OpenNebula 3.4 and VMWARE ESXi 5.0

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CREATING VMWARE ESXi Vms using OpenNebula 3.4

1 Hardware/software requirements :

1. A VT enabled hardware running ESXi [a valid trial license will also do]
   Hostname :esxi01
   IP address :192.168.1.95
   Gateway : 192.168.1.1

2. A VT enabled hardware with Ubuntu 11.04 or 11.10 server running
   Hostname : OneHost
   IP address : 192.168.1.98
   Gateway : 192.168.1.1

2 Configure OpenNebula Host

- Before installation of OpenNebula in Ubuntu Server , just check the following to ensure that you have a proper setup.

/etc/network/interfaces	# The loopback network interface auto lo iface lo inet loopback # The primary network interface auto eth0 iface eth0 inet static address 192.168.1.98 netmask 255.255.255.0 network 192.168.1.0 broadcast 192.168.1.255 gateway 192.168.1.1 # dns-* options are implemented by the resolvconf package, if installed dns-nameservers 192.168.1.1 dns-search example.com
/etc/hosts	127.0.0.1 localhost 192.168.1.98 OneHost.example.com OneHost 192.168.1.95 esxi01
/etc/resolv.conf	search example.com nameserver 192.168.1.1

2.1) Configure the OpenNebula host:

- `Create a folder "/var/liv" and create a group named "oneadmin"`

```
sudo mkdir -p /var/lib  {if does not exist}
```


```
sudo groupadd -g 10000 oneadmin
```

- Create a user "oneadmin" , add user to group "oneadmin" and have /var/lib/one as home folder.

```
sudo useradd -u 10000 -m oneadmin -d /var/lib/one -s /bin/bash -g oneadmin
```

- Setup password for "oneadmin" and make oneadmin owner of "/var/lib"

```
sudo passwd oneadmin                    - I chose “redhat123” as the password
sudo chown -R oneadmin:oneadmin /var/lib
```

- Test by logging as user "oneadmin" and exit

```
su -l oneadmin
exit
```

- Install Network file Server [NFS]

```
sudo apt-get install nfs-kernel-server
```

- edit /etc/exports and add the following line to make folder /var/lib/one/var shareable with ESX server. We will configure ESX server later.

```
For Rel 3.4 and ESXi

/var/lib/one/var/datastores/0
192.168.1.0/24(rw,sync,no_subtree_check,no_root_squash,anonuid=10000,anong
id=10000)

/var/lib/one/var/datastores/100
192.168.1.0/24(rw,sync,no_subtree_check,no_root_squash,anonuid=10000,anong
id=10000)
```

- Restart NFS server

```
sudo /etc/init.d/nfs-kernel-server start
```

- create a SSH key for oneadmin and disable host key checking else make all hostkeys known on the OpenNebula node.

```
su -l oneadmin
ssh-keygen
  • {Note - all defaults, and no passphrase.}
cat ~/.ssh/id_rsa.pub > ~/.ssh/authorized_keys
nano ~/.ssh/config
  • [add below two lines to SSH config file]
```

Host * StrictHostKeyChecking no
• If not done earlier, edit /etc/hosts file and add an alias to ESXi host as given below. 192.168.1.95 esxi01
• Save and exit

2.2) Install OpenNebula in Ubuntu server :

- Login to 192.168.1.98[OneHost] and download OpenNebula Release 3.4

su -l oneadmin
Download stable opennebula release for ubuntu [opennebula-3.4.0.tar.gz] from http://downloads.opennebula.org/ and save it in /var/lib/one folder.

- Un-tar the build

tar xzf opennebula-3.4.0.tar.gz
cd opennebula-3.4.0//

- Before installing OpenNebula, install all pre-requisite packages

sudo apt-get install libsqlite3-dev libxmlrpc-c3-dev g++ ruby libopenssl-ruby libssl-dev ruby-dev
sudo apt-get install libxml2-dev libmysqlclient-dev libmysql++-dev libsqlite3-ruby libexpat1-dev
sudo apt-get install libc6 libgcc1 libmysqlclient16 libpassword-ruby libsequel-ruby libsqlite3-0 libssl0.9.8 libstdc++6 libxml2 libxmlrpc-c3-0 libxmlrpc-core-c3-0
sudo apt-get install ruby rubygems libmysql-ruby libsqlite3-ruby libamazonec2-ruby
sudo apt-get install rake rubygems libxml-parser-ruby1.8 libxslt1-dev genisoimage scons
sudo gem install nokogiri rake xmlparser
sudo apt-get install opennebula-common [optional]
sudo apt-get install mysql-server [set the password when asked. I normally give “mygreatsecret” as the pwd]

- **configure MYSql: <refer below screen shot in case of any doubt)**

mysql -uroot -pmygreatsecret
CREATE USER 'oneadmin'@'localhost' IDENTIFIED BY 'oneadmin';
CREATE DATABASE opennebula;
GRANT ALL PRIVILEGES ON opennebula.* TO 'oneadmin' IDENTIFIED BY 'oneadmin';
quit;

```
oneadmin@OneHost:~/opennebula-3.1.90$ mysql -uroot -pmygreatsecret
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 39
Server version: 5.1.58-1ubuntu1 (Ubuntu)

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Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> CREATE USER 'oneadmin'@'localhost' IDENTIFIED BY 'oneadmin';
Query OK, 0 rows affected (0.00 sec)

mysql> CREATE DATABASE opennebula;
Query OK, 1 row affected (0.00 sec)

mysql> GRANT ALL PRIVILEGES ON opennebula.* TO 'oneadmin' IDENTIFIED BY 'oneadmin';
Query OK, 0 rows affected (0.00 sec)

mysql> quit;
Bye
oneadmin@OneHost:~/opennebula-3.1.90$
```

- <Screen shot as shown below>

-
- Before installing OpenNebula, configure mysql support.

```
cd  ~/opennebula-3.4.0                    [change your folder to opennebula source]
scons sqlite=no mysql=yes
```

- Install openebula in /var/lib/one accessible by group oneadmin and as user "oneadmin"

```
./install.sh -u oneadmin -g oneadmin -d /var/lib/one
```

- Create a profile file[~/.bash_profile] to set ENVIRONMENT VARIABLES required to start and use services rendered by "one"

```
nano ~/.bash_profile
export ONE_LOCATION=/var/lib/one
export ONE_AUTH=$ONE_LOCATION/.one/one_auth
export ONE_XMLRPC=http://localhost:2633/RPC2
export PATH=$ONE_LOCATION/bin:/usr/local/bin:/var/lib/gems/1.8/bin/:/var/lib/gems/1.8/:$PATH
```

- execute the profile file and set the environment variables

```
source ~/.bash_profile
```

-
- *[Note: Anytime you open a new SSH window for OneHost, change user to "oneadmin" and source ~/.bash_profile before issuing any "one" command]*
-

- Create and store OpenNebula user and password in a file. Substitute <THE_PASSWORD> with value

```
mkdir ~/.one
echo "oneadmin:<THE_PASSWORD>" > ~/.one/one_auth
```

-

- Make required changes in OpenNebula configuration file ~/etc/oned.conf

```
nano ~/etc/oned.conf

a. comment following line # Line 58 or near by [c hange if your password  for oneadmin is some different]
#DB = [ backend = "sqlite" ]
b. Set SQL as MYSQL-uncomment #lines 61 through 66 or near by
# Sample configuration for MySQL
 DB = [ backend = "mysql",
        server  = "localhost",
        port    = 0,
        user    = "oneadmin",
        passwd  = "oneadmin",
        db_name = "opennebula" ]
#*******************************************************************************
# DataStore Configuration
#*******************************************************************************
DATASTORE_LOCATION = /var/lib/one/var/datastores
#-------------------------------------------------------------------------------
IM_MAD = [
      name       = "im_vmware",
      executable = "one_im_sh",
      arguments  = "-t 15 -r 0 vmware" ]
#-------------------------------------------------------------------------------
#-------------------------------------------------------------------------------
VM_MAD = [
    name       = "vmm_vmware",
    executable = "one_vmm_sh",
    arguments  = "-t 15 -r 0 vmware",
    default    = "vmm_exec/vmm_exec_vmware.conf",
    type       = "vmware" ]
#-------------------------------------------------------------------------------
#*******************************************************************************
TM_MAD = [
    executable = "one_tm",
    arguments  = "-t 15 -d dummy,lvm,shared,qcow2,ssh,vmware,iscsi" ]
#*******************************************************************************
#*******************************************************************************
DATASTORE_MAD = [
    executable = "one_datastore",
    arguments  = "-t 15 -d fs,vmware,iscsi"
]
#*******************************************************************************
```

- Start Nebula

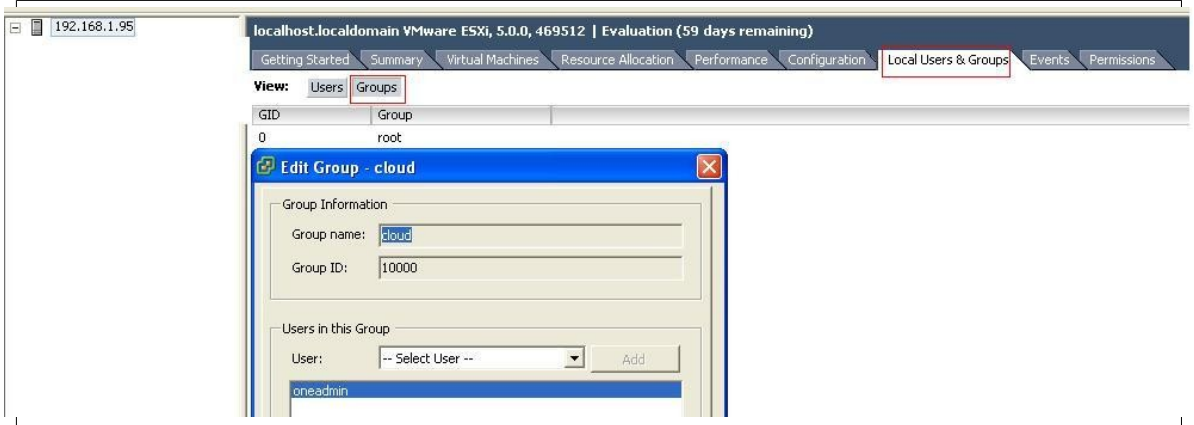
```
one start                { Note: it should start with no error messages}
```

- Now You can test OpenNebula services by typing "onevm list" on the $ prompt. The command should execute with no error.The list will be empty for now.

