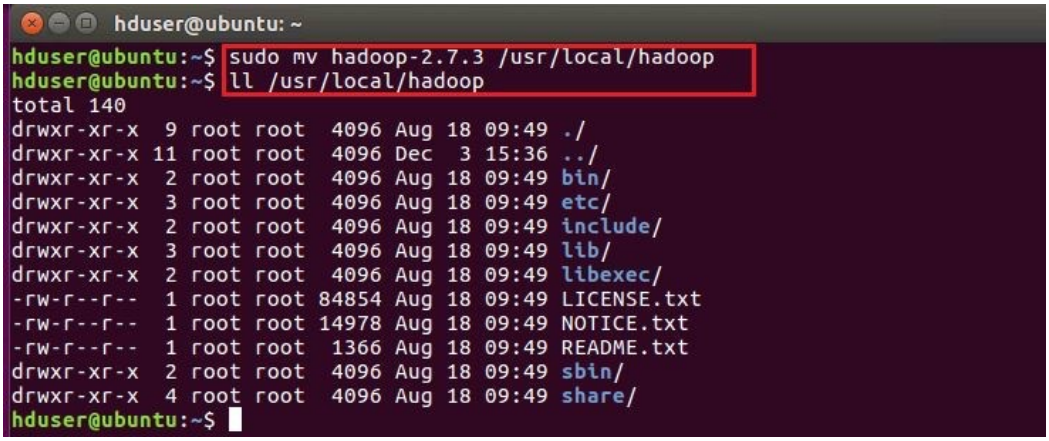




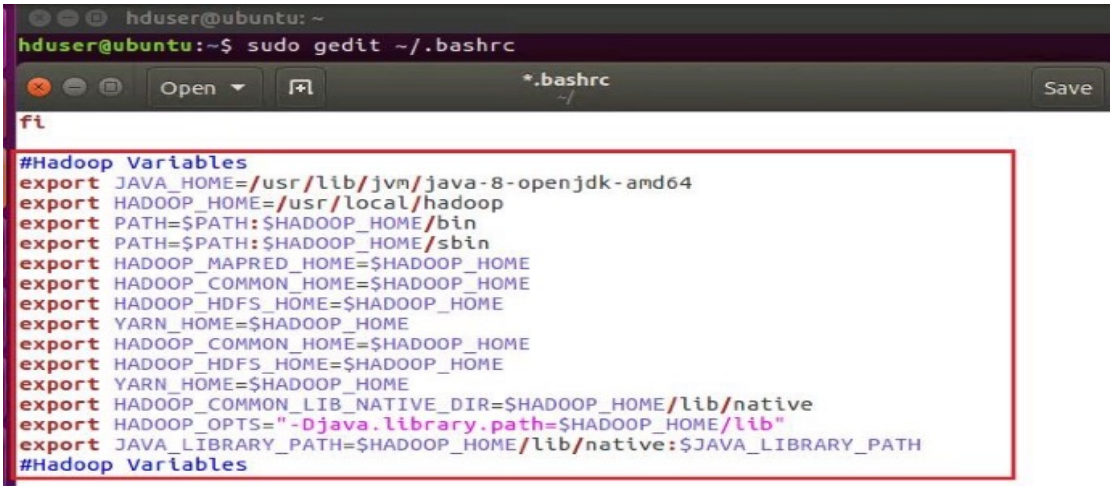
- 解壓縮 Hadoop-2.7.3.tar.gz 在 Terminal 中輸 sudo tar -zxvf Hadoop-2.7.3.tar.gz



- 預設安裝路徑為 /usr/local ，輸入 sudo mv hadoop-2.7.3 /usr/local/hadoop
- 查看hadoop安裝目錄，輸入 ll /usr/local/hadoop



