



HPCSA CASE STUDY Sept-2022

Task: Build a two node Disk-less HPC Cluster using OpenHPC with xCAT, openLDAP, slurm, HPL Benchmark, ganglia and document the results.

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xCAT

[root@master ~]# wget -P /etc/yum.repos.d <https://xcat.org/files/xcat/repos/yum/latest/xcat-core/xcat-core.repo>

[root@master ~]# wget -P /etc/yum.repos.d https://xcat.org/files/xcat/repos/yum/xcat-dep/rh7/x86_64/xcat-dep.repo

[root@master ~]# yum install yum-utils

```
[root@master ~]# wget -P /etc/yum.repos.d https://xcat.org/files/xcat/repos/yum/latest/xcat-core/xcat-core.repo
--2023-01-28 22:16:58 -- https://xcat.org/files/xcat/repos/yum/latest/xcat-core/xcat-core.repo
Resolving xcat.org (xcat.org)... 166.70.135.166
Connecting to xcat.org (xcat.org)|166.70.135.166|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 206
Saving to: '/etc/yum.repos.d/xcat-core.repo'

100%[=====] 206      --.-K/s   in 0s
2023-01-28 22:16:58 (69.7 MB/s) - '/etc/yum.repos.d/xcat-core.repo' saved [206/206]
[root@master ~]# case_study-node2:case_study-node2.vm
[root@master ~]# wget -P /etc/yum.repos.d https://xcat.org/files/xcat/repos/yum/xcat-dep/rh7/x86_64/xcat-dep.repo
--2023-01-28 22:17:11 -- https://xcat.org/files/xcat/repos/yum/xcat-dep/rh7/x86_64/xcat-dep.repo
Resolving xcat.org (xcat.org)... 166.70.135.166
Connecting to xcat.org (xcat.org)|166.70.135.166|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 209
Saving to: '/etc/yum.repos.d/xcat-dep.repo'

100%[=====] 209      --.-K/s   in 0s
2023-01-28 22:17:13 (72.2 MB/s) - '/etc/yum.repos.d/xcat-dep.repo' saved [209/209]
[root@master ~]# sestatus
SELinux status:                 disabled
[root@master ~]# yum install yum-utils
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
* base: mirrors.nxtgen.com
* updates: mirrors.nxtgen.com
* updates: repo.extreme-ix.org
xcat-core
xcat-dep
(1/2): xcat-core/primary_db
(2/2): xcat-dep/primary_db
Package yum-utils-1.1.31-54.el7_8.noarch already installed and latest version
Nothing to do
[root@master ~]# yum install
[  2.9 kB  00:00:00
 |  2.9 kB  00:00:00
 |  29 kB  00:00:00
 |  35 kB  00:00:00

```

[root@master ~]# yum install xCAT

```
[root@master ~]# yum install xCAT
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
 * base: mirrors.nxtgen.com
 * extras: mirrors.nxtgen.com
 * updates: epo.eleume-ix.org
Resolving Dependencies
--> Running transaction check
-->> Package xCAT.x86_64 0:2.16.4-snapp202206130853 will be installed
--> Processing Dependency: xCAT-server = 2.16.4-snapp202206130853 for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: xCAT-client = 2.16.4-snapp202206130853 for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: xCAT-genesis-scripts = 2.16.4-snapp202206130853 for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: xCAT-client = 4.2.16.4-snapp202206130853 for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: iproute-xcat = 1.8.17-1 for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: gcoscontrol = 1.0.0-1 for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: libbind for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: xCAT-buildkit for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: syslinux-xcat for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: perl-List-Simple for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: perl(xCAT::Util) for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: perl(xCAT::NetMessageUtils) for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: perl(XML::Simple) for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: perl(Expect) for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: perl(CGI) for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: nmap for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: httpd for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: ello-xcat for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: bind for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: /usr/sbin/in.tftpd for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: /sbin/dhcpcd for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Processing Dependency: /bin/kern for package: xCAT-2.16.4-snapp202206130853.x86_64
--> Running transaction check
-->> Package bind.x86_64 64.32.9.11.4-26.P2.el7.9.13 will be installed
--> Processing Dependency: python-ply for package: 32:9.11.4-9.11.4-26.P2.el7.9.13.x86_64
--> Processing Dependency: bind.x86_64 64.32.9.11.4-26.P2.el7.9.13 will be installed
-->> Package ello-xcat.noarch 0:3.14-6 will be installed
-->> Package gcosserver.x86_64 0:9.3.3-snapp20211021058 will be installed
-->> Package httpd.x86_64 0:2.4.6-98.el7.centos.6 will be installed
--> Processing Dependency: httpd-tools = 2.4.6-98.el7.centos.6 for package: httpd-2.4.6-98.el7.centos.6.x86_64
--> Processing Dependency: /etc/mime.types for package: httpd-2.4.6-98.el7.centos.6.x86_64
```

```
[root@master ~]# ll /etc/profile.d/xcat.sh
```

```
[root@master ~]# ./etc/profile.d/xcat.sh
```

```
[root@master ~]# lsxcatd -a
```

```
Complete!
[root@master ~]# lsxcatd
bash: lsxcatd: command not found...
[root@master ~]# ll /etc/profile.d/xcat.sh
-rwxr-xr-x 1 root root 174 Jan 28 22:27 /etc/profile.d/xcat.sh
[root@master ~]# . /etc/profile.d/xcat.sh
[root@master ~]# lsxcatd -a
Version 2.16.4 (git commit bb7a4bbbc8bde7e6613558d8d039fe43d49d2079, built Mon Jun 13 08:53:10 EDT 2022)
This is a Management Node
dbengine=SQLite
[root@master ~]# █
```

```
[root@master ~]# chdef -t site dhcpointerfaces="ens36"
```

```
[root@master ~]# chdef -t site master="192.168.160.10"
```

```
[root@master ~]# tabdump site | grep master
```

```
[root@master ~]# tabdump site | grep dhcp
```

```
[root@master ~]# chdef -t site dhcpinterfaces="ens36"
1 object definitions have been created or modified.
[root@master ~]# chdef -t site master="192.168.160.10"
1 object definitions have been created or modified.
[root@master ~]# tabdump site | grep master
"master","192.168.160.10",
[root@master ~]# tabdump site | grep dhcp
"dhcplease","43200",
"dhcpinterfaces","ens36",
[root@master ~]#
```

[root@master ~]# lsblk

[root@master ~]# dd if=/dev/sr0 of=/root/centos7.6.iso

[root@master ~]# lsblk

[root@master ~]# ll -h

```
[root@master ~]# lsblk ..
NAME      MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda          8:0    0 200G  0 disk 
└─sda1       8:1    0   1G  0 part /boot
└─sda2       8:2    0 199G  0 part 
  └─centos-root 253:0   0  50G  0 lvm  /
  └─centos-swap 253:1   0  7.9G 0 lvm  [SWAP]
  └─centos-home 253:2   0 141.1G 0 lvm  /home
sr0         11:0   1 1024M 0 rom 
[root@master ~]# dd if=/dev/sr0 of=/root/centos7.6.iso
9203712+0 records read
4712308544 bytes (4.7 GB) copied, 82.0666 s, 57.4 MB/s
[root@master ~]# lsblk
NAME      MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda          8:0    0 200G  0 disk 
└─sda1       8:1    0   1G  0 part /boot
└─sda2       8:2    0 199G  0 part 
  └─centos-root 253:0   0  50G  0 lvm  /
  └─centos-swap 253:1   0  7.9G 0 lvm  [SWAP]
  └─centos-home 253:2   0 141.1G 0 lvm  /home
sr0         11:0   1  4.4G 0 rom  /run/media/root/CentOS 7 x86_64
[root@master ~]# ll -h
total 8.0G
-rw-r--r--. 1 root root 1.5K Jan 28 19:37 anaconda-ks.cfg
-rw-r--r--. 1 root root 4.4G Jan 28 22:39 centos7.6.iso
drwxr-xr-x  2 root root  6 Jan 28 21:47 Desktop
drwxr-xr-x  2 root root  6 Jan 28 21:47 Documents
drwxr-xr-x  2 root root  6 Jan 28 21:47 Downloads
drwxr-xr-x  2 root root  6 Jan 28 21:47 ExtraInstall-setup-ks.cfg
drwxr-xr-x  2 root root  6 Jan 28 21:47 Music
drwxr-xr-x  2 root root  6 Jan 28 21:47 Pictures
drwxr-xr-x  2 root root  6 Jan 28 21:47 Public
drwxr-xr-x  2 root root  6 Jan 28 21:47 Templates
drwxr-xr-x  2 root root  6 Jan 28 21:47 Videos
[root@master ~]#
```

[root@master ~]# copycds centos7.6.iso

[root@master ~]# lsdef -t osimage

[root@master ~]# lsdef -t osimage centos7.9-x86_64-netboot-compute

[root@master ~]# genimage centos7.9-x86_64-netboot-compute

```
[root@master ~]# copycds centos7.6.iso
Copying media to /install/centos7.9/x86_64
Media copy operation successful
[root@master ~]# lsdef -t osimage
centos7.9-x86_64-install-compute (osimage)
centos7.9-x86_64-netboot-compute (osimage)
centos7.9-x86_64-statelite-compute (osimage)
[root@master ~]# lsdef -t osimage centos7.9-x86_64-netboot-compute
Object name: centos7.9-x86_64-netboot-compute
Exlist=/opt/xcat/share/xcat/netboot/centos/compute.centos7.exlist
Imagetype=linux
osarch=x86_64
osdistroname=centos7.9-x86_64
osname=linux
osvers=centos7.9
otherpkkdir=/install/post/otherpkgs/centos7.9/x86_64
pkkdir=/install/centos7.9/x86_64
pkglst=/opt/xcat/share/xcat/netboot/centos/compute.centos7.pkglst
postinstall=/opt/xcat/share/xcat/netboot/centos/compute.centos7.postinstall
profile=compute
provmethod=netboot
rootimgdir=/install/netboot/centos7.9/x86_64/compute
[root@master ~]# genimage centos7.9-x86_64-netboot-compute
Generating image:
cd /opt/xcat/share/xcat/netboot/centos; ./genimage -a x86_64 -o centos7.9 -p compute --srcdir "/install/centos7.9/x86_64" --pkglst /opt/xcat/share/xcat/netboot/centos/compute.centos7.pkglst --otherpkkdir "/install/post/otherpkgs/centos7.9/x86_64" --postinstall "/opt/xcat/share/xcat/netboot/centos/compute.centos7.postinstall" --rootimgdir /install/netboot/centos7.9/x86_64/compute --tempfile /tmp/xcat_genimage.14068 centos7.9-x86_64-netboot-compute
122 blocks
/opt/xcat/share/xcat/netboot/centos
122 blocks
/opt/xcat/share/xcat/netboot/centos
yum -y c /tmp/genimage.14083.yum.conf --installroot=/install/netboot/centos7.9/x86_64/compute/rootimg/ --disablerrepo=+ --enablerrepo=centos7.9-x86_64-0 install bash dracut-network nfs-utils openssl dhclient kernel openssh-server openssh-clients iputils bc irqbalance procps-ng wget vim-minimal ntp rpm rsync rsyslog e2fsprogs parted net-tools gzip tar xz ethtool
l
Resolving Dependencies
--> Running transaction check
--> Package bash.x86_64 0:4.2.46-34.el7 will be installed
--> Processing Dependency: rtld(GNU HASH) for package: bash-4.2.46-34.el7.x86_64
--> Processing Dependency: libdl.so.2(GLIBC_2.2.5)(64bit) for package: bash-4.2.46-34.el7.x86_64
--> Processing Dependency: libc.so.6(GLIBC_2.15)(64bit) for package: bash-4.2.46-34.el7.x86_64
--> Processing Dependency: libtinfo.so.5()(64bit) for package: bash-4.2.46-34.el7.x86_64
[root@master ~]# iter outside or press Ctrl+Alt.
[root@master ~]# 30°C Sunny 17:14 ENG 28-01-2023
```