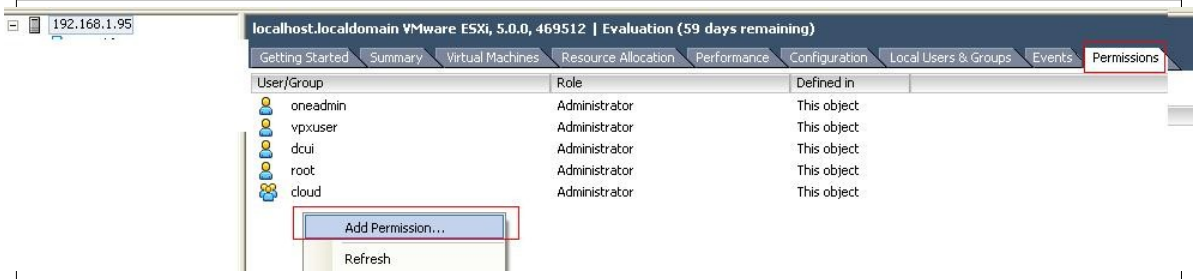
3 CONFIGURE ESXi server for OpenNebula

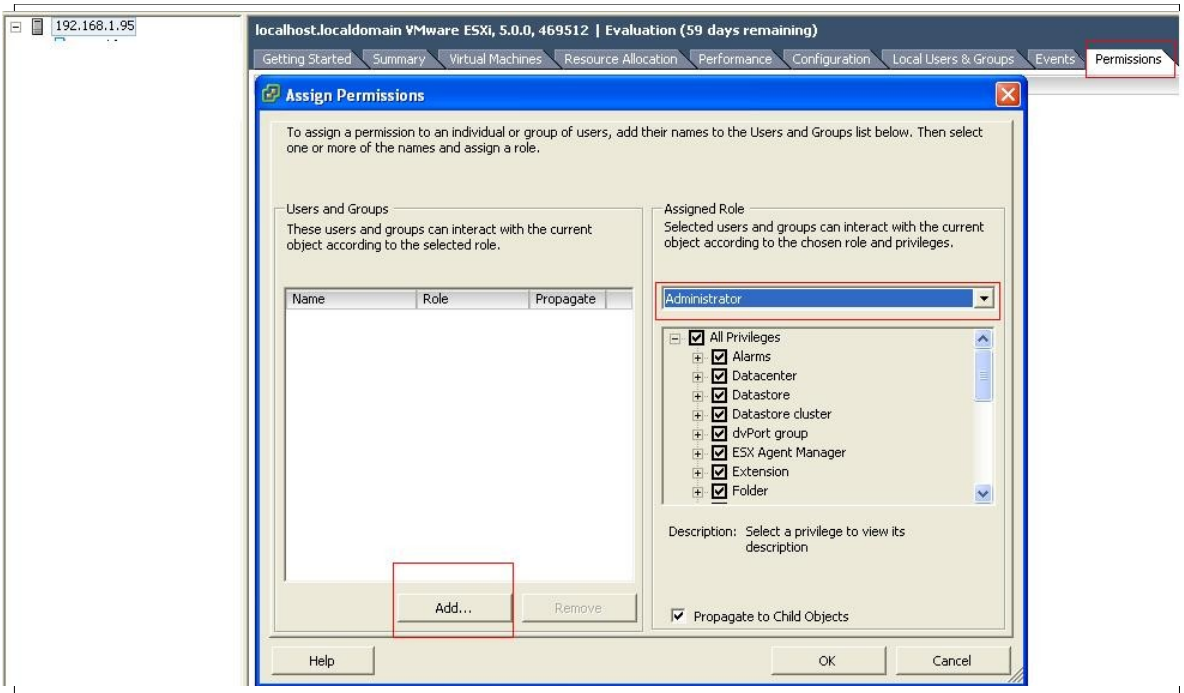
Create a user oneadmin in ESX server [refer http://www.opennebula.org/documentation:rel3.4:evmwareg]
`[You can use either a VSphere client or a SSH connection to ESX server.] I am using V VSphere client.`

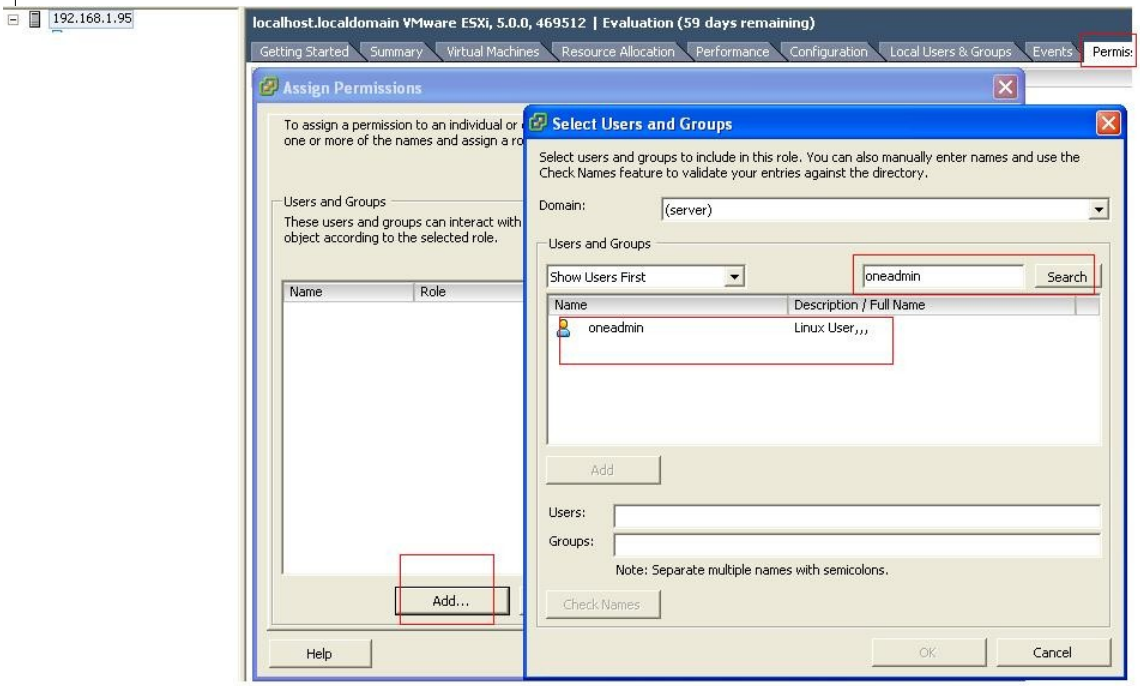
Create a new user “oneadmin” with ID and password. same as Opennebula oneadmin user. [i.e 10000 and redhat123] Right click on the “user” tab page and select “Add” option
Ssh to esxi console as root and create a user oneadmin with /home/oneadmin as home folder mkdir /home/oneadmin useradd -u 9001 oneadmin -d /home/oneadmin -s /bin/sh -g root
Create a new Group “oneadmin” with ID 9001 and add oneadmin user to it



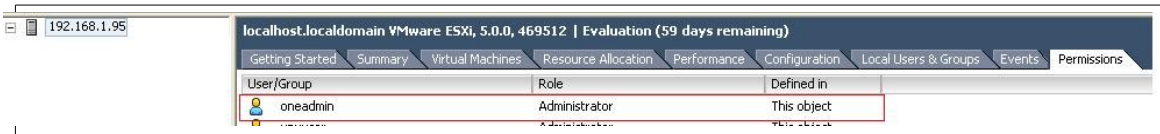
Provide required permissions to oneadmin user, using “permissions” tab. Follow the sequences as given below Right click on the page and select “Add Permission”







Once finished you will see oneadmin with “Administration” permissions



Next create a NFS share , so that the openNebula shared folder /var/lib/one/var/datastores/ will be accessible by ESX Server. Follow the steps below.