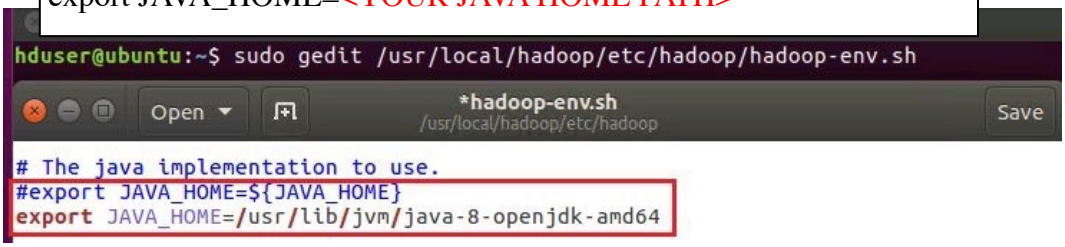
- 設定環境變數，編輯 .bashrc 輸入 sudo gedit ~/.bashrc ，在檔案的最後加入下列字串(注意JAVA_HOME為本機的路徑)




```
#Hadoop Variables
export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64
export HADOOP_HOME=/usr/local/hadoop
export PATH=$PATH:$HADOOP_HOME/bin
export PATH=$PATH:$HADOOP_HOME/sbin
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_COMMON_HOME=$HADOOP_HOME
export HADOOP_HDFS_HOME=$HADOOP_HOME
export YARN_HOME=$HADOOP_HOME
export HADOOP_COMMON_LIB_NATIVE_DIR=$HADOOP_HOME/lib/native
export HADOOP_OPTS="-Djava.library.path=$HADOOP_HOME/lib"
export JAVA_LIBRARY_PATH=$HADOOP_HOME/lib/native:$JAVA_LIBRARY_PATH
#Hadoop Variables
```

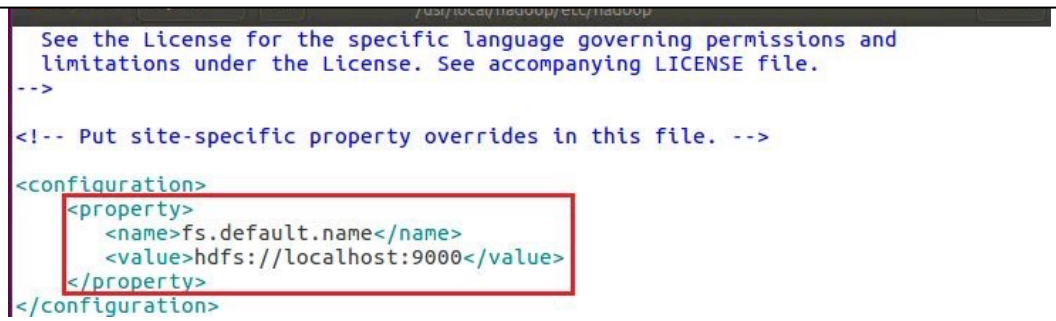
- 接下來編輯 Hadoop-env.sh，輸入 sudo gedit /usr/local/hadoop/etc/hadoop/hadoop-env.sh
- 在檔案中輸入下列字串(注意JAVA_HOME為本機的路徑)

```
export JAVA_HOME=<YOUR JAVA HOME PATH>
```



- 編輯core-site.xml，輸入sudo gedit /usr/local/hadoop/etc/hadoop/core-site.xml
- 在 xml 檔中，<configuration> tag 間輸入下列字串

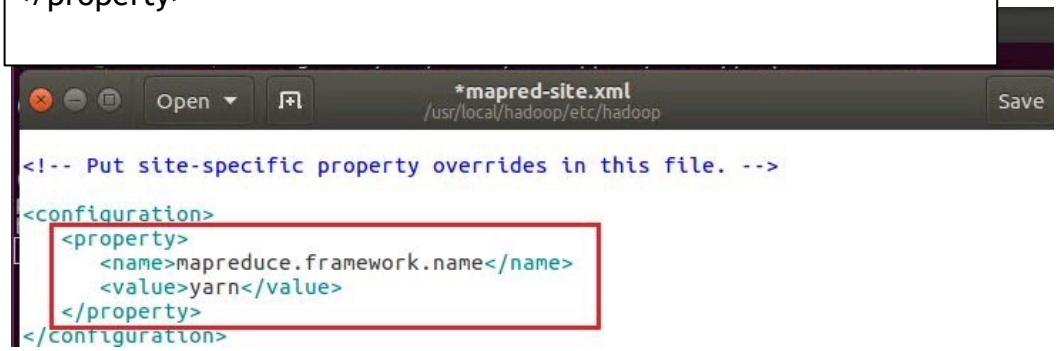
```
<property>
  <name>fs.default.name</name>
  <value>hdfs://localhost:9000</value>
</property>
```



