**********WAREWULF_Cluster INSTAALLATION**********

## _____ LAB _____

**# create 1 vm of centos image with two network adapter (ens33,ens36)**

**# system update**
yum update

**# disable selinux**setenforce 0
'or'
vi /etc/selinux/config
SELINUX=disabled

```
# This file controls the state of SELinux on the system.
# SELINUX= can take one of these three values:
#     enforcing - SELinux security policy is enforced.
#     permissive - SELinux prints warnings instead of enforcing.
#     disabled - No SELinux policy is loaded.
SELINUX=disabled
# SELINUXTYPE= can take one of three values:
#     targeted - Targeted processes are protected,
#     minimum - Modification of targeted policy. Only selected processes are protected.
#     mls - Multi Level Security protection.
SELINUXTYPE=targeted
```

**# firewall disable**
systemctl disable firewalld
systemctl stop firewalld

# build repo file
yum install
http://build.openhpc.community/OpenHPC:/1.3/CentOS_7/x86_64/ohpc-release-1.3-1.el7.x86_64.rpm -y

**# install utils**
yum -y install yum-utils

**# install ohpc-base**
yum -y install ohpc-base

**# install ohpc-waewolf**
yum -y install ohpc-warewulf

**# Edit this file**

vi /etc/warewulf/provision.conf

change network device = ens36

```
# What is the default network device that the master will use to
# communicate with the nodes?
network device = ens36

# Which DHCP server implementation should be used?
dhcp server = isc

# What is the TFTP root directory that should be used to store the
# network boot images? By default Warewulf will try and find the
# proper directory. Just add this if it can't locate it.
#tftpdir = /var/lib/tftpboot

# Automatically generate and manage a dynamnic_host virtual file
# object in the datastore? This is useful for provisioning this
# out to nodes so they always have a current /etc/hosts file.
generate dynamic_hosts = yes

# Should we manage and overwrite the local hostfile file on this
# system? This will cause all node entries to be added
# automatically to /etc/hosts.
update hostfile = yes

# If no cluster/domain is set on a node, should we add 'localdomain'
# as the default domain
use localdomain = yes

# The default kernel arguments to pass to the nodes boot kernel
default kargs = "net.ifnames=0 biosdevname=0 quiet"
```

**# Edit this file**

vi /etc/xinetd.d/tftp

```
# default: off
# description: The tftp server serves files using the trivial file trans
fer \
#       protocol.  The tftp protocol is often used to boot diskless \
#       workstations, download configuration files to network-aware prin
ters, \
#       and to start the installation process for some operating systems
.
service tftp
{
        socket_type             = dgram
        protocol                = udp
        wait                    = yes
        user                    = root
        server                  = /usr/sbin/in.tftpd
        server_args             = -s /var/lib/tftpboot
        disable                 = no
        per_source              = 11
        cps                     = 100 2
        flags                   = IPv4
}
~
```

#
ifconfig ${INT_NIC}

```
[root@localhost ~]# ifconfig ${INT_NIC}
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.174.203  netmask 255.255.255.0  broadcast 192.168.174.255
        inet6 fe80::daf8:a887:13b9:4316  prefixlen 64  scopeid 0x20<link>
        inet6 fe80::1bfd:21f6:cea3:421b  prefixlen 64  scopeid 0x20<link>
        inet6 fe80::d594:f147:4c5e:f6b9  prefixlen 64  scopeid 0x20<link>
        ether 00:0c:29:98:3d:36  txqueuelen 1000  (Ethernet)
        RX packets 72518  bytes 107503571 (102.5 MiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 5679  bytes 384518 (375.5 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

ens36: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.100.157  netmask 255.255.255.0  broadcast 192.168.100.255
        inet6 fe80::f26f:2b27:ba3b:a96e  prefixlen 64  scopeid 0x20<link>
        ether 00:0c:29:98:3d:40  txqueuelen 1000  (Ethernet)
        RX packets 86  bytes 9330 (9.1 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 53  bytes 9489 (9.2 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 64  bytes 5568 (5.4 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 64  bytes 5568 (5.4 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

virbr0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        inet 192.168.122.1  netmask 255.255.255.0  broadcast 192.168.122.255
        ether 52:54:00:c0:ba:bc  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

**# restart xinetd service**
systemctl restart xinetd

**# enable mariadb service**
systemctl enable mariadb.service

**# Restart mariadb**
systemctl restart mariadb

**# Enable httpd service**
systemctl enable httpd.service

**# Restart httpd service**

systemctl restart httpd

**# Enable httpd service**
systemctl enable dhcpd.service

**# Export centos image**
export CHROOT=/opt/ohpc/admin/images/centos7.7

**# Check your image on root**
echo ${CHROOT}

```
[root@master ~]# echo ${CHROOT}
/opt/ohpc/admin/images/centos7.7
```

**# ???????**
wwmkchroot centos-7 $CHROOT

**# ??????**
uname -r

**# ????????**
chroot ${CHROOT} uname -r