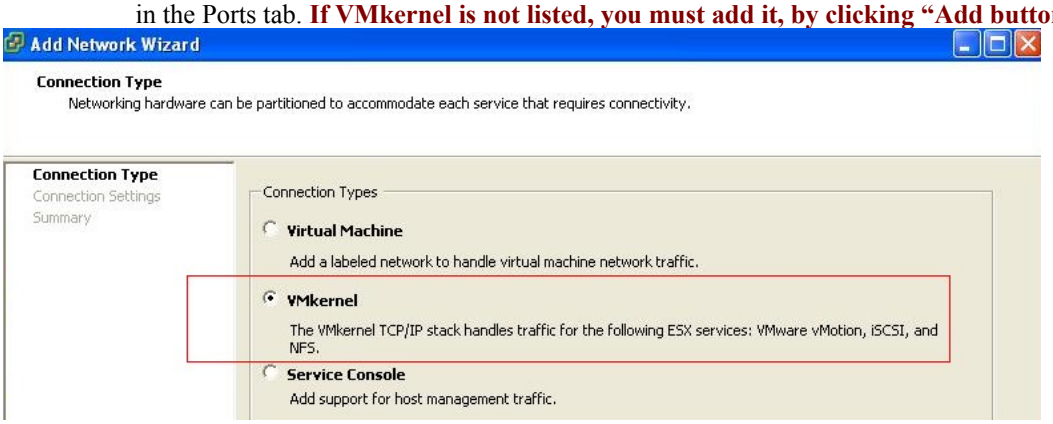
For ESXi

Note: Do not set up NFS datastores through the vSphere Client on the ESX Server system. Unlike VMFS datastores, NFS datastores created through the vSphere Client are not recognized by Lab Manager. Such datastores conflict with the creation of NFS datastores through the Lab Manager Web console

- Ensure the NFS server supports NFSv3 over TCP
- The NFS server must be accessible in read-write mode by all Managed Server (ESX) systems
- The NFS server must allow read-write access for the root system account
- The NFS export must be set for either `no_root_squash, or chmod 1777`
- Ensure NFS daemons are running on the server (`"rpcinfo -p localhost"` or `"service nfs status"`)

VMKernel must be able to mount share

- Check the VMkernel IP address:
    1. Using the vSphere Client, select the ESX server
    2. Select the Configuration tab
    3. Click Networking
    4. View the Networking diagram for the VMkernel (or click Properties, and click VMkernel in the Ports tab. **If VMkernel is not listed, you must add it, by clicking "Add button")**



    5. If you are adding a new new VM Kernel as in above picture, click Next
    6. Provide a Network Label – VMKernel , click Next
    7. IP Settings- click radio button , "Use the following IP settings" and provide a new IP, Netmask and Gateway [e.g. 192.168.1.96, 255.255.255.0 and 192.168.1.1]. Click Next and Fininsh the setup.
- Ensure this IP is allowed to mount the NFS share by inspecting the export list of OpenNebula Front end.

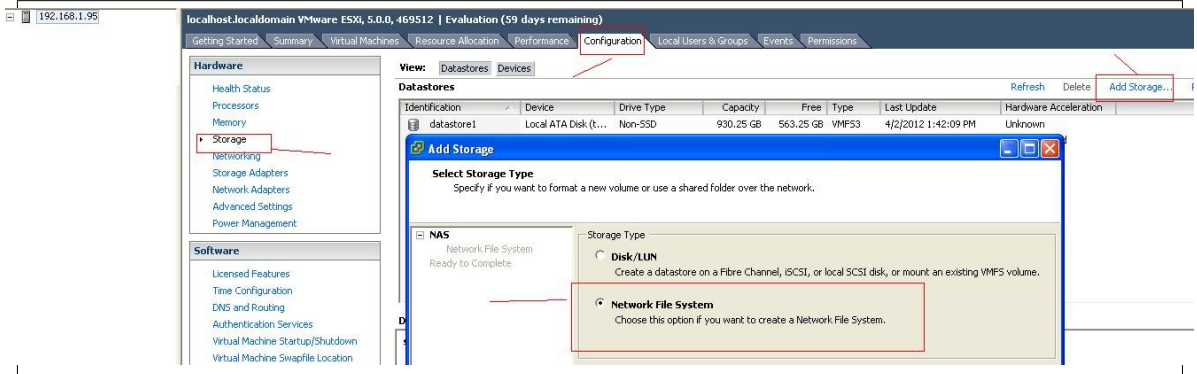
Add NFS storage for System and VMWARE datastores as exported by Opennebula Front end

[following steps will help us to monitor the contents of the NFS shares graphically]

Go to "Configuration" tab , select "storage" from "Hardware" list and click on "Add storage" link to the right.

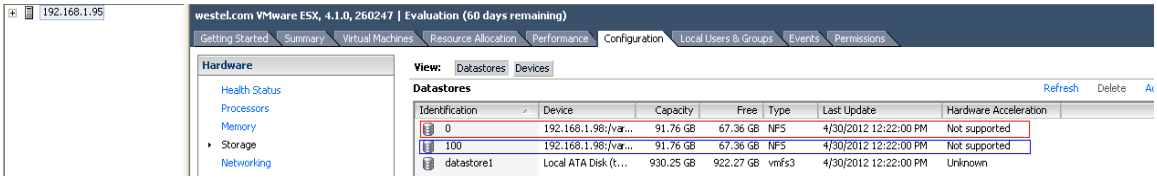
1.

Select “Network File System” radio option and click “ Next”



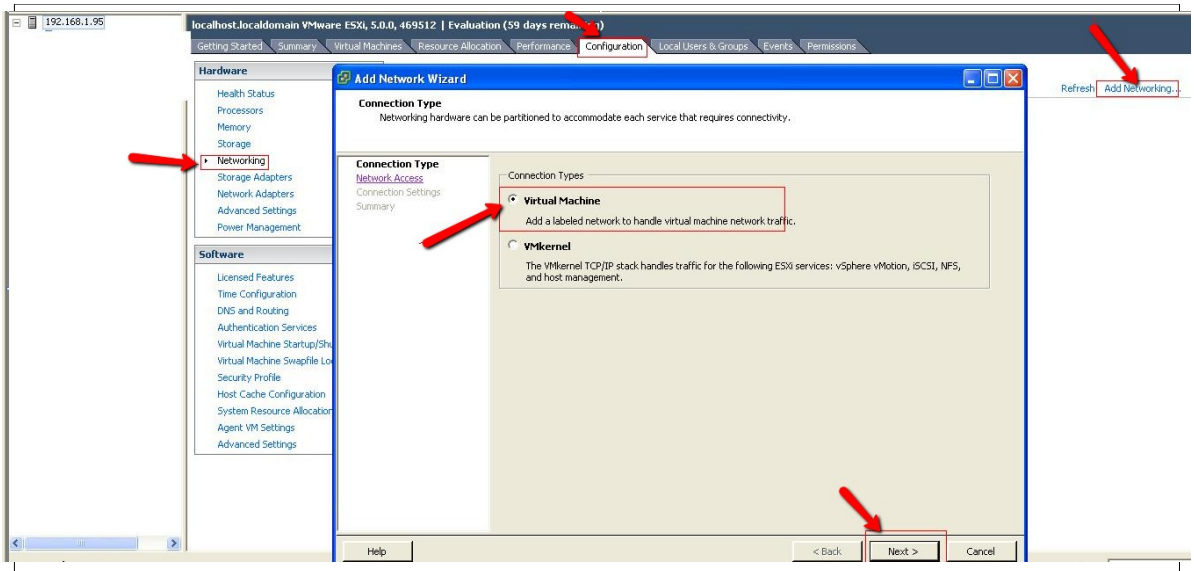
Provide following values to create a connection to “System Datastore”
Server : Ip address of OpenNebula Host . 192.168.1.98
Folder : as shared in /etc/exports of OpenNebula host - /var/lib/one/var/datastores/0
Datastore Name : 0
Finish storage creation.
2.
Select “Network File System” radio option and click “ Next”
Provide following values to create a connection to “VMWare Datastore”
Server : Ip address of OpenNebula Host . 192.168.1.98
Folder : as shared in /etc/exports of OpenNebula host - /var/lib/one/var/datastores/100
Datastore Name : 100
Finish storage creation.

Once Finished, you will get Datastores “0” and 100 will be created . You can test it by right clicking on the Datastore name and go for “Browse Data Store” . With that you will be able to browse through the /var/lib/one/var/datastores/0 and /var/lib/one/var/datastores/100 folders.

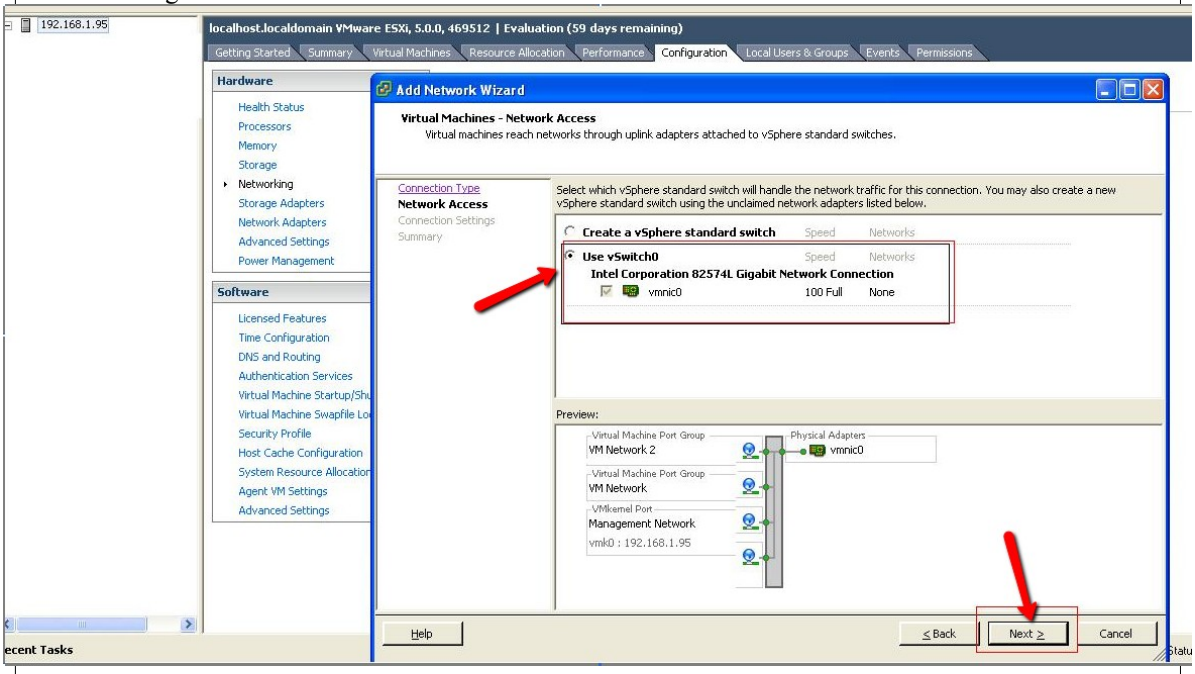


Next let's setup the Networking part. Let's assume we are going to create a Virtual Net with the Name”ESX Netwok” later in OpenNebula.