- 編輯yarn-site.xml，輸入sudo gedit /usr/local/hadoop/etc/hadoop/yarn-site.xml
- 在 xml 檔中，<configuration> tag 間輸入下列字串

```
hduser@ubuntu: ~
<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>
```

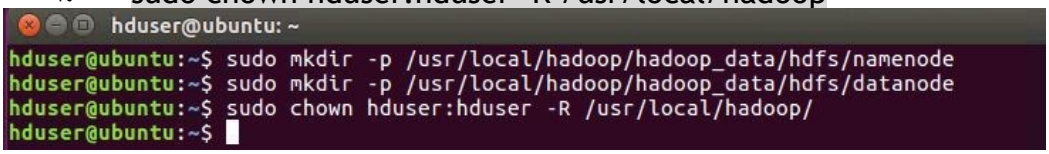
```
<property>
  <name>mapreduce.framework.name</name>
  <value>yarn</value>
</property>
```



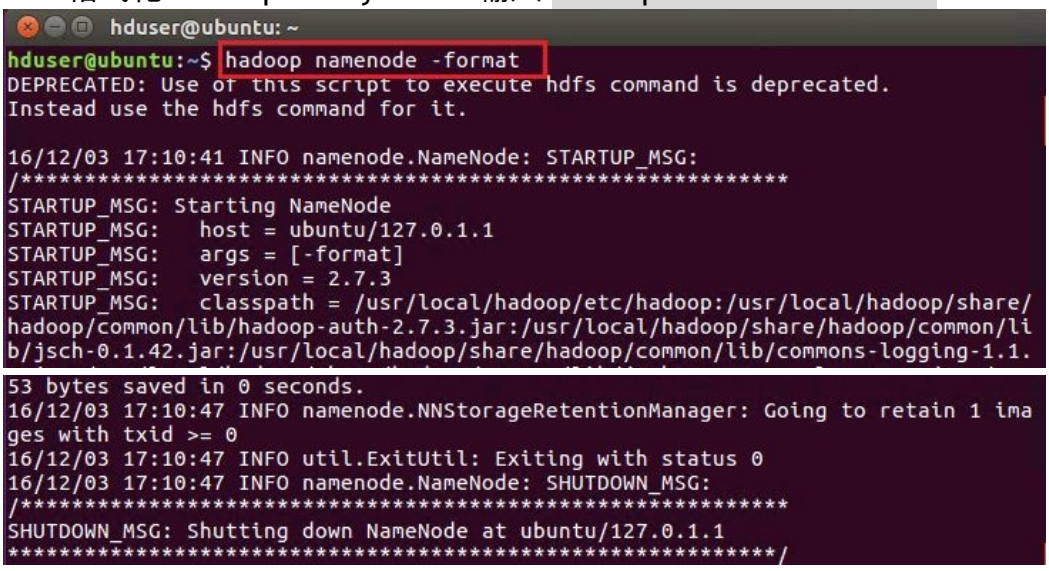
- 編輯hdfs-site.xml，輸入sudo gedit /usr/local/hadoop/etc/hadoop/hdfs-site.xml
- 在 xml 檔中，<configuration> tag 間輸入下列字串

```
<property>
  <name>dfs.replication</name>
  <value>3</value>
</property>
<property>
  <name>dfs.namenode.name.dir</name>
  <value> file:/usr/local/hadoop/hadoop_data/hdfs/namenode</value>
</property>
<property>
  <name>dfs.datanode.data.dir</name>
  <value> file:/usr/local/hadoop/hadoop_data/hdfs/datanode</value>
 </property>
```