[root@master ~]# mkdir -p /install/custom/netboot

[root@master ~]# lsdef -t osimage

[root@master ~]# chdef -t osimage centos7.9-x86_64-netboot-compute
synclists="/install/custom/netboot/compute.synclist"

[root@master ~]# echo "/etc/passwd -> /etc/passwd" >
/install/custom/netboot/compute.synclist

[root@master ~]# echo "/etc/shadow -> /etc/shadow" >>
/install/custom/netboot/compute.synclist

[root@master ~]# echo "/etc/group -> /etc/group" >>
/install/custom/netboot/compute.synclist

[root@master ~]# echo "/etc/hosts -> /etc/hosts" >> /install/custom/netboot/compute.synclist

[root@master ~]# lsdef -t osimage

[root@master ~]# packimage centos7.9-x86_64-netboot-compute

[root@master ~]# mkdef -t node cn00 groups=compute,all ip=192.168.160.20
mac=00:0C:29:01:04:00 netboot=xnba

[root@master ~]# mkdef -t node cn01 groups=compute,all ip=192.168.160.30
mac=00:0C:29:D9:E4:87 netboot=xnba

```
[root@master ~]# chdef -t group compute provmethod=centos7.9-x86_64-netboot-compute
[root@master ~]# lsdef cn00
[root@master ~]# chdef -t site domain=xcat.in
[root@master ~]# cat /etc/hosts
[root@master ~]# makehosts
[root@master ~]# makenetworks
[root@master ~]# makedhcp -n
[root@master ~]# makedns -n
```

```
[root@master ~]# mkdir -p /install/custom/netboot
[root@master ~]# chdef -t osimage
[root@master ~]# lsdef -t osimage
centos7.9-x86_64-install-compute (osimage)
centos7.9-x86_64-netboot-compute (osimage)
centos7.9-x86_64-statelite-compute (osimage)
[root@master ~]# chdef -t osimage centos7.9-x86_64-netboot-compute synclists="/install/custom/netboot/compute.synclist"
1 object definitions have been created or modified.
[root@master ~]# echo "/etc/passwd" > /install/custom/netboot/compute.synclist
[root@master ~]# echo "/etc/sh" > /etc/passwd" > /install/custom/netboot/compute.synclist
shadow shadow shells
[root@master ~]# echo "/etc/shadow" > /etc/shadow" >> /install/custom/netboot/compute.synclist
[root@master ~]# echo "/etc/group" > /etc/group" >> /install/custom/netboot/compute.synclist
[root@master ~]# echo "/etc/hosts" > /etc/hosts" >> /install/custom/netboot/compute.synclist
[root@master ~]# lsdef -t osimage
centos7.9-x86_64-install-compute (osimage)
centos7.9-x86_64-netboot-compute (osimage)
centos7.9-x86_64-statelite-compute (osimage)
[root@master ~]# packimage centos7.9-x86_64-netboot-compute
Packing contents to /install/netboot/centos7.9,x86_64/compute/rootimg
archive method:cpio
compress method:gzip
[root@master ~]# mkdef -t node cn00 groups=compute.all ip=192.168.160.20 mac=00:0C:29:01:04:00 netboot=xnba
1 object definitions have been created or modified.
[root@master ~]# mkdef -t node cn01 groups=compute.all ip=192.168.160.30 mac=00:0C:29:D9:E4:87 netboot=xnba
1 object definitions have been created or modified.
[root@master ~]# chdef -t group compute provmethod=centos7.9-x86_64-netboot-compute
1 object definitions have been created or modified.
[root@master ~]# lsdef cn00
Object name: cn00
groups=compute.all
ip=192.168.160.20
mac=00:0C:29:01:04:00
netboot=xnba
postbootscripts=otherpkgs
postscripts=syslog,remoteshell,syncfiles
provmethod=centos7.9-x86_64-netboot-compute
[root@master ~]# chdef -t site domain=xcat.in
1 object definitions have been created or modified.
[root@master ~]# cat /etc/hosts
```

The terminal window also shows the desktop environment at the bottom, with icons for file manager, browser, and other applications.

```
[root@master ~]# cat /etc/hosts
127.0.0.1 localhost localhost.localdomain localhost4 localhost4.localdomain4
::1 localhost localhost.localdomain localhost6 localhost6.localdomain6
[root@master ~]# makedns
[root@master ~]# makedns -n
Warning: [master]: The network entry '192_168_122_0-255_255_255_0' already exists in xCAT networks table. Cannot create a definition for '192_168_122_0-255_255_255_0'
Warning: [master]: The network entry '192_168_174_0-255_255_255_0' already exists in xCAT networks table. Cannot create a definition for '192_168_174_0-255_255_255_0'
[root@master ~]# maked
makedb makedeltarpn makedhcp makedns makedumpfile
[root@master ~]# makedhcp -n
Renamed existing dhcp configuration file to /etc/dhcp/dhcpd.conf.xcatbak

The dhcp server must be restarted for OMAPI function to work
Warning: [master]: No dynamic range specified for 192.168.160.0. If hardware discovery is being used, a dynamic range is required.
[root@master ~]# makedns -n
Handling localhost in /etc/hosts.
Handling localhost in /etc/hosts.
Handling cn01 in /etc/hosts.
Handling cn00 in /etc/hosts.
Getting reverse zones, this may take several minutes for a large cluster.
Completed getting reverse zones.
Updating zones.
Completed updating zones.
Restarting named
Restarting named complete
Updating DNS records, this may take several minutes for a large cluster.
Error: [master]: No reply received when sending DNS update to zone 160.168.192.IN-ADDR.ARPA.
Error: [master]: No reply received when sending DNS update to zone xcat.in.
Completed updating DNS records.
DNS setup is completed
[root@master ~]#

```

[root@master ~]# vim /etc/resolv.conf

[root@master ~]# cat /etc/resolv.conf

[root@master ~]# makedns -n

[root@master ~]# nslookup cn00

[root@master ~]# nslookup cn01

```
[root@master ~]# cat /etc/resolv.conf
# Generated by NetworkManager
search localdomain xcat.in
nameserver 192.168.160.10
[root@master ~]# nslookup cn00
[2]: Stopped nslookup cn00
[root@master ~]# nslookup cn01
[2]: Stopped nslookup cn01
[root@master ~]# cat /etc/hosts
127.0.0.1 localhost localhost.localdomain localhost4 localhost4.localdomain4
::1 localhost localhost.localdomain localhost6 localhost6.localdomain6
192.168.160.20 cn00 cn00.xcat.in
192.168.160.30 cn01 cn01.xcat.in
[root@master ~]# makedns -n
Handling localhost in /etc/hosts.
Handling localhost in /etc/hosts.
Handling cn01 in /etc/hosts.
Handling cn00 in /etc/hosts.
Getting reverse zones, this may take several minutes for a large cluster.
Completed getting reverse zones.
Updating zones.
Completed updating zones.
Restarting named
Restarting named complete
Updating DNS records, this may take several minutes for a large cluster.
Completed updating DNS records.
DNS setup is completed
[root@master ~]# nslookup cn00
Server: 192.168.160.10
Address: 192.168.160.10#53

Name: cn00.xcat.in
Address: 192.168.160.20

[root@master ~]# nslookup cn01
Server: 192.168.160.10
Address: 192.168.160.10#53

Name: cn01.xcat.in
Address: 192.168.160.30

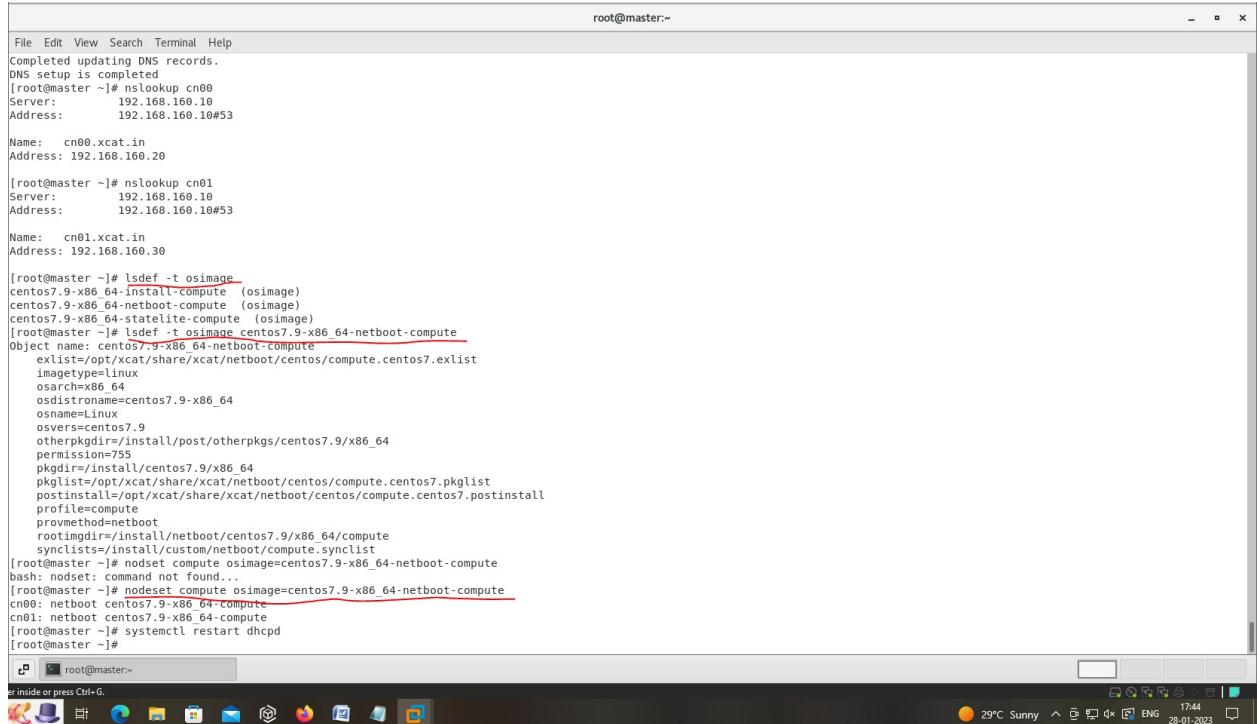
```

```
[root@master ~]# lsdef -t osimage
```

```
[root@master ~]# lsdef -t osimage centos7.9-x86_64-netboot-compute
```

```
[root@master ~]# nodeset compute osimage=centos7.9-x86_64-netboot-compute
```

```
[root@master ~]# systemctl restart dhcpcd
```