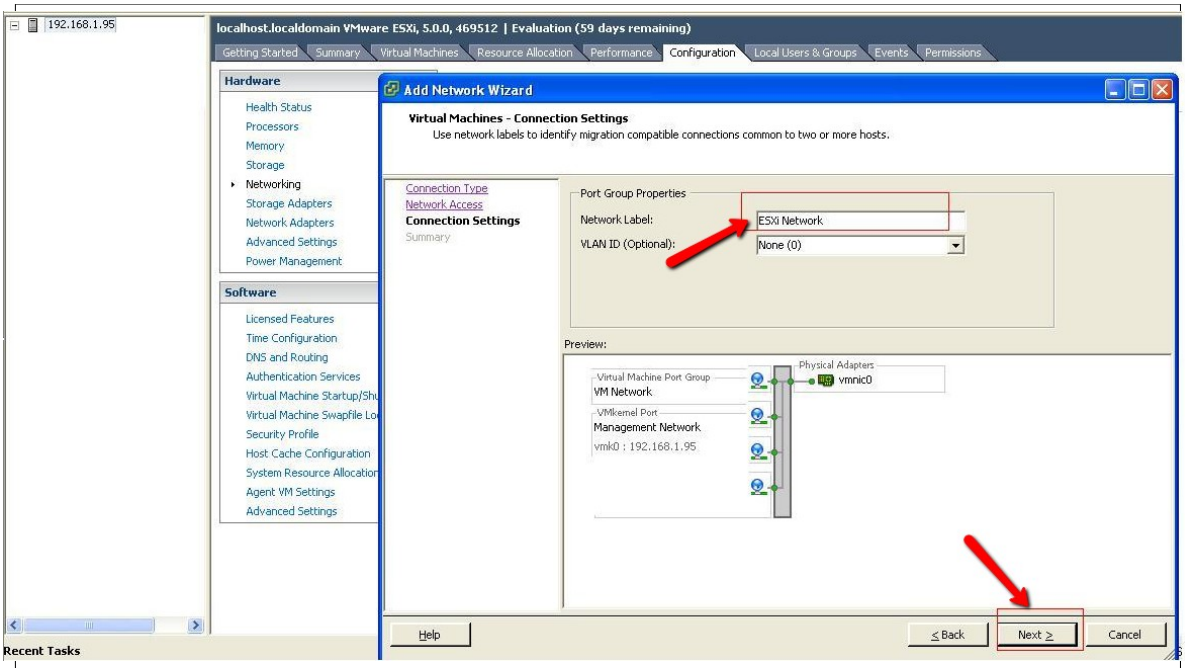
Click “Configuration” tab, Select “Networking “ from the left pane and click on “Add Networking” link
Select the Radio option “Virtual Machine” from the dialog displayed and click Next



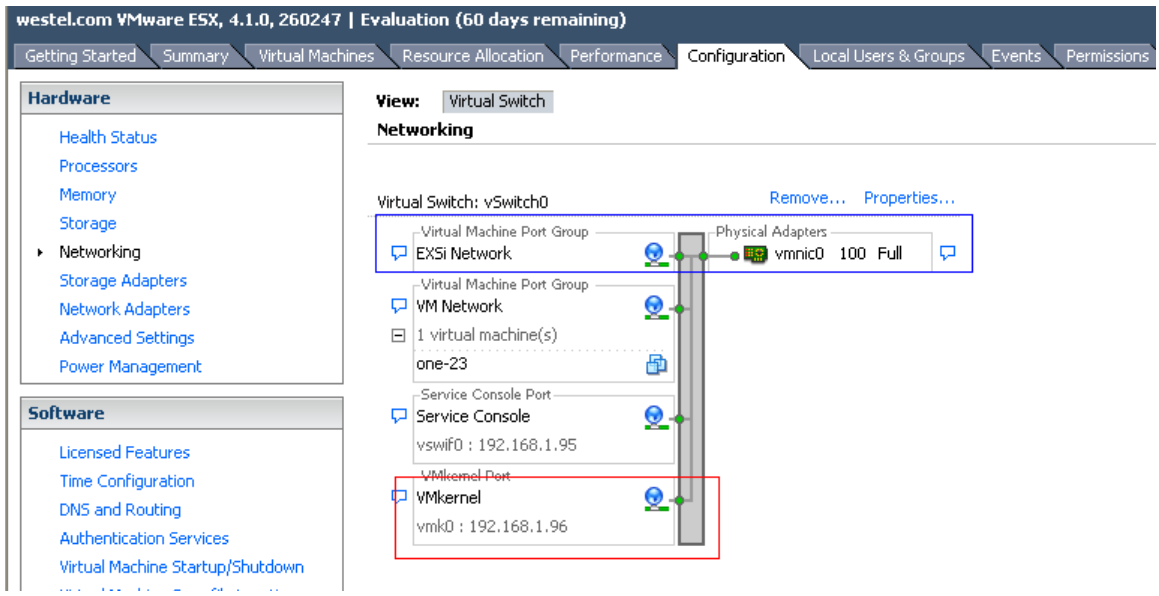
Select existing switch and click Next



Provide a Label “EXSi Network” and click Next. [remember this label as we will create similar one in OpenNebula”]

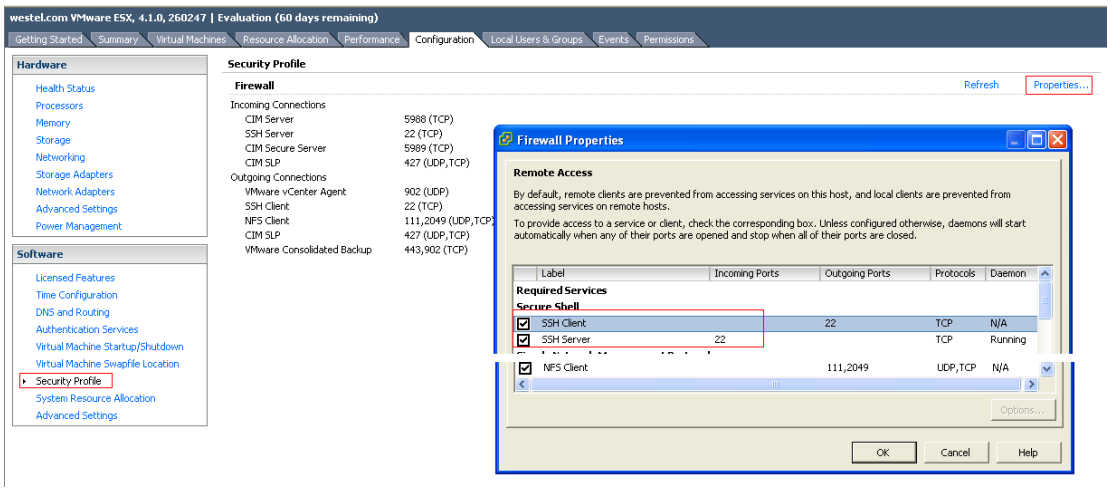


You will see that ESX virtual swich will now point the newly created network.



- **Next, enable Firewall properties for SSH [input and output]and NFS client**

1. Go to VSphere- Configuration – Security Profile screen and click Properties.
2. In the resulting page, check the options, SSH client, SSH Server and NFS client options



- **Let's create the NFS folders in ESXi Server and link them with same folders in OpenNebula front end.**

1. Login to ESXi 5.0 shell as root user. [if logged as oneadmin user, use "su" command and get the root shell]
2. Steps 1 to 4 can be added to rc.local also, so that you need to repreate these steps everytime VMWARE reboots.
3. Create folders for datastores **[I have given only the final mkdir command. You have to execute it for each non existent folders individually] and make oneadmin owner of them.**
4. [root@westel oneadmin]# mkdir /var/lib/one/var/datastores
5.
6. Create symlinks to the datastores 0 and 100 , created through VSPHERE
7. ln -s /vmfs/volumes/0/ /var/lib/one/var/datastores/
8. ln -s /vmfs/volumes/100/ /var/lib/one/var/datastores/
9. [root@westel oneadmin]# test it with ls var/lib/one/var/datastores/0
10. [root@westel oneadmin]# test it with ls var/lib/one/var/datastores/100
11. The contents should be exactly same as /vmfs/volumes/0/ and /vmfs/volumes/100/ respectively
12. Edit /etc/fstab and add the following two lines to the end of it. Save and exit
13. 192.168.1.98:/var/lib/one/var/datastores/0 /var/lib/one/var/datastores/0 nfs defaults 0 0
14. 192.168.1.98:/var/lib/one/var/datastores/100 /var/lib/one/var/datastores/100 nfs defaults 0 0
15. You will not be able to mount them in ESXi version. Just have it there.....

- **Assigning home folder /home/oneadmin for user oneadmin [needed only for TM= vmware.If TM=sahred, you may skip this step]**

1. The `create-homedir` codepath has been disabled on ESX/ESXi . Attempting to configure this behavior using the `/etc/likewise/lsassd.conf` file will not succeed. To configure home directories for Active Directory user accounts, the directories must be manually created.
2.
3. The `/etc/likewise/lsassd.conf` file can be modified to detail the location of the home directories once they exist by Adding or modifying these lines:

```
homedir-prefix = /home
homedir-template = %H/%U
```

4.
5. This causes the`homedir-prefix = /home` to set the starting point for all home

directories to be `/home` and `homedir-template = %H/%U` sets the home directory to be the `homedir-prefix %H` followed by the user account name `%U`.The variable `%D` can also be used to substitute the Active Directory domain name into the user's home directory.