v. sudo chown hduser:hduser -R /usr/local/hadoop



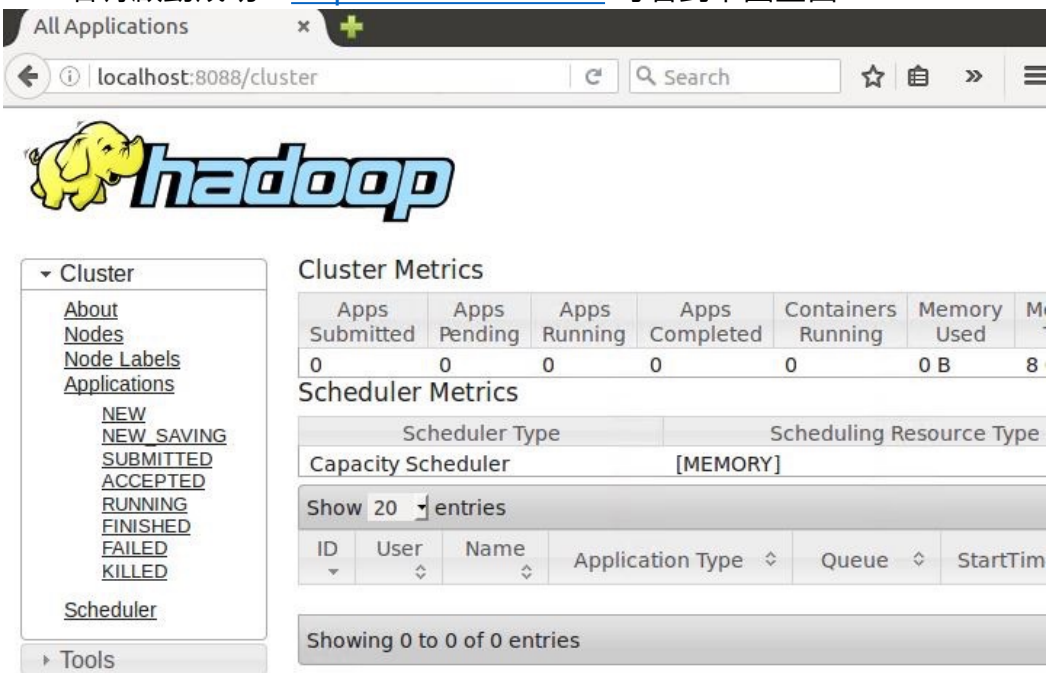
- 格式化 Hadoop file system，輸入 Hadoop namenode -format



- 輸入 start-all.sh 啟動 Hadoop

```
hduser@ubuntu: ~
hduser@ubuntu:~$ start-all.sh
This script is Deprecated. Instead use start-dfs.sh and start-yarn.sh
Starting namenodes on [localhost]
hduser@localhost's password:
localhost: starting namenode, logging to /usr/local/hadoop/logs/hadoop-hduser-na
menode-ubuntu.out
hduser@localhost's password:
localhost: starting datanode, logging to /usr/local/hadoop/logs/hadoop-hduser-da
tanode-ubuntu.out
Starting secondary namenodes [0.0.0.0]
hduser@0.0.0.0's password:
0.0.0.0: starting secondarynamenode, logging to /usr/local/hadoop/logs/hadoop-hd
user-secondarynamenode-ubuntu.out
starting yarn daemons
starting resourcemanager, logging to /usr/local/hadoop/logs/yarn-hduser-resource
manager-ubuntu.out
hduser@localhost's password:
localhost: starting nodemanager, logging to /usr/local/hadoop/logs/yarn-hduser-n
odemanager-ubuntu.out
hduser@ubuntu:~$
```

- 若有啟動成功，http://localhost:8088 可看到下圖畫面



- http://localhost:50070 檢視 datanode 或 file system

Overview 'localhost:54310' (active)

Started:	Sun Nov 13 16:52:16 CST 2016
Version:	2.7.3, rbaa91f7c6bc9cb92be5982de4719c1c8af91ccff
Compiled:	2016-08-18T01:41Z by root from branch-2.7.3
Cluster ID:	CID-fe287edb-4de7-45f2-afa6-9190189edf6f
Block Pool ID:	BP-2047880570-127.0.1.1-1479026925454