The screenshot shows a terminal window titled "root@master:~". The terminal displays the following command-line session:

```

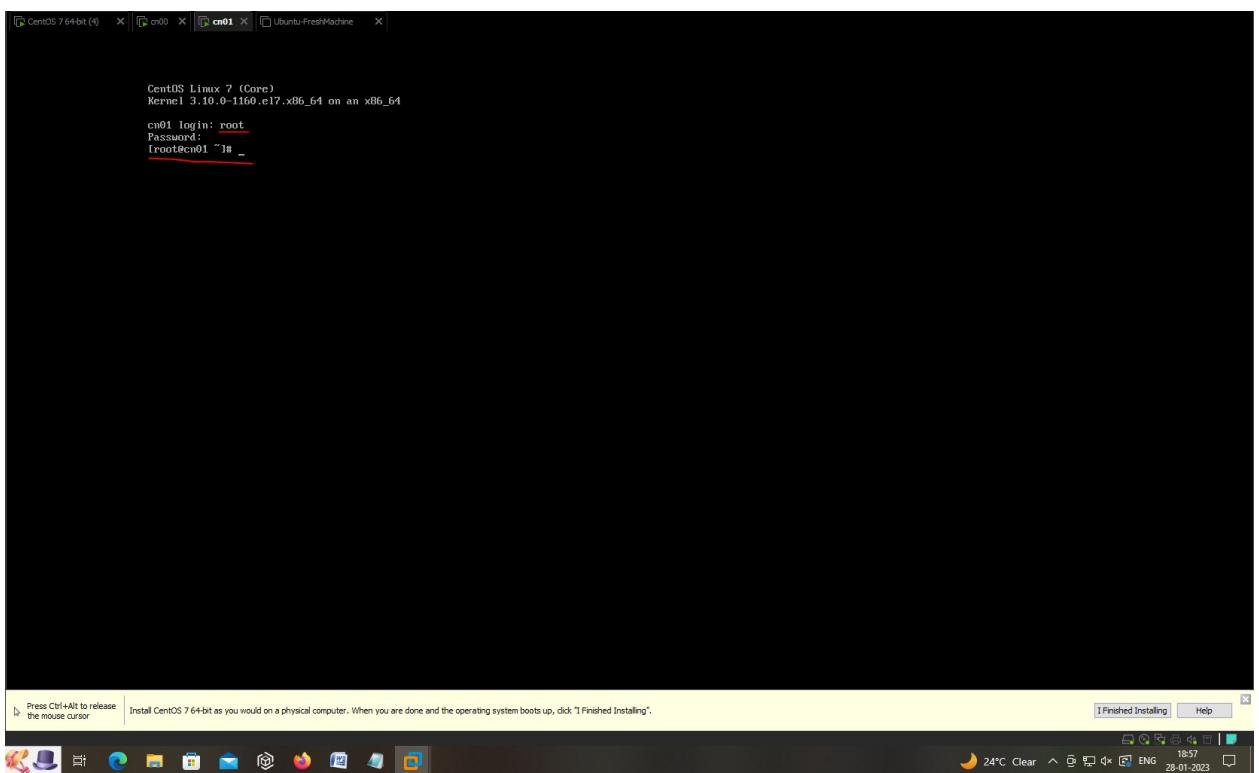
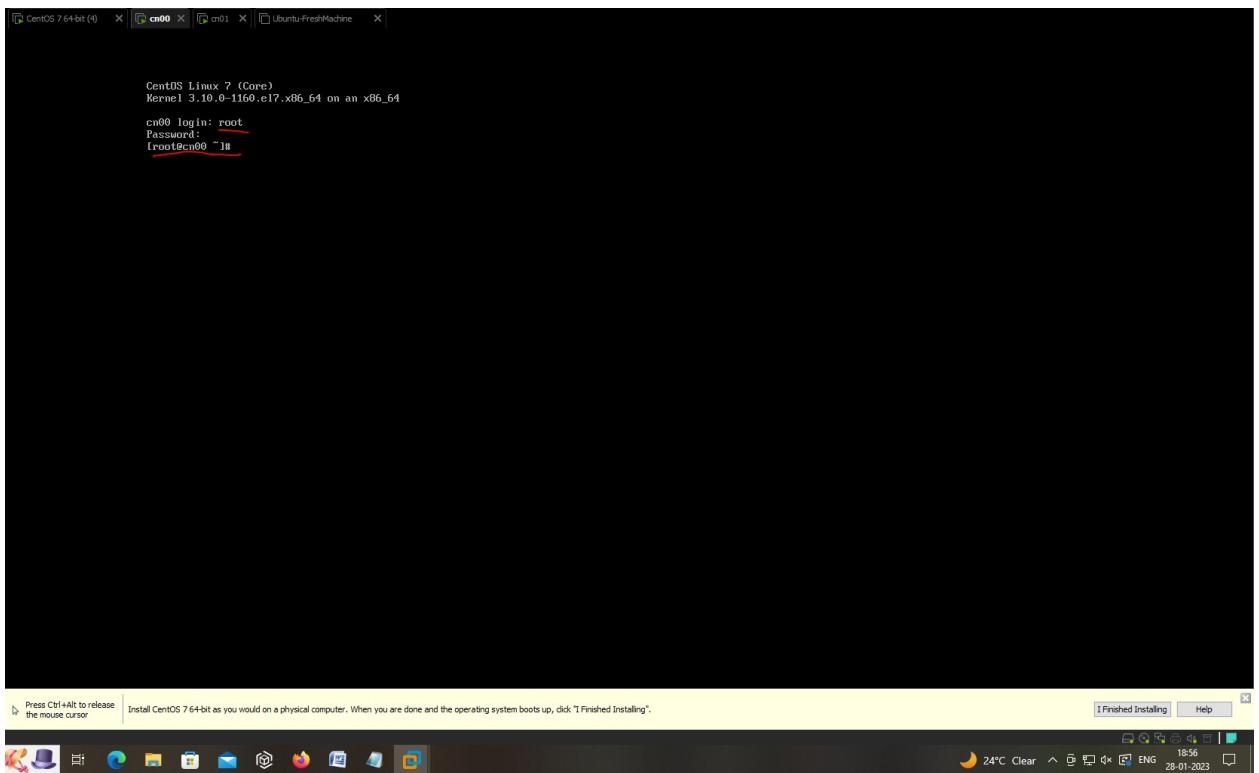
root@master:~#
File Edit View Search Terminal Help
Completed updating DNS records.
DNS setup is completed
[root@master ~]# nslookup cn00
Server:      192.168.160.10
Address:     192.168.160.10#53
Name:  cn00.xcat.in
Address: 192.168.160.20

[root@master ~]# nslookup cn01
Server:      192.168.160.10
Address:     192.168.160.10#53
Name:  cn01.xcat.in
Address: 192.168.160.30

[root@master ~]# lsdef -t osimage
centos7.9-x86_64-install-compute  (osimage)
centos7.9-x86_64-netboot-compute  (osimage)
centos7.9-x86_64-satellite-compute  (osimage)
[root@master ~]# lsdef -t osimage centos7.9-x86_64-netboot-compute
Object name: centos7.9-x86_64-netboot-compute
  exlist=/opt/xcat/share/xcat/netboot/centos/compute.centos7.exlist
  imagedtype=linux
  osarch=x86_64
  osdistroname=centos7.9-x86_64
  osname=linux
  osvers=centos7.9
  otherpkgsdir=/install/post/otherpkgs/centos7.9/x86_64
  permission=755
  pkgdir=/install/centos7.9/x86_64
  pkglst=/opt/xcat/share/xcat/netboot/centos/compute.centos7.pkglst
  postinstall=/opt/xcat/share/xcat/netboot/centos/compute.centos7.postinstall
  profile=compute
  provmethod=netboot
  rootingmdir=/install/netboot/centos7.9/x86_64/compute
  synclists=/install/custom/netboot/compute.synclist
[root@master ~]# nodset compute osimage=centos7.9-x86_64-netboot-compute
bash: nodset: command not found...
[root@master ~]# nodeset compute osimage=centos7.9-x86_64-netboot-compute
cn00: netboot centos7.9-x86_64-compute
cn01: netboot centos7.9-x86_64-compute
[root@master ~]# systemctl restart dhcpcd
[root@master ~]#

```

The terminal window has a title bar "root@master:~". The bottom right corner shows system status: 29°C Sunny, 17:44, ENG, 28-01-2023.