6. Run these commands in sequence to restart the lsassd daemon and clear the Active Directory cache for these settings to take effect.
7. /etc/init.d/lsassd stop
8. rm /etc/likewise/db/lsass-adcache.filedb
9. /etc/init.d/lsassd start

- **Configure ESX for password less SSH from Front end.**

1. The access via SSH needs to be passwordless. Please follow the next steps to configure the ESX node:
2. login to the esxi host (ssh esxi01)
3. become root (su)
4. mkdir /home
5. mkdir /home/oneadmin
6. mkdir /etc/ssh/keys-oneadmin
7. chmod 755 /etc/ssh/keys-oneadmin/keys-oneadmin
8. chown -R oneadmin /etc/ssh/keys-oneadmin
9. touch /etc/ssh/keys-oneadmin/authorized_keys
10. chmod 600 /etc/ssh/keys-oneadmin//authorized_keys
11. chown -R oneadmin /etc/ssh/keys-oneadmin//authorized_keys
12. [You can add tto /etc/rc.local also so that these will be present when to restart ESXi]
13. Send ESXi ssh key to OpenNebula front end [**[needed only for TM= vmware.If TM=sahred, you may skip this step]**] to have passwordless login from ESXi to front end.
14. scp /etc/ssh/ssh_host_rsa_key.pub oneadmin@onehost:/var/lib/one/.ssh/authorized_keys
15. Test from ESXi Console with ssh onehost or ssh 192.168.1.98

That's it. Now let's move to Ubuntu Server to install OpenNebula

4 Configure Virsh with ESX

- `Install the pre-dependecy packages as root user`

```
root@apt-get install libgnutls-dev libdevmapper-dev libcurl4-gnutls-dev python-dev libnl-dev libapparmor-dev libxml2
```

- `Download Libvirt-0.9.10 so that we configure it for ESX support.[ for ESX 4.x version` Libvirt-0.9.2 is also fine]

- `Untar it post download and change folder to tarred one.`

```
root@wget http://libvirt.org/sources/libvirt-0.9.10.tar.gz
root@tar xvzf libvirt-0.9.10.tar.gz
root@cd libvirt-0.9.10
```

- `Configure Libvirt for ESX support , with the following commands`

```
root@ ./configure --with-esx --with-apparmor --sysconfdir=/etc --libdir=/usr/lib --sbindir=/usr/sbin
```

```
--datarootdir=/usr/share --localstatedir=/var --libexecdir=/usr/lib/libvirt

root@ make
root@ make install
root@cp -a examples/apparmor/usr.* /etc/apparmor.d/
root@cp -a examples/apparmor/TEMPLATE /etc/apparmor.d/libvirt/
root@cp -a examples/apparmor/libvirt-qemu /etc/apparmor.d/abstractions/
root@ cat /etc/apparmor.d/usr.sbin.libvirtd
root@cat /etc/apparmor.d/usr.sbin.libvirtd | grep owner
root@/etc/init.d/apparmor restart
```

Change user to oneadmin now

- Execute the below commands. Better to add below command to rc.local too

```
export PERL_LWP_SSL_VERIFY_HOSTNAME=0
```

- Let's test Virsh for ESX support with the below command. Provide credentials of "oneadmin" , as we have already created this user in ESX

```
virsh -c esx://esxi01/?no_verify=1 --readonly nodeinfo

You should get an output like the following

oneadmin@OneHost:/home/localadmin$  virsh -c esx://esxi01/?no_verify=1 --readonly nodeinfo
Enter username for esxi01 [root]: oneadmin
Enter oneadmin's password for esxi01:
CPU model:           Intel Xeon CPU E31230 @ 3.20GHz
CPU(s):              4
CPU frequency:       3192 MHz
CPU socket(s):       1
Core(s) per socket:  4
Thread(s) per core:  2
NUMA cell(s):        1
Memory size:         8106080 kB
```

- Execute the below command too to check if installation is proper

```
/var/lib/one/bin/tty_expect -u oneadmin -p redhat123 virsh -c esx://esxi01/?no_verify=1 --readonly nodeinfo
You should get an output like the following [same as above]
oneadmin@OneHost:/home/localadmin$ /var/lib/one/bin/tty_expect -u oneadmin -p redhat123 virsh -c esx://esxi01/?no_verify=1 --readonly nodeinfo

CPU model:           Intel Xeon CPU E31230 @ 3.20GHz
CPU(s):              4
CPU frequency:       3192 MHz
CPU socket(s):       1
Core(s) per socket:  4
Thread(s) per core:  2
NUMA cell(s):        1
Memory size:         8106080 kB
```

Now stop the one server
$ one stop

Download and install Vspehere CLI vSphere-CLI-4.1.0-254719.x86_64.tar.gz from vmware site . We require it to thin provision the vmdk files.

sudo apt-get install libxml-libxml-perl
sudo apt-get install libclass-methodmaker-perl
sudo apt-get install libcrypt-ssleay-perl
sudo apt-get install curl
tar -zxvf VMware-vSphere-CLI-4.1.0-254719.x86_64.tar.gz
cd vmware-vsphere-cli-distrib/
[if not done already,add oneadmin to /etc/sudoers as required]
sudo ./vmware-install.pl
[Accept the certificate by typing “yes”, rest cane be default values , unless you want to install the executable files to be installed in a folder different than /usr/bin]
Test it
export PERL_LWP_SSL_VERIFY_HOSTNAME=0
source ~/.bash_profile
Folowing command should execute:
esxcfg-nas -l --server esxi01 --username root

You will gett an output similar to below.
ooneadmin@OneHost:~$ source ~/.bash_profile
oneadmin@OneHost:~$ export PERL_LWP_SSL_VERIFY_HOSTNAME=0
oneadmin@OneHost:~$ esxcfg-nas -l --server esxi01 --username root
Enter password:
0 is /var/lib/one/var/datastores/0 from 192.168.1.98 mounted
100 is /var/lib/one/var/datastores/100 from 192.168.1.98 mounted

5 Configure OpenNebula for ESX support

1.Execute the below [you will get two cannot stat errors, just ignore]. Since OpeNebula VMWare addons are built in inside the openNebula Tar files, the below two lines in red are taken care by OpenNebula Install command.

```
mkdir -p $ONE_LOCATION/var/remotes/im/vmware.d && cp -r im/remotes/*     $ONE_LOCATION/var/remotes/im/vmware.d

mkdir -p $ONE_LOCATION/var/remotes/vmm/vmware && cp -r vmm/remotes/* $ONE_LOCATION/var/remotes/vmm/vmware
```

2.

Before restarting OpenNebula, you must type the user and password used to access to esxi01 and include a line into the sudoers file, so that OpenNebula may properly set some permissions

edit ~/etc/vmwarerc file and make following changes. If you donot have a Vcenter, just leave it as it is , as below.

```
# Libvirt congfiguration
:libvirt_uri: "'esx://@HOST@/?no_verify=1&auto_answer=1'"

# Username and password of the VMware hypervisor
:username: "oneadmin"
:password: "redhat123"

# VMotion configuration attributes
:datacenter: "ha-datacenter"
#:vcenter:
```

As a root user, edit /etc/sudoers file and add the following line, just below root   ALL=(ALL:ALL) ALL, If you have already added oneadmin to sudoers, just comment that line.

```
oneadmin ALL=NOPASSWD:/var/lib/one/var/remotes/hooks/fix_owner_perms.sh ""
```

Save Sudoers, exit and login back as oneadmin

edit ~/etc/vmm_exec/vmm_exec_vmware.conf and make the following changes

```
CPU    = 1
MEMORY = 256
OS     = [ ARCH = i686 ]
DISK   = [ DRIVER = file ]

# Name of the system datastore in the remote VMware hypervisors
# mounting DATASTORE_LOCATION/var/datastore/0 exported as a nfs share
# by the OpenNebula front-end. This would need to be changed
# *only* with custom TM drivers

DATASTORE = 0
```

1.

edit the file ~/etc/vmm_exec/vmm_execrc and add the following lines

```
        VMWARE_DATASTORE=0
DATASTORE_PATH=/var/lib/one/var/datastores/0
```

start one

```
one start
```

Test it by executing the below

```
oneadmin@OneHost:~$  /var/lib/one/var/remotes/im/run_probes vmware 0 esxi01
```

You should get an output like the following.


```
HYPERVISOR=vmware TOTALCPU=400 FREECPU=400 CPUSPEED=3192 TOTALMEMORY=8106080
FREEMEMORY=6484864

Note: if you get an error like  /usr/lib/libvirt.so.0: version `LIBVIRT_PRIVATE_0.9.2' not found (required by
/usr/bin/virsh), means you have ab earlier version of libvirt and /usr/bin/virsh is pointing to that.
Just  make a copy and then replace /usr/bin/virsh with /usr/local/bin/virsh. And try the command again )
```

- Start one server if not started

```
source ~/.bash_profile
one start
```

- Create a Vmware datastore, using a newly created config file ds.conf, with the following contents

- mkdir ~/templates

- nano ~/templates/ds.conf

```
NAME = production
DS_MAD = vmware
TM_MAD = shared
```

```
onedatastore create ds.conf
```

- Test it with list command. A new DS with ID 100 will be created.

```
oneadmin@OneHost:~$ onedatastore list
  ID NAME            CLUSTER  IMAGES TYPE     TM
   0 system          -             0 -        ssh
   1 default         -             0 fs       shared
 100 production      -             0 vmware   shared
```

- Note that TM for datastore 0 is ssh. If not make it SSH using command onedatastore update 0