```
[root@warewulf ~]# uname -r
3.10.0-1160.el7.x86_64
[root@warewulf ~]# chroot ${CHROOT} uname -r
3.10.0-1160.el7.x86_64
[root@warewulf ~]#
```

**# install ohpc-compute**
yum -y --installroot=$CHROOT install ohpc-base-compute

# see resolv.conf.file
cat /etc/resolv.conf

```
[root@warewulf ~]# cat /etc/resolv.conf
# Generated by NetworkManager
search localdomain
master 192.168.100.157
nameserver 192.168.174.2
nameserver 192.168.100.1
[root@warewulf ~]#
```

**# ?????????????**
cp -p /etc/resolv.conf $CHROOT/etc/resolv.conf

**# install root kernal**

yum -y --installroot=$CHROOT install kernel

**# install root ohpc**
yum -y --installroot=$CHROOT install lmod-ohpc

**# ?????????????**
wwinit database

```
[root@warewulf ~]# wwinit database
database:     Checking to see if RPM 'mysql-server' is installed     NO
database:     Checking to see if RPM 'mariadb-server' is installed   OK
database:     Activating Systemd unit: mariadb
database:      + /bin/systemctl -q enable mariadb.service            OK
database:      + /bin/systemctl -q restart mariadb.service           OK
database:     Database version: 1
database:      + mysql --defaults-extra-file=/tmp/0.EzQVHU5JSZny/my.cnf war
ew                                                                   OK
database:      + mysql --defaults-extra-file=/tmp/0.EzQVHU5JSZny/my.cnf war
ew                                                                   OK
database:     Checking binstore kind                                 SUCCES
S
Done.
```

**# ?????????????????**
wwinit ssh_keys

```
[root@warewulf ~]# wwinit ssh_keys
ssh_keys:     Checking ssh keys for root
OK
ssh_keys:     Checking root's ssh config
OK
ssh_keys:     Checking for default RSA host key for nodes
OK
ssh_keys:     Checking for default DSA host key for nodes
OK
ssh_keys:     Checking for default ECDSA host key for nodes
OK
ssh_keys:     Checking for default Ed25519 host key for nodes
OK
Done.
```

**# ??????????**
df -hT | grep -v tmpfs

```
[root@warewulf ~]# df -hT | grep -v tmpfs
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/sda3      xfs        98G  7.7G   90G   8% /
/dev/sda1      xfs       297M  152M  145M  52% /boot
```

**# check hostname**
hostname

```
[root@warewulf ~]# hostname
warewulf
```

**# see this file**
cat  ${CHROOT}/etc/fstab

```
[root@localhost ~]# cat  ${CHROOT}/etc/fstab
#GENERATED_ENTRIES#
tmpfs /dev/shm tmpfs defaults 0 0
devpts /dev/pts devpts gid=5,mode=620 0 0
sysfs /sys sysfs defaults 0 0
proc /proc proc defaults 0 0
```

**# ???????????**
echo "master:/home /home nfs nfsvers=3,nodev,nosuid 0 0" >> $CHROOT/etc/fstab

**# ???????????**
echo "master:/opt/ohpc/pub /opt/ohpc/pub nfs nfsvers=3,nodev 0 0" >> $CHROOT/etc/fstab

**# ??????????????**
echo "/home *(rw,no_subtree_check,fsid=10,no_root_squash)" >> /etc/exports

**# ?????????????**
echo "/opt/ohpc/pub *(ro,no_subtree_check,fsid=11)" >> /etc/exports

**# ???????????/**
exportfs -arv

```
[root@master ~]# exportfs -arv
exporting *:/opt/ohpc/pub
exporting *:/home
```

**# Start nfs-server**
systemctl start nfs-server

**# Check nfs-server status**
systemctl status nfs-server

**# Enable nfs-server status**
systemctl enable nfs-server

**# import password file**
wwsh file import /etc/passwd

```
[root@warewulf ~]# wwsh file import /etc/passwd
Overwrite existing file object "passwd" in the data store?
Yes/No [no]> yes
```

**# import group file**

wwsh file import /etc/group

```
[root@warewulf ~]# wwsh file import /etc/group
Overwrite existing file object "group" in the data store?
Yes/No [no]> yes
```

**# Import shadow file**

wwsh file import /etc/shadow

```
[root@warewulf ~]# wwsh file import /etc/shadow
Overwrite existing file object "shadow" in the data store?
Yes/No [no]> yes
```

**# Show file list**

wwsh file list

```
[root@warewulf ~]# wwsh file list
dynamic_hosts           :  rw-r--r-- 0   root root             643 /etc/hosts
group                   :  rw-r--r-- 1   root root            1047 /etc/group
network                 :  rw-r--r-- 1   root root              17 /etc/sysconfig/ne
twork
passwd                  :  rw-r--r-- 1   root root            2462 /etc/passwd
shadow                  :  rw-r----- 1   root root            1247 /etc/shadow
[root@warewulf ~]#
```

**# Export bootstrap**

export WW_CONF=/etc/warewulf/bootstrap.conf

**# Export kernel driver**

echo "drivers += updates/kernel/" >> $WW_CONF

**# ??????????????**

echo "modprobe += ahci, nvme"  >> $WW_CONF

**# ??????????????**

echo "drivers += overlay" >> $WW_CONF

**# ??????????????**

wwbootstrap `uname -r`