LDAP Installation and Configuration

```
[root@master ~]# yum -y install openldap-servers openldap-clients
```

```
[root@master ~]# cd
[root@master ~]# yum -y install openldap-servers openldap-clients
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
 * base: centos.excellmedia.net
 * extras: centos.excellmedia.net
 * updates: centos.excellmedia.net
Resolving Dependencies
--> Running transaction check
--> Package openldap-clients.x86_64 0:2.4.44-25.el7_9 will be installed
   Processing Dependency: openldap(x86-64) = 2.4.44-25.el7_9 for package: openldap-clients-2.4.44-25.el7_9.x86_64
--> Package openldap-servers.x86_64 0:2.4.44-25.el7_9 will be installed
   Running transaction check
--> Package openldap.x86_64 0:2.4.44-22.el7 will be updated
--> Package openldap.x86_64 0:2.4.44-25.el7_9 will be an update
--> Finished Dependency Resolution

Dependencies Resolved

=====
Package           Arch      Version            Repository        Size
=====
Installing:
openldap-clients    x86_64   2.4.44-25.el7_9   updates          191 K
openldap-servers    x86_64   2.4.44-25.el7_9   updates          2.2 M
Updating for dependencies:
openldap            x86_64   2.4.44-25.el7_9   updates          356 K

Transaction Summary
=====
Install 2 Packages
Upgrade   ( 1 Dependent package)

Total size: 2.7 M
Total download size: 2.4 M
Downloading packages:
(1/2): openldap-clients-2.4.44-25.el7_9.x86_64.rpm          | 191 kB  00:00:00
(2/2): openldap-servers-2.4.44-25.el7_9.x86_64.rpm          | 2.2 MB  00:00:00

Total
Running transaction check
Running transaction test
[  1  ] root@master~
```

```
[root@master ~]# cp /usr/share/openldap-servers/DB_CONFIG.example  
/var/lib/ldap/DB_CONFIG
```

```
[root@master ~]# chown ldap. /var/lib/ldap/DB CONFIG
```

```
[root@master ~]# systemctl start slapd
```

```
[root@master ~]# systemctl enable slapd
```

```
Complete!
[root@master ~]# cp /user/share/openldap-servers/DB_CONFIG.example /var/lib/ldap/DB_CONFIG
[root@master ~]# chmod 644 ldap /var/lib/ldap/DB_CONFIG
[root@master ~]# systemctl start slapd
[root@master ~]# systemctl enable slapd
Created symlink from /etc/systemd/system/multi-user.target.wants/slapd.service to /usr/lib/systemd/system/slapd.service.
[root@master ~]# systemctl status slapd
● slapd.service - openLDAP Server Daemon
   Loaded: loaded (/usr/lib/systemd/system/slapd.service; enabled; vendor preset: disabled)
     Active: active (running) since Wed 2023-01-25 20:43:55 IST; 12s ago
       Docs: man:slapd(8)
              man:slapd-config
              man:slapd-hdb
              man:slapd-mdb
              file:///usr/share/doc/openldap-servers/guide.html
 Main PID: 8531 (slapd)
  CGroup: /system.slice/slapd.service
         └─8531 /usr/sbin/slapd -u ldap -h ldapi:// ldap://

Jan 25 20:43:50 master systemd[1]: Starting OpenLDAP Server Daemon...
Jan 25 20:43:50 master slapd[8512]: pam_unix(unix:session): session opened for user ldap by (uid=0)
Jan 25 20:43:50 master slapd[8524]: (#) $OpenLDAP: slapd 2.4.44 (Feb 23 2022 17:11:27) $
Jan 25 20:43:55 master slapd[8524]: tlcmc_get_pin: INFO: Please note the extracted key file will not be protected with a PIN any more, however it will be still protected at ... permissions.
Jan 25 20:43:55 master slapd[8531]: slapd starting
Jan 25 20:43:55 master systemd[1]: Started OpenLDAP Server Daemon.
Hint: Some lines were ellipsized, use -l to show in full.
[root@master ~]#
```

```
[root@master ~]# slappasswd
[root@master ~]# vi chrootpw.ldif
```

```
Case_Study-Master case_study_node1 case_study-node2
Applications Places Terminal Tabs Help
root@master:~-
root@node1:~-
root@node2:~-
root@master:~-
# specify the password generated above for "olcRootPW" section
dn: olcDatabase={0}config,cn=config
changetype: modify
add: olcRootPW
olcRootPW: {SSHA}laQ52jif/Thpdiiapbs/lpZ418WgBj0W
-
```

```
[root@master ~]# ldapadd -Y EXTERNAL -H ldapi:/// -f chrootpw.ldif
```

```
[root@master ~]# ldapadd -Y EXTERNAL -H ldapi:/// -f /etc/openldap/schema/cosine.ldif
```

```
[root@master ~]# ldapadd -Y EXTERNAL -H ldapi:/// -f /etc/openldap/schema/nis.ldif
```

```
[root@master ~]# ldapadd -Y EXTERNAL -H ldapi:/// -f
/etc/openldap/schema/inetorgperson.ldif
```

```
[root@master ~]# slappasswd
New password:
Re-enter new password:
{SSHA}laQ52jif/Thpdiiapbs/lpZ418WgBj0W
[root@master ~]# vi chrootpw.ldif
[root@master ~]# ldapadd -Y EXTERNAL -H ldapi:/// -f chrootpw.ldif
SASL/EXTERNAL authentication started
SASL username: gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth
SASL SSF: 0
modifying entry "olcDatabase={0}config,cn=config"

[root@master ~]# ldapadd -Y EXTERNAL -H ldapi:/// -f /etc/openldap/schema/cosine.ldif
SASL/EXTERNAL authentication started
SASL username: gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth
SASL SSF: 0
adding new entry "cn=cosine,cn=schema,cn=config"

[root@master ~]# ldapadd -Y EXTERNAL -H ldapi:/// -f /etc/openldap/schema/nis.ldif
SASL/EXTERNAL authentication started
SASL username: gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth
SASL SSF: 0
adding new entry "cn=nis,cn=schema,cn=config"

[root@master ~]# ldapadd -Y EXTERNAL -H ldapi:/// -f /etc/openldap/schema/inetorgperson.ldif
SASL/EXTERNAL authentication started
SASL username: gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth
SASL SSF: 0
adding new entry "cn=inetorgperson,cn=schema,cn=config"
[root@master ~]#
```

```
[root@master ~]# vi chdomain.ldif
```

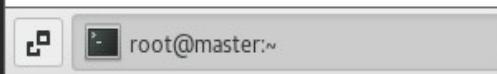
```
[root@master ~]# ldapmodify -Y EXTERNAL -H ldapi:/// -f chdomain.ldif
```

```
[root@master ~]# vi basedomain.ldif
```

```
[root@master ~]# ldapadd -x -D cn=Manager,dc=srv,dc=world -W -f basedomain.ldif
```

```
[root@master ~]# vi ldapuser.ldif
```

```
[root@master ~]# ldapadd -x -D cn=Manager,dc=srv,dc=world -W -f ldapuser.ldif
```

```
[root@master ~]# ldapadd -Y EXTERNAL -H ldapi:/// -f /etc/openldap/schema/inetorgperson.ldif
SASL/EXTERNAL authentication started
SASL username: gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth
SASL SSF: 0
adding new entry "cn=inetorgperson,cn=schema,cn=config"

[root@master ~]# vi chdomain.ldif
[root@master ~]# ldapmodify -Y EXTERNAL -H ldapi:/// -f chdomain.ldif
SASL/EXTERNAL authentication started
SASL username: gidNumber=0+uidNumber=0,cn=peercred,cn=external,cn=auth
SASL SSF: 0
modifying entry "olcDatabase={1}monitor,cn=config"
modifying entry "olcDatabase={2}hdb,cn=config"
modifying entry "olcDatabase={2}hdb,cn=config"
modifying entry "olcDatabase={2}hdb,cn=config"
modifying entry "olcDatabase={2}hdb,cn=config"

[root@master ~]# vi basedomain.ldif
[root@master ~]# ldapadd -x -D cn=Manager,dc=cdac,dc=in -W -f basedomain.ldif
Enter LDAP Password:
adding new entry "dc=cdac,dc=in"
adding new entry "cn=Manager,dc=cdac,dc=in"
adding new entry "ou=People,dc=cdac,dc=in"
adding new entry "ou=Group,dc=cdac,dc=in"

[root@master ~]# vi ldapuser.ldif
[root@master ~]# ldapadd -x -D cn=Manager,dc=cdac,dc=in -W -f ldapuser.ldif
Enter LDAP Password:
adding new entry "uid=test,ou=People,dc=cdac,dc=in"
adding new entry "cn=cent,ou=Group,dc=cdac,dc=in"

[root@master ~]#
```

[root@master ~]# yum -y --installroot=/install/netboot/centos7.9/x86_64/compute/rootimg
install openldap-clients nss-pam-ldapd

```
[root@master ~]# yum -y --installroot=/install/netboot/centos7.9/x86_64/compute/rootimg install openldap-clients nss-pam-ldapd
Loaded plugins: fastestmirror, langpacks
Determining fastest mirrors
  • base: mirrors.nxtgen.com
    | extras: mirrors.nxtgen.com
    | updates: mirrors.nxtgen.com
base
extras
updates
(1/4): base/7/x86_64/group.gz 3.6 kB 00:00:00
(2/4): extras/7/x86_64/primary_db 2.9 kB 00:00:00
(3/4): base/7/x86_64/primary_db 2.9 kB 00:00:00
(4/4): updates/7/x86_64/primary_db 153 kB 00:00:00
Resolving Dependencies
--> Running transaction check
--> Package nss-pam-ldapd.x86_64 0:0.8.13-25.el7 will be installed
--> Processing Dependency: nscd for package: nss-pam-ldapd-0.8.13-25.el7.x86_64
--> Package openldap-clients.x86_64 0:2.4.44-25.el7_9 will be installed
--> Processing Dependency: openldap(x86-64) = 2.4.44-25.el7_9 for package: openldap-clients-2.4.44-25.el7_9.x86_64
--> Package glibc.x86_64 0:2.17-326.el7_9 will be installed
--> Processing Dependency: glibc = 2.17-326.el7_9 for package: nscd-2.17-326.el7_9.x86_64
--> Package openldap.x86_64 0:2.4.44-22.el7 will be updated
--> Package openldap.x86_64 0:2.4.44-25.el7_9 will be an update
--> Running transaction check
--> Package glibc.x86_64 0:2.17-317.el7 will be updated
--> Processing Dependency: glibc = 2.17-317.el7 for package: glibc-common-2.17-317.el7.x86_64
--> Package glibc.x86_64 0:2.17-326.el7_9 will be an update
--> Running transaction check
--> Package glibc-common.x86_64 0:2.17-317.el7 will be updated
--> Package glibc-common.x86_64 0:2.17-326.el7_9 will be an update
--> Finished Dependency Resolution
Dependencies Resolved

=====
| Package           | Arch      | Version            | Repository | Size
|=====
```