- **Let's add ESX as a host in OpenNebula**

- Before adding, lets transfer the public key of front end to esxi server. Add oneadmin's front-end account public key (FE → $HOME/.ssh/id_{rsa,dsa}.pub) to the ESXi oneadmin account authorized_keys (ESXi → /etc/ssh/keys-oneadmin/authorized_keys)

```
cat ~/.ssh/id_rsa.pub | ssh root@esxi01 'cat >> /etc/ssh/keys-oneadmin/authorized_keys'
cat ~/.ssh/id_rsa.pub | ssh root@esxi01 'cat >> /etc/ssh/keys-root/authorized_keys'
 or
scp ~/.ssh/id_rsa.pub root@esxi01:etc/ssh/keys-oneadmin/authorized_keys
scp ~/.ssh/id_rsa.pub root@esxi01:etc/ssh/keys-root/authorized_keys
```

- Test the password less ssh connection with esxi01. You should get an output like below. No password hint to be there.

oneadmin@OneHost:~$ ssh esxi01
Last login: Mon Apr 30 12:20:13 2012 from 192.168.1.9
[oneadmin@westel ~]$

- ***Now let's add ESX as a host in OpenNebula***

```
onehost create esxi01 -i im_vmware -v vmm_vmware -n dummy
```

- Test it with onehost list. You should get an oupt like the below. If you get STAT as "err" troubleshoot using ~/var/oned.log file.

```
oneadmin@OneHost:~/vmware-vsphere-cli-distrib$ onehost list
  ID NAME       CLUSTER    RVM   TCPU   FCPU   ACPU   TMEM   FMEM   AMEM STAT
   0 esxi01          -        0    400    400    400   7.7G    6.2G    7.7G on
```

- Create a folder ~/images [mkdir ~/images]

- Now let's create a network template file with the name ~/templates/esxinetwork.net [Note that the "Name" is same as one we created in ESX server networking configuration]

```
NAME           = "ESX Network"
TYPE           = RANGED
PUBLIC         = NO
BRIDGE         = "VM Network"
NETWORK_ADDRESS = 192.168.1.160
NETWORK_SIZE    = 16
NETMASK        = 255.255.255.0
GATEWAY        = 192.168.1.1
DNS            = 192.168.1.1
```

- Create a Vnet in OpenNebula

```
onevnet create esxinetwork.net
```

- Test it


```
oneadmin@OneHost:~/images$ onevnet list
  ID USER     GROUP    NAME            TYPE BRIDGE PUB  LEASES
   0 oneadmin oneadmin ESX Network       R VM Net  No       0
```

- **Uploading VMWARE VMDK files to datastore** :
  - If you have vmdk files[already thin provisioned] copied from an existing VMWARE instance , just skip the following portion in "blue" and directly copy the vmdk files to /var/images folder. Just donot forget to rename the main vmdk file to disk.vmdk.
  - Else, Download VMWARE virtual appliance for Ubuntu desktop 11.10

Download it from http://www.trendsigma.net/vmware/ubuntu1110t.html
You may get a file ubuntu1110t.zip.

As root user ,Create a folder /var/images
mkdir /var/images
As root user, change the owner to oneadmin
sudo chown -R oneadmin /var/images

as oneadmin user ,create a folder images within /var/lib/one/ folder.
mkdir ~/images

unzip the VA ubuntu1110.zip to ~/images folder
oneadmin@OneHost:~/images/unzip Ubuntu1110.zip

change folder to Ubuntu1110
cd ~/imager/ Ubuntu1110

You may get following files in the Ubuntu1110 folder

oneadmin@OneHost:~/images/Ubuntu1110$ ls
nvram Ubuntu-s002.vmdk Ubuntu-s005.vmdk Ubuntu-s008.vmdk Ubuntu-s011.vmdk Ubuntu-s014.vmdk Ubuntu-s017.vmdk Ubuntu-s020.vmdk Ubuntu.vmsd
Readme.txt Ubuntu-s003.vmdk Ubuntu-s006.vmdk Ubuntu-s009.vmdk Ubuntu-s012.vmdk Ubuntu-s015.vmdk Ubuntu-s018.vmdk Ubuntu-s021.vmdk Ubuntu.vmx
Ubuntu-s001.vmdk Ubuntu-s004.vmdk Ubuntu-s007.vmdk Ubuntu-s010.vmdk Ubuntu-s013.vmdk Ubuntu-s016.vmdk Ubuntu-s019.vmdk **Ubuntu.vmdk**

Copy [only] all the vmdk files to ~/var/images folder
mkdir ~/var/datastores/100/images
cp ~/images/Ubuntu1110/*.vmdk ~/var/datastores/100/images

Rename the Ubuntu.vmdk file to disk.vmdk
mv ~/var/datastores/100/images/Ubuntu.vmdk ~/var/datastores/100/images/disk.vmdk

Convert Ubuntu.vmdk to a thin provisioned flat file:

- Now let's convert the disk.vmdk file to a "thin provisioned" file using Vsphere CLI command "vmkfstools"
- Change folder to CLI installation home.

```
cd ~/vmware-vsphere-cli-distrib/bin [or where ever you untared and installed it]

export PERL_LWP_SSL_VERIFY_HOSTNAME=0
```

- Convert disk.vmdk to thin provisioned and save resulting file as disk1.vmdk. [Note: You can monitor the progress through VSphere]

```
vmkfstools -username root  -password redhat123 -server esxi01 -i '[100] /images/disk.vmdk'  -d thin '[100] /images/disk1.vmdk'
```

- Move existing disk.vmdk to ~/images folder and rename disk1.vmdk to disk.vmdk

```
mv ~/var/datastores/100/images/disk.vmdk ~/images
mv ~/var/datastores/100/images/disk1.vmdk ~/var/datastores/100/images/disk.vmdk
```

- Just list to find out everything is proper

```
ls ~/var/datastores/100/images
```

- You will find a new file disk1-flat.vmdk. Do not rename it. Just leave all other files untouched.

- Move all *.vmdk files to /var/images folder, so that it will be safe away from opennebula shared folders.

```
mv ~/var/datastores/100/images/*.vmdk /var/images
```

- Now let's create a OpenNebula Image template named ~/templates/ubuntuvmdk.img and store below given content in it

```
NAME = Ubuntu_11_vmdk
PATH = /var/images
TYPE = OS
```

- Create oneimage using ubuntuvmdk.img template

```
oneimage create  ubuntuvmdk.img --datastore production
```

- Monitor the status change to "rdy" status . It will take a while based on the size.

```
oneimage top

You may get an output like the following  [it will take a while to transfer huge files]
 oneadmin@OneHost:~/images$ oneimage list
  ID USER     GROUP    NAME            DATASTORE     SIZE TYPE PER STAT  RVMS
  1 oneadmin oneadmin Ubuntu_11_vm production          42.8G  OS    No    rdy     0

 [in case of errors, use ~/var/oned.log for troubleshooting]
```

On a successful copy ~/var/oned.log may contain the following: lines:

```
Sat Apr 28 20:18:34 2012 [ImG][D]: Message received: LOG I 1 cp: Copying local disk folder /var/images to the image repository
Sat Apr 28 20:18:34 2012 [ImM][I]: cp: Copying local disk folder /var/images to the image repository
Sat Apr 28 20:18:34 2012 [ImG][D]: Message received: LOG I 1 ExitCode: 0
Sat Apr 28 20:18:34 2012 [ImM][I]: ExitCode: 0
Sat Apr 28 20:18:34 2012 [ImG][D]: Message received: CP SUCCESS 1 /var/lib/one/var/datastores/100/e6e41998aa86ab39ed9cc7d759c57d1e 43847
Sat Apr 28 20:18:34 2012 [ImM][I]: Image copied and ready to use.
```

Also , get details using the show command, note that "SOURCE" is the datastore we created,

```
oneadmin@OneHost:~/templates$ oneimage show 1
IMAGE 1 INFORMATION
ID             : 1
NAME           : Ubuntu_11_vmdk
USER           : oneadmin
GROUP          : oneadmin
DATASTORE      : production
TYPE           : OS
REGISTER TIME  : 04/28 20:14:23
PERSISTENT     : No
SOURCE         : /var/lib/one/var/datastores/100/e6e41998aa86ab39ed9cc7d759c57d1e
PATH           : /var/images
SIZE           : 43847
STATE          : rdy
RUNNING_VMS    : 0

PERMISSIONS
OWNER          : um-
GROUP          : ---
OTHER          : ---

IMAGE TEMPLATE
DEV_PREFIX="hd"
```

- `Create a onevm template with the name ~/templates/ubuntu.one and store below content in it`

```
NAME   = "UbuntuServer-01"
CPU    = 1
MEMORY = 512
# if the  IMAGE_ID is different in you case change the value accordingly
DISK   = [ IMAGE_ID  ="1",
       TARGET = hda, BUS = ide ]

NIC    = [ NETWORK = "ESX Network" ]
OS=[  ARCH=i686,   BOOT=hd ]
GRAPHICS=[   TYPE=vnc ]
#FEATURES=[ ACPI=yes ]
```

- **`Now , time to create a new VM`**

```
onevm create ubuntu.one
```

- Check the status using onevm top command.

```
oneadmin@OneHost:~/images$ onevm top
```

```
ID     USER     GROUP    NAME            STAT CPU     MEM        HOSTNAME        TIME
 2     oneadmin oneadmin UbuntuServer    runn   0       0K         esxi01          00 01:22:20
```