```
[root@warewulf ~]# wwbootstrap 3.10.0-1160.el7.x86_64
Number of drivers included in bootstrap: 544
Number of firmware images included in bootstrap: 102
Building and compressing bootstrap
WARNING:  Do you wish to overwrite '3.10.0-1160.el7.x86_64' in the Warewulf data stor
e?
Yes/No> yes
Integrating the Warewulf bootstrap: 3.10.0-1160.el7.x86_64
Including capability: provision-adhoc
Including capability: provision-files
Including capability: provision-selinux
Including capability: provision-vnfs
Including capability: setup-filesystems
Including capability: setup-ipmi
Including capability: transport-http
Compressing the initramfs
Locating the kernel object
Bootstrap image '3.10.0-1160.el7.x86_64' is ready
Done.
```

**# create root path**

echo ${CHROOT}

```
[root@warewulf ~]# echo ${CHROOT}
/opt/ohpc/admin/images/centos7.7
```

**# ??????????????????**

wwvnfs --chroot $CHROOT

or

wwvnfs --chroot /opt/ohpc/admin/images/centos7.7

```
[root@warewulf ~]# wwvnfs --chroot $CHROOT
Using 'centos7.7' as the VNFS name
Creating VNFS image from centos7.7
Compiling hybridization link tree                           : 0.83 s
Building file list                                          : 1.44 s
Compiling and compressing VNFS                              : 84.52 s
Adding image to datastore                                   : 15.53 s
Total elapsed time                                          : 102.33 s
```

**# ???????????**

wwsh vnfs list

```
[root@warewulf ~]# wwsh vnfs list
VNFS NAME            SIZE (M)   ARCH       CHROOT LOCATION
centos7.7            335.1      x86_64     /opt/ohpc/admin/images/centos7.7
```

**********

**# ??????????????**

echo "GATEWAYDEV=ens36" > /tmp/network.wwsh

**# ??????????????**

wwsh -y file import /tmp/network.wwsh --name network

**# ???????????????**

wwsh -y file set network --path /etc/sysconfig/network --mode=0644 --uid=0

```
[root@warewulf ~]# wwsh -y file set network --path /etc/sysconfig/network --mode=0644 --uid=0
About to apply 3 action(s) to 1 file(s):

     SET: PATH                = /etc/sysconfig/network
     SET: MODE                = 0644
     SET: UID                 = 0

Proceed?
```

**# Add node**

wwsh node new node1

```
[root@warewulf ~]# wwsh node new node1
Are you sure you want to make the following 2 change(s) to 1 node(s):

     NEW: NODE                = node1

Yes/No [no]> yes
```

## create a machine which connect the same network and copy there mac address

**# Enter node detail for add npde**

wwsh node set node1 --netdev ens36 --ipaddr='rundom ip of host-only range'
--hwaddr=00:0C:29:EC:16:C2 --netmask=255.255.255.0 --gateway 'host only ip-address'

```
[root@warewulf ~]# wwsh node set node1 --netdev ens36 --ipaddr=192.168.100.167 --hwaddr=00:0C:29:EC:16:C
2 --netmask=255.255.255.0 --gateway 192.168.100.157
ERROR:  Can not set HWADDR on more then 1 node!
Are you sure you want to make the following 6 change(s) to 2 node(s):

     SET: ens36.IPADDR        = 192.168.100.167
     SET: ens36.NETMASK       = 255.255.255.0
     SET: ens36.GATEWAY       = 192.168.100.157

Yes/No [no]> yes
```

**# create a machine without os and start (here show mac-address)**

00:0C:29:F8:F8:78-new node mac-address

**# ??????????**

wwsh node list

```
[root@master ~]# wwsh node list
NAME                GROUPS              IPADDR              HWADDR
================================================================================
client1             UNDEF               192.168.100.139     00:0c:29:f1:02:45
client2             UNDEF               192.168.100.149     00:0c:29:18:d4:47
[root@master ~]#
```

**# ????????????????????**

```
wwsh -y provision set node1 --vnfs=centos7.7 --bootstrap=`uname -r`
--files=dynamic_hosts,passwd,group,shadow,network

# Restart DHCP server and update PXE server
systemctl restart dhcpd && wwsh pxe update
```

Alternative:

```
---------------------------------------------------------------
echo "
systemctl enable  dhcpd
systemctl restart xinetd
systemctl enable  mariadb
systemctl restart mariadb
systemctl enable  httpd
systemctl restart httpd
" > /tmp/provisioning_service_run.sh

bash /tmp/provisioning_service_run.sh
```