[root@master ~]#chroot /install/netboot/centos7.9/x86_64/compute/rootimg

```
[root@master /]# authconfig --enableldap \
--enableldapauth \
--ldapserver=dsp.srv.world \
--ldapbasedn="dc=srv,dc=world" \
--enablemkhomedir \
--update
[root@master /]# exit
```

```
[root@master ~]# chroot /install/netboot/centos7.9/x86_64/compute/rootimg systemctl enable  
nslcd
```

```
[root@master ~]# chroot /install/netboot/centos7.9/x86_64/compute/rootimg
```

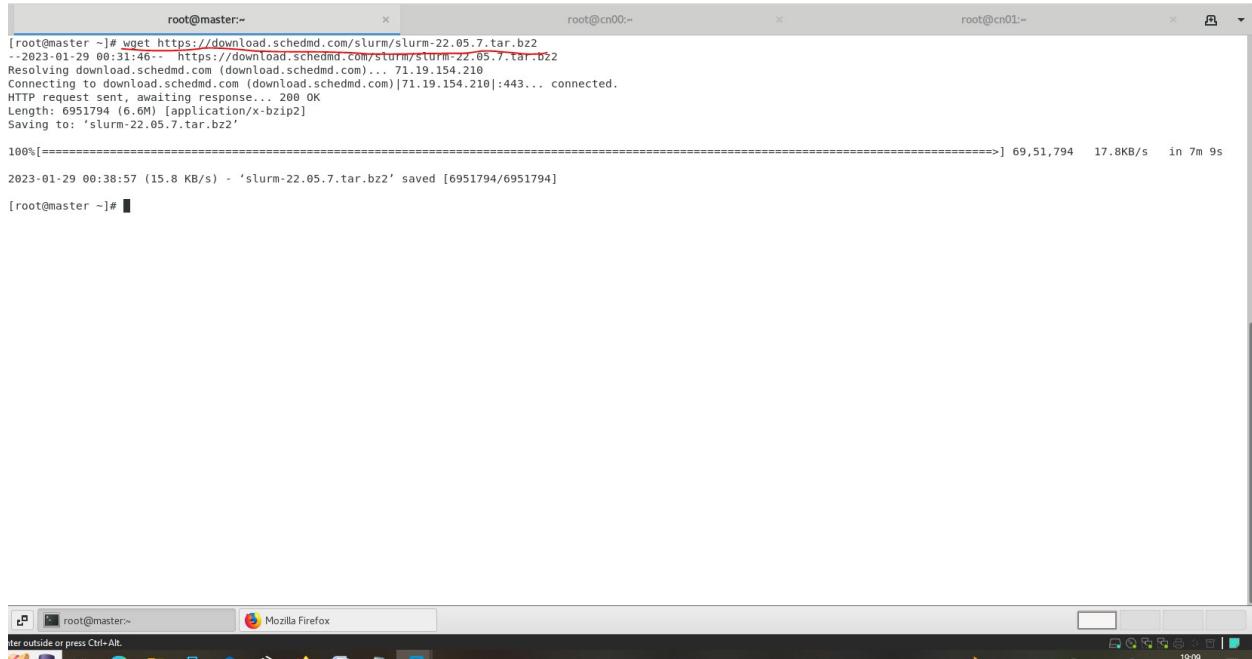
```
[root@master /]# ldapsearch -x
```

```
[root@master /]# getent passwd
```

```
[root@master /]# ssh test@localhost
```

SLURM INSTALLATION

[root@master ~]# wget <https://download.schedmd.com/slurm/slurm-22.05.7.tar.bz2>



```
root@master ~]# wget https://download.schedmd.com/slurm/slurm-22.05.7.tar.bz2
--2023-01-29 00:31:46-- https://download.schedmd.com/slurm/slurm-22.05.7.tar.bz2
Resolving download.schedmd.com (download.schedmd.com)... 71.19.154.210
Connecting to download.schedmd.com (download.schedmd.com)|71.19.154.210|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 6951794 (6.6M) [application/x-bzip2]
Saving to: 'slurm-22.05.7.tar.bz2'

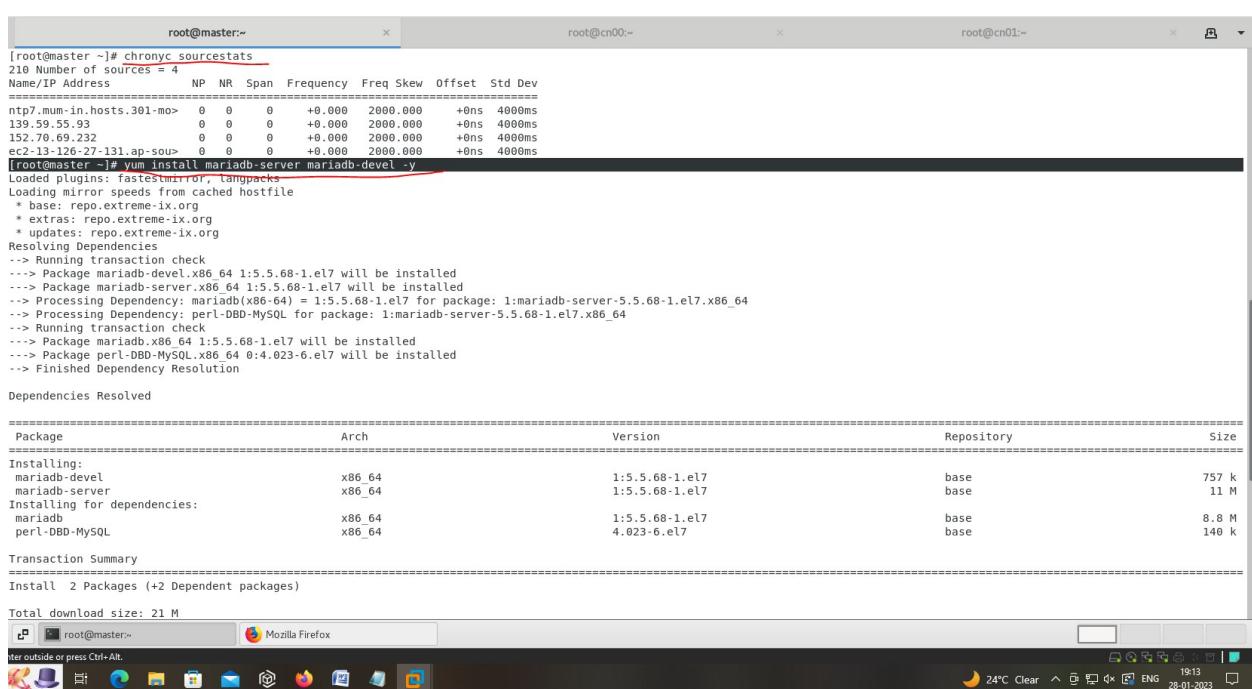
100%[=====] 69,51,794 17.8KB/s in 7m 9s

2023-01-29 00:38:57 (15.8 KB/s) - 'slurm-22.05.7.tar.bz2' saved [6951794/6951794]

[root@master ~]#
```

[root@master ~]# date

[root@master ~]# yum install mariadb-server mariadb-devel -y



```
root@master ~]# chronyc sourcestats
210 Number of sources = 4
Name/IP Address          NP  NR   Span   Frequency   Freq Skew  Offset  Std Dev
=====
ntp7.mun-in.hosts.301-mo> 0    0     0      +0.000  2000.000  +0ns 4000ms
139.59.55.93              0    0     0      +0.000  2000.000  +0ns 4000ms
152.70.69.232             0    0     0      +0.000  2000.000  +0ns 4000ms
ec2-13-126-27-131.ap-sou> 0    0     0      +0.000  2000.000  +0ns 4000ms
[root@master ~]# yum install mariadb-server mariadb-devel -y
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
* base: repo.extreme-ix.org
* extras: repo.extreme-ix.org
* updates: repo.extreme-ix.org
Resolving Dependencies
--> Running transaction check
--> Package mariadb-devel.x86_64 1:5.5.68-1.el7 will be installed
--> Package mariadb-server.x86_64 1:5.5.68-1.el7 will be installed
--> Processing Dependency: libmariadb(x86-64) = 1:5.5.68-1.el7 for package: 1:mariadb-server-5.5.68-1.el7.x86_64
--> Processing Dependency: perl-DBD-MySQL for package: 1:mariadb-server-5.5.68-1.el7.x86_64
--> Running transaction check
--> Package mariadb.x86_64 1:5.5.68-1.el7 will be installed
--> Package perl-DBD-MySQL.x86_64 0:4.023-6.el7 will be installed
--> Finished Dependency Resolution
Dependencies Resolved

=====
Package           Arch      Version            Repository        Size
=====
Installing:
mariadb-devel    x86_64   1:5.5.68-1.el7      base            757 k
mariadb-server   x86_64   1:5.5.68-1.el7      base           11 M
Installing for dependencies:
mariadb          x86_64   1:5.5.68-1.el7      base            8.8 M
perl-DBD-MySQL   x86_64   4.023-6.el7       base           140 k

Transaction Summary
=====
Install 2 Packages (+2 Dependent packages)

Total download size: 21 M
[root@master ~]# Mozilla Firefox
[enter outside or press Ctrl+Alt.]
24°C Clear 19:13 ENG 1909 28-01-2023
```

[root@master ~]# yum install epel-release

[root@master ~]# yum --installroot=/install/netboot/centos7.9/x86_64/compute/rootimg/ install epel-release

```

root@master:~ mariadb.x86_64 1:5.5.68-1.el7
Complete!
[root@master ~]# yum install epel-release
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
 * base: repo.extreme-ix.org
 * extras: repo.extreme-ix.org
 * updates: repo.extreme-ix.org
Resolving Dependencies
--> Running transaction check
--> Package epel-release.noarch 0:7-11 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

=====
Package           Arch      Version       Repository      Size
=====
Installing:
epel-release     noarch    7-11          extras          15 k

Transaction Summary
=====
Install 1 Package

Total download size: 15 k
Installed size: 24 k
Is this ok [y/d/N]: y
Downloading packages:
epel-release-7-11.noarch.rpm
Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
  Installing : epel-release-7-11.noarch
  Verifying  : epel-release-7-11.noarch
                                           | 15 kB  00:00:00
Installed:
  epel-release.noarch 0:7-11
                                           | 1/1
                                           1/1

Complete!