- If the STAT shows "Err" instead of "runn", we need to troubleshoot

- Troubleshoot the cause for failure from ~/var/<vmid>/vm.log file

A sample error : You may get error messages stating the following in the log file

```
[VMM][I]: Command execution fail: /var/lib/one/var/remotes/vmm/vmware/deploy /var/lib/one/var/16/deployment.0 esxi01 16 esxi01
[VMM][I]: [VMWARE] cmd failed [/var/lib/one/bin/tty_expect -u oneadmin -p redhat123 virsh -c esx://esxi01/?no_verify=1 start one-16]. Stderr:
[VMM][I]: error: Failed to start domain one-16
[VMM][I]: error: internal error Could not start domain: GenericVmConfigFault - Module DevicePowerOn power on failed.
[VMM][I]:
[VMM][I]:
[VMM][I]: . Stdout: ExitCode: 1
VMM][I]:   ExitCode: 1
[VMM][I]:  Failed to execute virtualization driver operation: deploy.
[VMM][E]: Error deploying virtual machine
[DiM][I]:    New VM state is FAILED
```

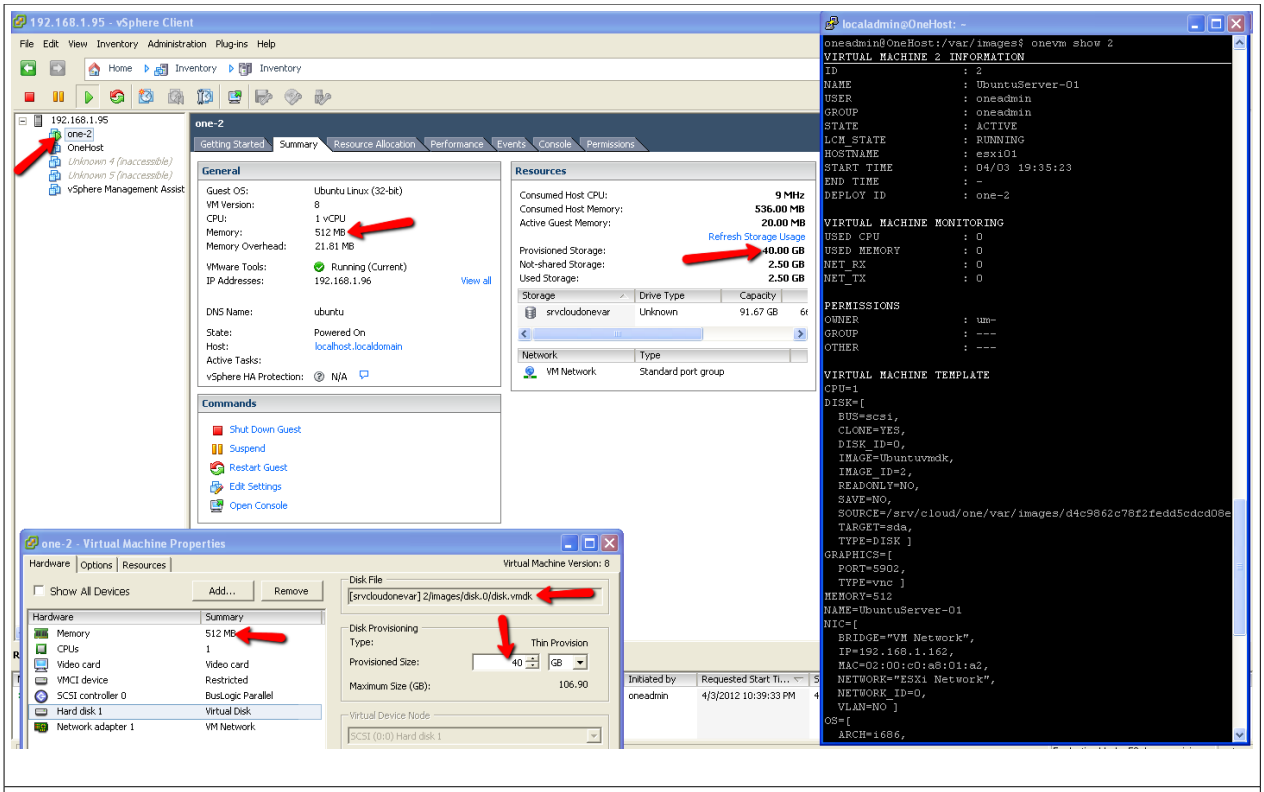
- This error shows that the disk.vmdk is not properly thin provisioned. Hence you need to repeat the thin provisioning steps once again properly.

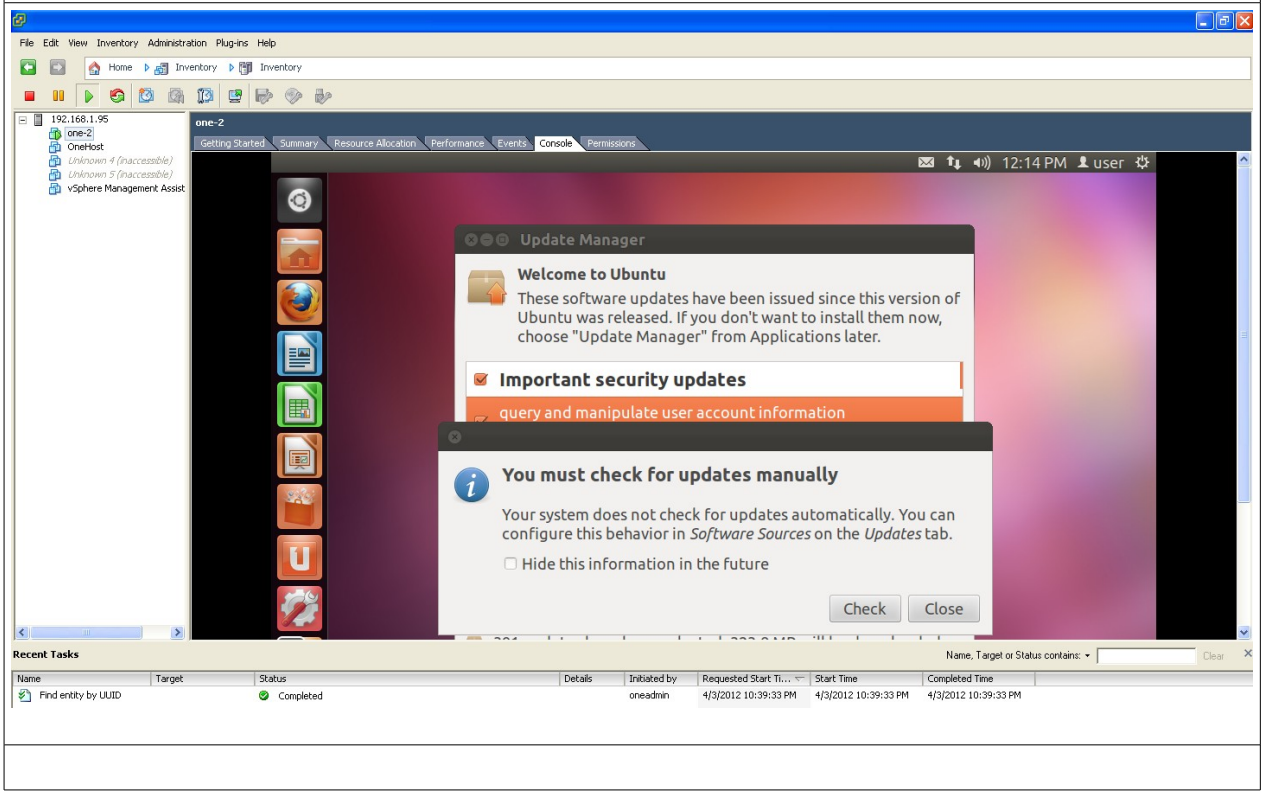
Another sample error:

```
Tue Apr  3 17:07:46 2012 [VMM][I]: Successfully execute network driver operation: pre.
Tue Apr  3 17:08:12 2012 [VMM][I]: Command execution fail:
/var/lib/one/var/remotes/vmm/vmware/deploy /var/lib/one/var/1/deployment.0 esxi01 1 esxi01
Tue Apr  3 17:08:12 2012 [VMM][D]: deploy: Successfully defined domain one-1.
Tue Apr  3 17:08:12 2012 [VMM][E]: deploy: Error executing: virsh -c esx://esxi01/?no_verify=1
start one-1 err: ExitCode: 1
Tue Apr  3 17:08:12 2012 [VMM][I]: out:
Tue Apr  3 17:08:12 2012 [VMM][I]: error: Failed to start domain one-1
Tue Apr  3 17:08:12 2012 [VMM][I]: error: internal error Could not start domain:
GenericVmConfigFault - Reason: The file specified is not a virtual disk.
Tue Apr  3 17:08:12 2012 [VMM][I]:
Tue Apr  3 17:08:12 2012 [VMM][I]: ExitCode: 1
Tue Apr  3 17:08:12 2012 [VMM][I]: Failed to execute virtualization driver operation: deploy.
Tue Apr  3 17:08:12 2012 [VMM][E]: Error deploying virtual machine
Tue Apr  3 17:08:12 2012 [DiM][I]: New VM state is FAILED
Tue Apr  3 19:23:18 2012 [DiM][I]: New VM state is DONE.
```

- This error also shows that the disk.vmdk is not properly thin provisioned. Hence you need to repeat the thin provisioning steps once again properly.