```

```

[root@master ~]# yum --installroot=/install/netboot/centos7.9/x86_64/compute/rootimg/ install epel-release
Loaded plugins: fastestmirror, langpacks
Determining fastest mirrors
 * base: mirrors.nxtgen.com
 * extras: mirrors.nxtgen.com
 * updates: repo.extreme-ix.org
base
extras
updates
(1/4): base/7/x86_64/group_gz
(2/4): extras/7/x86_64/primary_db
(3/4): updates/7/x86_64/primary_db
(4/4): base/7/x86_64/primary_db
Resolving Dependencies
--> Running transaction check
--> Package epel-release.noarch 0:7-11 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

=====
Package           Arch      Version       Repository      Size
=====
Installing:
epel-release     noarch    7-11          extras          15 k

Transaction Summary
=====
Install 1 Package

Total download size: 15 k
Installed size: 24 k
Is this ok [y/d/N]: y
Downloading packages:
warning: /install/netboot/centos7.9/x86_64/compute/rootimg/var/cache/yum/x86_64/7/extras/packages/epel-release-7-11.noarch.rpm: Header V3 RSA/SHA256 Signature, key ID f4a80eb5: NOKEY
Public key for epel-release-7-11.noarch.rpm is not installed
epel-release-7-11.noarch.rpm
Retrieving key from file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-7
Importing GPG key 0xF4A80EB5:
  Userid  : "CentOS-7 Key (CentOS 7 Official Signing Key) <security@centos.org>"
  Fingerprint: 6341 ab27 53d7 8a78 a7c2 7b1b 24c6 a8a7 f4a8 0eb5
  Package  : centos-release-7-9.2009.0.el7.centos.x86_64 (@centos7.9-x86_64-0/$releasever)

```

[root@master ~]# yum install munge munge-libs munge-devel -y

[root@master ~]# yum --installroot=/install/netboot/centos7.9/x86_64/compute/rootimg/ install munge munge-libs munge-devel -y

```

root@master:~#
Complete!
[root@master ~]# yum install munge munge-libs munge-devel -y
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
epel/x86_64/metalink
* base: repo.extreme-ix.org
* epel: repo.extreme-ix.org
* extras: repo.extreme-ix.org
* updates: repo.extreme-ix.org
epel
(1/3): epel/x86_64/group_gz
(2/3): epel/x86_64/updateinfo
(3/3): epel/x86_64/primary_db
Resolving Dependencies
--> Running transaction check
--> Package munge.x86_64 0:0.5.11-3.el7 will be installed
--> Package munge-devel.x86_64 0:0.5.11-3.el7 will be installed
--> Package munge-libs.x86_64 0:0.5.11-3.el7 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

=====
Package           Arch      Version       Repository     Size
=====
Installing:
munge            x86_64    0.5.11-3.el7   epel          95 k
munge-devel      x86_64    0.5.11-3.el7   epel          22 k
munge-libs       x86_64    0.5.11-3.el7   epel          37 k

Transaction Summary
=====
Install 3 Packages

Total download size: 154 k
Installed size: 341 k
Downloading packages:
warning: /var/cache/yum/x86_64/7/epel/packages/munge-0.5.11-3.el7.x86_64.rpm: Header V3 RSA/SHA256 Signature, key ID 352c64e5: NOKEY
Public key for munge-0.5.11-3.el7.x86_64.rpm is not installed
(1/3): munge-0.5.11-3.el7.x86_64.rpm
(2/3): munge-devel-0.5.11-3.el7.x86_64.rpm
(3/3): munge-libs-0.5.11-3.el7.x86_64.rpm
[  95 kB  00:00:00
[  22 kB  00:00:00
[  37 kB  00:00:00

root@master:~#
Enter outside or press Ctrl+Alt.
24°C Clear 19:19 ENG 28-01-2023

```

```

root@master:~#
Complete!
[root@master ~]# yum --installroot=/install/netboot/centos7.9/x86_64/compute/rootimg/ install munge munge-libs munge-devel -y
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
epel/x86_64/metalink
* base: mirrors.nxtgen.com
* epel: repo.extreme-ix.org
* extras: mirrors.nxtgen.com
* updates: repo.extreme-ix.org
epel
(1/3): epel/x86_64/group_gz
(2/3): epel/x86_64/updateinfo
(3/3): epel/x86_64/primary_db
Resolving Dependencies
--> Running transaction check
--> Package munge.x86_64 0:0.5.11-3.el7 will be installed
--> Package munge-devel.x86_64 0:0.5.11-3.el7 will be installed
--> Package munge-libs.x86_64 0:0.5.11-3.el7 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

=====
Package           Arch      Version       Repository     Size
=====
Installing:
munge            x86_64    0.5.11-3.el7   epel          95 k
munge-devel      x86_64    0.5.11-3.el7   epel          22 k
munge-libs       x86_64    0.5.11-3.el7   epel          37 k

Transaction Summary
=====
Install 3 Packages

Total download size: 154 k
Installed size: 341 k
Downloading packages:
warning: /install/netboot/centos7.9/x86_64/compute/rootimg/var/cache/yum/x86_64/7/epel/packages/munge-0.5.11-3.el7.x86_64.rpm: Header V3 RSA/SHA256 Signature, key ID 352c64e5: NOKEY
Public key for munge-0.5.11-3.el7.x86_64.rpm is not installed
(1/3): munge-0.5.11-3.el7.x86_64.rpm
(2/3): munge-devel-0.5.11-3.el7.x86_64.rpm
(3/3): munge-libs-0.5.11-3.el7.x86_64.rpm
[  95 kB  00:00:00
[  22 kB  00:00:00
[  37 kB  00:00:00

root@master:~#
Enter outside or press Ctrl+Alt.
Construction on Ban... 19:20 ENG 28-01-2023

```

```
[root@master ~]# ls
```

```
[root@master ~]# yum install rpmbuild
```

```
[root@master ~]# rpmbuild -ta slurm-22.05.7.tar.bz2
```

```
root@master:~#
Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
  Installing : munge-libs-0.5.11-3.el7.x86_64
    Installing : munge-0.5.11-3.el7.x86_64
    Installing : munge-devel-0.5.11-3.el7.x86_64
    Verifying   : munge-0.5.11-3.el7.x86_64
    Verifying   : munge-devel-0.5.11-3.el7.x86_64
    Verifying   : munge-libs-0.5.11-3.el7.x86_64

Installed:
  munge.x86_64 0:0.5.11-3.el7
  munge-devel.x86_64 0:0.5.11-3.el7
  munge-libs.x86_64 0:0.5.11-3.el7

Complete!
[root@master ~]# ls
anaconda-ks.cfg centos7.9.iso Desktop Documents Downloads initial-setup-ks.cfg Music Pictures Public slurm-22.05.7.tar.bz2 Templates Videos
[root@master ~]# yum install rpmbuild
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
 * base: repo.extreme-ix.org
 * epel: repo.extreme-ix.org
 * extras: repo.extreme-ix.org
 * updates: repo.extreme-ix.org
No package rpmbuild available.
Error: Nothing to do
[root@master ~]# yum install rpmbuil*
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
 * base: repo.extreme-ix.org
 * epel: repo.extreme-ix.org
 * extras: repo.extreme-ix.org
 * updates: repo.extreme-ix.org
No package rpmbuil* available.
Error: Nothing to do
[root@master ~]# rpmbuild -ta slurm-22.05.7.tar.bz2
error: Failed build dependencies:
        python3 is needed by slurm-22.05.7-1.el7.x86_64
        readline-devel is needed by slurm-22.05.7-1.el7.x86_64
        pam-devel is needed by slurm-22.05.7-1.el7.x86_64
[root@master ~]#
```

Enter outside or press Ctrl+Alt.

24°C Clear 19:23 ENG 28-01-2023

```
[root@master ~]# yum install readline-devel pam-devel gcc python3 -y
```

```
root@master:~#
Verifying : python3-setuptools-39.2.0-10.el7.noarch
Verifying : python3-langs-3.6.8-18.el7.x86_64
Verifying : python3-3.6.8-18.el7.x86_64
Verifying : python3-pip-9.0.3-8.el7.noarch

Installed:
  python3.x86_64 0:3.6.8-18.el7

Dependency Installed:
  python3-langs.x86_64 0:3.6.8-18.el7           python3-pip.noarch 0:9.0.3-8.el7          python3-setuptools.noarch 0:39.2.0-10.el7

Complete!
[root@master ~]# yum install readline-devel pam-devel gcc -y
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
 * base: repo.extreme-ix.org
 * epel: repo.extreme-ix.org
 * extras: repo.extreme-ix.org
 * updates: repo.extreme-ix.org
Resolving Dependencies
--> Running transaction check
--> Package gcc.x86_64 0:4.8.5-44.el7 will be installed
--> Processing Dependency: cpp = 4.8.5-44.el7 for package: gcc-4.8.5-44.el7.x86_64
--> Package pam-devel.x86_64 0:1.1.8-23.el7 will be installed
--> Package readline-devel.x86_64 0:6.2-11.el7 will be installed
--> Processing Dependency: ncurses-devel for package: readline-devel-6.2-11.el7.x86_64
--> Running transaction check
--> Package cpp.x86_64 0:4.8.5-44.el7 will be installed
--> Package ncurses-devel.x86_64 0:5.9-14.20130511.el7_4 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

=====
Package           Arch      Version            Repository      Size
=====
Installing:
  gcc              x86_64   4.8.5-44.el7      base           16 M
  pam-devel        x86_64   1.1.8-23.el7      base          185 k
  readline-devel   x86_64   6.2-11.el7       base          139 k
Installing for dependencies:
  cpp              x86_64   4.8.5-44.el7      base          5.9 M

=====
root@master:~#
Enter outside or press Ctrl+Alt.

24°C Clear 19:25 ENG 28-01-2023
```

```
[root@master ~]# rpmbuild -ta slurm-22.05.7.tar.bz2
```

```
[root@master ~]# rpmbuild -ta slurm-22.05.7.tar.bz2
Executing(%prep): /bin/sh -e /var/tmp/rpm-tmp.78JdH
+ umask 022
+ cd /root/rpmbuild/BUILD
+ rm -rf slurm-22.05.7
+ /usr/bin/bzip2 -dc /root/slurm-22.05.7.tar.bz2
+ /usr/bin/tar -xvf -
drwxrwxr-x 1000/1000 0 2022-12-29 21:38 slurm-22.05.7/
-rw-rw-r-- 1000/1000 1379 2022-12-29 21:38 slurm-22.05.7/.gitignore
-rw-rw-r-- 1000/1000 595 2022-12-29 21:38 slurm-22.05.7/.travis.yml
-rw-rw-r-- 1000/1000 119 2022-12-29 21:38 slurm-22.05.7/AUTHORS
-rw-rw-r-- 1000/1000 3624 2022-12-29 21:38 slurm-22.05.7/CONTRIBUTING.md
-rw-rw-r-- 1000/1000 20474 2022-12-29 21:38 slurm-22.05.7/COPYING
-rw-rw-r-- 1000/1000 6369 2022-12-29 21:38 slurm-22.05.7/DISCLAIMER
-rw-rw-r-- 1000/1000 9571 2022-12-29 21:38 slurm-22.05.7/INSTALL
-rw-rw-r-- 1000/1000 8543 2022-12-29 21:38 slurm-22.05.7/LICENSE.OpenSSL
-rw-rw-r-- 1000/1000 1066 2022-12-29 21:38 slurm-22.05.7/META
-rw-rw-r-- 1000/1000 1106 2022-12-29 21:38 slurm-22.05.7/Makefile.am
-rw-rw-r-- 1000/1000 27167 2022-12-29 21:38 slurm-22.05.7/Makefile.in
-rw-rw-r-- 1000/1000 735725 2022-12-29 21:38 slurm-22.05.7/NEWS
-rw-rw-r-- 1000/1000 3313 2022-12-29 21:38 slurm-22.05.7/README.rst
-rw-rw-r-- 1000/1000 7129 2022-12-29 21:38 slurm-22.05.7/RELEASE.NOTES
-rw-rw-r-- 1000/1000 71807 2022-12-29 21:38 slurm-22.05.7/aclcalc.m4
drwxrwxr-x 1000/1000 0 2022-12-29 21:38 slurm-22.05.7/auxdir/
-rw-rw-r-- 1000/1000 217 2022-12-29 21:38 slurm-22.05.7/auxdir/Makefile.am
-rw-rw-r-- 1000/1000 17111 2022-12-29 21:38 slurm-22.05.7/auxdir/Makefile.in
-rw-rw-r-- 1000/1000 3331 2022-12-29 21:38 slurm-22.05.7/auxdir/_ax_check_compile_flag.m4
-rw-rw-r-- 1000/1000 6571 2022-12-29 21:38 slurm-22.05.7/auxdir/_ax_COMPARE.version.m4
-rw-rw-r-- 1000/1000 5861 2022-12-29 21:38 slurm-22.05.7/auxdir/_ax_builtin.m4
-rw-rw-r-- 1000/1000 11237 2022-12-29 21:38 slurm-22.05.7/auxdir/_ax_lib hdf5.m4
-rw-rw-r-- 1000/1000 22556 2022-12-29 21:38 slurm-22.05.7/auxdir/_ax_pthread.m4
-rw-rw-r-- 1000/1000 7400 2022-12-29 21:38 slurm-22.05.7/auxdir/_ax_pthread.m4
-rw-rw-r-- 1000/1000 49482 2022-12-29 21:38 slurm-22.05.7/auxdir/_ax_slurm compile
-rw-rw-r-- 1000/1000 35406 2022-12-29 21:38 slurm-22.05.7/auxdir/_ax_slurm-devel
-rw-rw-r-- 1000/1000 23568 2022-12-29 21:38 slurm-22.05.7/auxdir/_ax_slurm-devel
-rw-rw-r-- 1000/1000 15358 2022-12-29 21:38 slurm-22.05.7/auxdir/_ax_slurm-devel
-rw-rw-r-- 1000/1000 306681 2022-12-29 21:38 slurm-22.05.7/auxdir/_libtool.m4
-rw-rw-r-- 1000/1000 327299 2022-12-29 21:38 slurm-22.05.7/auxdir/_lmain_sh
+ exit 0
[root@master ~]#
```

```
Checking for unpackaged file(s): /usr/lib/rpm/check-files /root/rpmbuild/BUILDROOT/slurm-22.05.7-1.el7.x86_64
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-perlapl-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-devel-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-example-configs-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-slurmctld-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-slurmd-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-slurmdbd-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-torque-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-openava-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-contribs-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-pam slurm-22.05.7-1.el7.x86_64.rpm
Executing(%clean): /bin/sh -e /var/tmp/rpm-tmp.8yqN9t
+ umask 022
+ cd /root/rpmbuild/BUILD
+ cd slurm-22.05.7
+ rm -rf /root/rpmbuild/BUILDROOT/slurm-22.05.7-1.el7.x86_64
+ exit 0
[root@master ~]#
```

```
[root@master ~]# ll /root/rpmbuild/
```

```
[root@master ~]# ll /root/rpmbuild/
total 0
drwxr-xr-x 3 root root 27 Jan 29 00:56 BUILD
drwxr-xr-x 2 root root 6 Jan 29 00:58 BUILDROOT
drwxr-xr-x 3 root root 20 Jan 29 00:58 RPMS
drwxr-xr-x 2 root root 6 Jan 29 00:51 SOURCES
drwxr-xr-x 2 root root 6 Jan 29 00:58 SPECS
drwxr-xr-x 2 root root 41 Jan 29 00:58 SRPMS
[root@master ~]#
```

```
[root@master ~]# /usr/sbin/create-munge-key
```

```
[root@master ~]# ll /etc/munge/munge.key
```

```
[root@master ~]# chown -R munge:munge /etc/munge
```

```
[root@master ~]# cp
/etc/munge/munge.key/install/netboot/centos7.9/x86_64/compute/rootimg/etc/munge/
```

```
[root@master ~]# cd /root/rpmbuild/RPMS/x86_64/
```

```
[root@master x86_64]# ls
```

```

root@master:~/rpmbuild/RPMS/x86_64
Wrote: /root/rpmbuild/SRPMS/slurm-22.05.7-1.el7.src.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-perlapi-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-devel-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-example-configs-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-slurmctld-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-slurmd-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-libpmi-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-torque-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-openlava-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-contribs-22.05.7-1.el7.x86_64.rpm
Wrote: /root/rpmbuild/RPMS/x86_64/slurm-pam_slurm-22.05.7-1.el7.x86_64.rpm
Executing(%clean): /bin/sh -e /var/tmp/rpm-tmp.0ygn9t
+ umask 022
+ cd /root/rpmbuild/BUILD
+ cd slurm-22.05.7
+ rm -rf /root/rpmbuild/BUILDROOT/slurm-22.05.7-1.el7.x86_64
+ exit 0
[root@master ~]# ll /run/
root@run/
[root@master ~]# ll /root/rpmbuild/
total 0
drwxr-xr-x 3 root root 27 Jan 29 00:56 BUILD
drwxr-xr-x 2 root root 6 Jan 29 00:58 BUILDROOT
drwxr-xr-x 3 root root 20 Jan 29 00:58 RPMS
drwxr-xr-x 2 root root 6 Jan 29 00:51 SOURCES
drwxr-xr-x 2 root root 6 Jan 29 00:58 SPECS
drwxr-xr-x 2 root root 41 Jan 29 00:58 SRPMS
[root@master ~]# /usr/sbin/create-munge-key
Generating a pseudo-random key using /dev/urandom completed.
[root@master ~]# ll /etc/munge/munge.key
-r----- 1 munge munge 1024 Jan 29 01:01 /etc/munge/munge.key
[root@master ~]# chown -R munge:munge /etc/munge
[root@master ~]# cp /etc/munge/munge.key /install/netboot/centos7.9/x86_64/compute/rootimg/etc/munge/
[root@master ~]# cd /root/rpmbuild/RPMS/x86_64/
[root@master x86_64]# ls
slurm-22.05.7-1.el7.x86_64.rpm      slurm-example-configs-22.05.7-1.el7.x86_64.rpm  slurm-pam_slurm-22.05.7-1.el7.x86_64.rpm  slurm-slurmctld-22.05.7-1.el7.x86_64.rpm
slurm-contribs-22.05.7-1.el7.x86_64.rpm  slurm-libpmi-22.05.7-1.el7.x86_64.rpm    slurm-perlapi-22.05.7-1.el7.x86_64.rpm  slurm-slurmd-22.05.7-1.el7.x86_64.rpm
slurm-devel-22.05.7-1.el7.x86_64.rpm   slurm-openlava-22.05.7-1.el7.x86_64.rpm   slurm-slurmdbd-22.05.7-1.el7.x86_64.rpm  slurm-torque-22.05.7-1.el7.x86_64.rpm
[root@master x86_64]#