- Let's watch it from VSphere window and onevm show <vmid>


192.168.1.95 - vSphere Client
File Edit View Inventory Administration Plug-ins Help
Home Inventory Inventory
192.168.1.95
one-2
OneHost
vSphere Management Assist
one-2
Getting Started Summary Resource Allocation Performance Events Console Permissions
General
Guest OS: Ubuntu Linux (32-bit)
VM Version: 8
CPU: 1 vCPU
Memory: 512 MB
Memory Overhead: 21.81 MB
VMware Tools: Running (Current)
IP Addresses: 192.168.1.96 View all
DNS Name: ubuntu
State: Powered On
Host: localhost.localdomain
Active Tasks:
vSphere HA Protection: N/A
Resources
Consumed Host CPU: 9 MHz
Consumed Host Memory: 536.00 MB
Active Guest Memory: 20.00 MB
Refresh Storage Usage
Provisioned Storage: 40.00 GB
Not-shared Storage: 2.50 GB
Used Storage: 2.50 GB
Storage Drive Type Capacity
srvcloudonevar Unknown 91.67 GB
Network Type
VM Network Standard port group
Commands
Shut Down Guest
Suspend
Restart Guest
Edit Settings
Open Console
one-2 - Virtual Machine Properties
Hardware Options Resources
Virtual Machine Version: 8
Show All Devices
Add... Remove
Hardware Summary
Memory 512 MB
CPUs 1
Video card Video card
VMCI device Restricted
SCSI controller 0 BusLogic Parallel
Hard disk 1 Virtual Disk
Network adapter 1 VM Network
Disk File
[srvcloudonevar] 2/images/disk.0/disk.vmdk
Disk Provisioning
Type: Thin Provision
Provisioned Size: 40 GB
Maximum Size (GB): 106.90
Virtual Device Node
SCSI (0:0) Hard disk 1
Initiated by Requested Start Ti...
oneadmin 4/3/2012 10:39:33 PM
localadmin@OneHost: ~
oneadmin@OneHost:/var/images$ onevm show 2
VIRTUAL MACHINE 2 INFORMATION
ID : 2
NAME : UbuntuServer-01
USER : oneadmin
GROUP : oneadmin
STATE : ACTIVE
LCM_STATE : RUNNING
HOSTNAME : esxi01
START TIME : 04/03 19:35:23
END TIME : -
DEPLOY ID : one-2
VIRTUAL MACHINE MONITORING
USED CPU : 0
USED MEMORY : 0
NET_RX : 0
NET_TX : 0
PERMISSIONS
OWNER : um-
GROUP : ---
OTHER : ---
VIRTUAL MACHINE TEMPLATE
CPU=1
DISK=[
BUS=scsi,
CLONE=YES,
DISK_ID=0,
IMAGE=Ubuntuvmdk,
IMAGE_ID=2,
READONLY=NO,
SAVE=NO,
SOURCE=/srv/cloud/one/var/images/d4c9862c78f2fedd5cdcd08e
TARGET=sda,
TYPE=DISK]
GRAPHICS=[
PORT=5902,
TYPE=vnc]
MEMORY=512
NAME=UbuntuServer-01
NIC=[
BRIDGE="VM Network",
IP=192.168.1.162,
MAC=02:00:c0:a8:01:a2,
NETWORK="ESXi Network",
NETWORK_ID=0,
VLAN=NO]
OS=[
ARCH=i686,


File Edit View Inventory Administration Plug-ins Help
Home Inventory Inventory
192.168.1.95
one-2
OneHost
vSphere Management Assist
one-2
Getting Started Summary Resource Allocation Performance Events Console Permissions
12:14 PM user
Update Manager
Welcome to Ubuntu
These software updates have been issued since this version of Ubuntu was released. If you don't want to install them now, choose "Update Manager" from Applications later.
Important security updates
query and manipulate user account information
You must check for updates manually
Your system does not check for updates automatically. You can configure this behavior in Software Sources on the Updates tab.
Hide this information in the future
Check
Close
Recent Tasks
Name, Target or Status contains:
Name Target Status Details Initiated by Requested Start Ti... Start Time Completed Time
Find entity by UUID Completed oneadmin 4/3/2012 10:39:33 PM 4/3/2012 10:39:33 PM 4/3/2012 10:39:33 PM

6 Using Transfer mode as VMWARE

- Download the copy of "clone" file available in http://dev.opennebula.org/issues/1260 and store it in /var/lib/one folder. Replace existing one with it

  cp /var/lib/one/var/remotes/tm/vmware/clone /var/lib/one/var/remotes/tm/vmware/clone.bk

  mv /var/lib/one/clone /var/lib/one/var/remotes/tm/vmware/clone

- List datastores.

```
oneadmin@OneHost:~$ onedatastore list
  ID NAME          CLUSTER  IMAGES TYPE          TM
   0 system                -      0 -             ssh
   1 default               -      0 fs            shared
 100 production            -      0 vmware        shared
```

- Change TM for datastore 100 to VMWARE using **the command and change the TM to vmware in the resulting VI editor**

  onedatastore update 0
  DS_MAD="vmware"
  TM_MAD="vmware"

```
oneadmin@OneHost:~$ onedatastore list
  ID NAME          CLUSTER  IMAGES TYPE          TM
   0 system                -      0 -             ssh
   1 default               -      0 fs            shared
 100 production            -      1 vmware        vmware
```

- Rest of the steps will be same as TM="shared". That means , just create the VM.

- Transfer id_rsa.pub of onehost to Authorized-keys files of keys-root of esxi. That means onehost should ssh to root@esxi01 password less.

  ```
  cat ~/.ssh/id_rsa.pub | ssh root@esxi01 'cat >> /etc/ssh/keys-root/authorized_keys'
  ```

7 Using Transfer mode as SSH

- List datastores.

```
oneadmin@OneHost:~$ onedatastore list
  ID NAME          CLUSTER  IMAGES TYPE          TM
   0 system                -      0 -             ssh
   1 default               -      0 fs            shared
 100 production            -      0 vmware        shared
```

Change TM for datastore 100 to VMWARE using the command and change the TM to ssh in the resulting VI editor

onedatastore update 0
DS_MAD="vmware"
TM_MAD="ssh"

```
oneadmin@OneHost:~$ onedatastore list
  ID NAME            CLUSTER  IMAGES TYPE        TM
   0 system              -       0    -           ssh
   1 default             -       0    fs          shared
 100 production          -       1    vmware      shh
```

- Transfer id_rsa.pub of onehost to Authorized-keys files of onehost. That means onehost should ssh to itself password less.

```
cat ~/.ssh/id_rsa.pub | ssh oneadmin@onehost 'cat >> ~/.ssh/authorized_keys'
```

- Transfer ssh_host_rsa_key.pub of esxi to Authorized-keys files of onehost. That means esxi should ssh to onehost password less.

```
scp /etc/ssh/ssh_host_rsa_key.pub
   oneadmin@onehost:/var/lib/one/.ssh/authorized_keys
```

- Rest of the steps will be same as TM="shared". That means , just create the VM.

Additi0onal informationCONTEXTUALIZATION:

- Once you thin provision the vmdk file and rename the main vmdk to disk.vmdk,use virtual shell to deploy the vmdk file to VMWARE , so that we can perform nessary updates and modifications to the image before a VM is being created through OpenNebula.

- In order to edit the vmdk file create a deployment script and store it in ~/images folder with the name deployment.0.

- Store the following content in it. Note we name the vm as "ubuntu". We need this name to start the VM

```
<domain type='vmware'>
        <name>ubuntu</name>
        <memory>524288</memory>
        <os>
                <type arch='i686'>hvm</type>
        </os>
        <devices>
                <disk type='file' device='disk'>
                        <source file='[100] /images/ubuntu/disk.vmdk'/>
                        <target dev='hda' bus='ide'/>
                </disk>
                <interface type='bridge'>
                        <source bridge='VM Network'/>
                        <mac address='02:00:c0:a8:01:a2'/>
                </interface>
        </devices>
</domain>
```

- Deploy the vmdk image in ESX server using below command


```
/var/lib/one/var/remotes/vmm/vmware/deploy /var/lib/one/images/deployment.0
esxi01 1 esxi01
```

- Normally VM starts in ESX.If VM does not starts, Start the VM using following command

```
virsh -c esx://esxi01/?no_verify=1 start ubuntu
```

- Login to Vspehere and you will notice that a VM with name "ubuntu" in running state. Perform necessary modification. I am going to add following lines to /etc/rc.local , before "exit 0 ", so that the context script will be executed on "boot"

```
mount -t iso9660 /dev/cdrom1 /mnt
if [ -f /mnt/context.sh ];
then
. /mnt/init.sh
fi
umount /mnt
```

- Shutdown the VM
- copy the disk.vmdk and other vmdk files to /var/images
- create a new oneimage as you did earlier
- Now add context information to ~/images/ubuntu.one
- add following lines to the top of ubuntu.one

```
CONTEXT = [ hostname = ubuntu,
ip_public = "$NIC[IP, NETWORK=\"ESX Network\"]",
username = user,
dns = "$NETWORK[DNS, NETWORK_ID=0]",
password = "password",
files = "/var/lib/one/images/id_rsa.pub  /var/lib/one/images/init.sh"]
```

- Copy id_rsa.pub from ~/.ssh to ~/images folder
- Create a file ~/images/init.sh and add following lines to it [self explanatory]

```
#!/bin/bash
if [ -f /mnt/context.sh ]; then
. /mnt/context.sh
fi
hostname $HOSTNAME
ifconfig eth0 $IP_PUBLIC
useradd -m $USERNAME
mkdir -p /home/$USERNAME/.ssh
cat /mnt/id_rsa.pub >> /home/$USERNAME/.ssh/authorized_keys
echo nameserver $DNS >  /etc/resolv.conf
chown -R $USERNAME /home/$USERNAME


#update host file with IP address of Ubuntu server
echo $IP_PUBLIC $HOSTNAME >> /etc/hosts


#update /etc/network/interfaces file with static IP
```


```
sed -i -e 's/dhcp/static/g' /etc/network/interfaces
echo address $IP_PUBLIC >> /etc/network/interfaces
echo netmask 255.255.255.0 >> /etc/network/interfaces
echo gateway 192.168.1.1 >> /etc/network/interfaces


# restart networking
```

- Create a new VM

```
onevm create ubuntu.one
```

- You will see that IP address , hostname etc are set as specified in CONTEXT

If you liked this tutorial post a comment to cloud.b.lab@zoho.com or admin@cloud-b-lab.co.in – Anil Kumar