```

```
[root@master x86_64]# yum install slurm*
```

```
[root@master x86_64]# cd
```

```
[root@master ~]# yum install nfs
```

```
[root@master ~]# vim /etc/exports
```

```
[root@master ~]# exportfs -arv
```

```
[root@master ~]# chroot /install/netboot/centos7.9/x86_64/compute/rootimg
```

```
[root@master /]# showmount -e 192.168.160.10
```

```
[root@master /]# mount -t nfs 192.168.160.10:/root /root
```

```
[root@master /]# exit
```

```
[root@master ~]# packimage centos7.9-x86_64-netboot-compute
```

```
[root@master x86_64]# yum install slurm*
Loaded plugins: fastestmirror, langpacks
Examining slurm--22.05.7-1.el7.x86_64.rpm: slurm-22.05.7-1.el7.x86_64
Marking slurm--22.05.7-1.el7.x86_64.rpm to be installed
Examining slurm-contribs--22.05.7-1.el7.x86_64.rpm: slurm-contribs-22.05.7-1.el7.x86_64
Marking slurm-contribs--22.05.7-1.el7.x86_64.rpm to be installed
Examining slurm-devel--22.05.7-1.el7.x86_64.rpm: slurm-devel-22.05.7-1.el7.x86_64
Marking slurm-devel--22.05.7-1.el7.x86_64.rpm to be installed
Examining slurm-example-configs--22.05.7-1.el7.x86_64.rpm: slurm-example-configs-22.05.7-1.el7.x86_64
Marking slurm-example-configs--22.05.7-1.el7.x86_64.rpm to be installed
Examining slurm-lbpmi--22.05.7-1.el7.x86_64.rpm: slurm-lbpmi-22.05.7-1.el7.x86_64
Marking slurm-lbpmi--22.05.7-1.el7.x86_64.rpm to be installed
Examining slurm-openlava--22.05.7-1.el7.x86_64.rpm: slurm-openlava-22.05.7-1.el7.x86_64
Marking slurm-openlava--22.05.7-1.el7.x86_64.rpm to be installed
Examining slurm-pam--slurm--22.05.7-1.el7.x86_64.rpm: slurm-pam-slurm-22.05.7-1.el7.x86_64
Marking slurm-pam--slurm--22.05.7-1.el7.x86_64.rpm to be installed
Examining slurm-perlapl--22.05.7-1.el7.x86_64.rpm: slurm-perlapl-22.05.7-1.el7.x86_64
Marking slurm-perlapl--22.05.7-1.el7.x86_64.rpm to be installed
Examining slurm-slurmctld--22.05.7-1.el7.x86_64.rpm: slurm-slurmctld-22.05.7-1.el7.x86_64
Marking slurm-slurmctld--22.05.7-1.el7.x86_64.rpm to be installed
Examining slurm-slurmd--22.05.7-1.el7.x86_64.rpm: slurm-slurmd-22.05.7-1.el7.x86_64
Marking slurm-slurmd--22.05.7-1.el7.x86_64.rpm to be installed
Examining slurm-slurmbdd--22.05.7-1.el7.x86_64.rpm: slurm-slurmbdd-22.05.7-1.el7.x86_64
Marking slurm-slurmbdd--22.05.7-1.el7.x86_64.rpm to be installed
Examining slurm-torque--22.05.7-1.el7.x86_64.rpm: slurm-torque-22.05.7-1.el7.x86_64
Marking slurm-torque--22.05.7-1.el7.x86_64.rpm to be installed
Resolving Dependencies
  Running transaction check
--> Package slurm.x86_64 0:22.05.7-1.el7 will be installed
--> Package slurm-contribs.x86_64 0:22.05.7-1.el7 will be installed
--> Package slurm-devel.x86_64 0:22.05.7-1.el7 will be installed
--> Package slurm-example-configs.x86_64 0:22.05.7-1.el7 will be installed
--> Package slurm-lbpmi.x86_64 0:22.05.7-1.el7 will be installed
--> Package slurm-openlava.x86_64 0:22.05.7-1.el7 will be installed
--> Processing Dependency: perl(Switch) for package: slurm-openlava-22.05.7-1.el7.x86_64
Loading mirror speeds from cached hostfile
 * base: repo.extreme-ix.org
 * epel: repo.extreme-ix.org

[root@master ~]
```

```
[root@master x86_64]# cd
[root@master ~]# yum install nfs
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
 * base: repo.extreme-ix.org
 * epel: repo.extreme-ix.org
 * extras: repo.extreme-ix.org
 * updates: repo.extreme-ix.org
No package nfs available.
Error: Nothing to do
[root@master ~]# yum install nfs-utils
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
 * base: repo.extreme-ix.org
 * epel: repo.extreme-ix.org
 * extras: repo.extreme-ix.org
 * updates: repo.extreme-ix.org
Resolving Dependencies
--> Running transaction check
--> Package nfs-utils.x86_64 1:1.3.0-0.68.el7 will be updated
--> Package nfs-utils.x86_64 1:1.3.0-0.68.el7.2 will be an update
--> Finished Dependency Resolution

Dependencies Resolved

=====
Package           Arch      Version            Repository        Size
=====
Updating:
nfs-utils         x86_64   1:1.3.0-0.68.el7.2   updates          413 k

Transaction Summary
=====
Upgrade 1 Package

Total size: 413 k
Is this ok [y/d/N]: y
[  1  ] root@master:~
```

```

[Complete]
[root@master ~]# vim /etc/exports
[root@master ~]# exportfs -arv
exporting .:/install
exporting *:/tftpboot
[root@master ~]# chroot /install/netboot/centos7.9/x86_64/compute/rootimg
bash: vte_prompt_command: command not found
[root@master ~]# showmount -e master
[1]+ Stopped                  showmount -e master
bash: vte_prompt_command: command not found
[root@master ~]# showmount -e 192.168.174.227
Export list for 192.168.174.227:
[root@master ~]# /install
[Install]
[root@master ~]# /tftpboot
bash: vte_prompt_command: command not found
[root@master ~]# mount -t nfs 192.168.160.10:/root /root
bash: vte_prompt_command: command not found
[root@master ~]# df -Th
df: cannot read table of mounted file systems: No such file or directory
bash: vte_prompt_command: command not found
[root@master ~]# exit
exit
There are stopped jobs.
bash: vte_prompt_command: command not found
[root@master ~]# exit
exit
[root@master ~]# cd
[root@master ~]# lsdef -t osimage
centos7.9-x86_64-install-compute (osimage)
centos7.9-x86_64-netboot-compute (osimage)
centos7.9-x86_64-stateelite-compute (osimage)
[root@master ~]# packimage centos7.9-x86_64-netboot-compute
Packing contents of /install/netboot/centos7.9/x86_64/compute/rootimg

```

[root@master ~]# cp -r /root/rpmbuild/RPMS/x86_64/

/install/netboot/centos7.9/x86_64/compute/rootimg/home/

[root@master ~]# export SLURMUSER=1005

[root@master ~]# groupadd -g \$SLURMUSER slurm

[root@master ~]# useradd -m -c "SLURM workload manager" -d /var/lib/slurm -u \$SLURMUSER -g slurm -s /bin/bash slurm

[root@master ~]# id slurm

```

root@master:~# munge.key
[root@master ~]# scp /etc/munge/munge.key root@cn01:/etc/munge/
root@cn01's password:
munge.key
[root@master ~]# cd /
root/run/
[root@master ~]# cd /root/rpmbuild/RPMS/x86_64/
[root@master x86_64]# yum install slurm*
Loaded plugins: fastestmirror, langpacks
Examining slurm-22.05.7-1.el7.x86_64.rpm: slurm-22.05.7-1.el7.x86_64
slurm-22.05.7-1.el7.x86_64.rpm: does not update installed package.
Examining slurm-attrib-22.05.7-1.el7.x86_64.rpm: slurm-attrib-22.05.7-1.el7.x86_64
slurm-attrib-22.05.7-1.el7.x86_64.rpm: does not update installed package.
Examining slurm-devel-22.05.7-1.el7.x86_64
slurm-devel-22.05.7-1.el7.x86_64.rpm: does not update installed package.
Examining slurm-example-configs-22.05.7-1.el7.x86_64
slurm-example-configs-22.05.7-1.el7.x86_64.rpm: does not update installed package.
Examining slurm-libpmi-22.05.7-1.el7.x86_64.rpm: slurm-libpmi-22.05.7-1.el7.x86_64
slurm-libpmi-22.05.7-1.el7.x86_64.rpm: does not update installed package.
Examining slurm-openlava-22.05.7-1.el7.x86_64.rpm: slurm-openlava-22.05.7-1.el7.x86_64
slurm-openlava-22.05.7-1.el7.x86_64.rpm: does not update installed package.
Examining slurm-pam-22.05.7-1.el7.x86_64.rpm: slurm-pam-22.05.7-1.el7.x86_64
slurm-pam-22.05.7-1.el7.x86_64.rpm: does not update installed package.
Examining slurm-perlapl-22.05.7-1.el7.x86_64.rpm: slurm-perlapl-22.05.7-1.el7.x86_64
slurm-perlapl-22.05.7-1.el7.x86_64.rpm: does not update installed package.
Examining slurm-slurmctld-22.05.7-1.el7.x86_64.rpm: slurm-slurmctld-22.05.7-1.el7.x86_64
slurm-slurmctld-22.05.7-1.el7.x86_64.rpm: does not update installed package.
Examining slurm-slurmd-22.05.7-1.el7.x86_64.rpm: slurm-slurmd-22.05.7-1.el7.x86_64
slurm-slurmd-22.05.7-1.el7.x86_64.rpm: does not update installed package.
Examining slurm-slurmdbd-22.05.7-1.el7.x86_64.rpm: slurm-slurmdbd-22.05.7-1.el7.x86_64
slurm-slurmdbd-22.05.7-1.el7.x86_64.rpm: does not update installed package.
Examining slurm-torque-22.05.7-1.el7.x86_64.rpm: slurm-torque-22.05.7-1.el7.x86_64
slurm-torque-22.05.7-1.el7.x86_64.rpm: does not update installed package.
Error: Nothing to do
[root@master x86_64]# cd
[root@master ~]# export $SLURMUSER=1005
[root@master ~]# groupadd -g $SLURMUSER slurm
[root@master ~]# useradd -m -c "SLURM workload manager" -d /var/lib/slurm -u $SLURMUSER -g slurm -s /bin/bash slurm
[root@master ~]# id slurm
uid=1005(slurm) gid=1005(slurm) groups=1005(slurm)
[root@master ~]#

```

Inter outside or press Ctrl+Alt.

13°C Clear 06:15 29-01-2023 ENG

[root@master ~]# cp /etc/slurm/slurm.conf.example /etc/slurm/slurm.conf

[root@master ~]# vim /etc/slurm/slurm.conf

```

# Example slurm.conf file. Please run configurator.html
# (in doc/html) to build a configuration file customized
# for your environment.
#
# slurm.conf file generated by configurator.html.
# Put this file on all nodes of your cluster.
# See the slurm.conf man page for more information.
#
#ClusterName=golden
$SlurmctldHost=master
#$SlurmctldHost=
#
#DisableRootJobs=NO
#EnforcePartLimits=NO
#Epilog=
#EpilogSlurmctld=
#FirstJobId=1
#MaxJobId=67043328
#GresTypes=
#GroupUpdateForce=0
#GroupUpdateTime=600
#JobFileAppend=0
#JobFileDelete=0
#JobSubmitPlugins=lua
#KillOnBadExit=0
#LaunchType=launch/slurm
#Licenses=foo*4,bar
#MailProg/bin/mail
#MailToJobs=0
#MaxStepCount=40000
#MaxTasksPerNode=512
MpiDefault=None
#MpiParams=ports=-#
#PluginDir=
#PluginConfig=
#PrivateData=jobs
ProctrackType=proctrack/cgroup
#Prologue=
"/etc/slurm/slurm.conf" 153L, 3034C

```

1,1 Top

Inter outside or press Ctrl+Alt.

13°C Clear 06:24 29-01-2023 ENG

```

ReturnToService=1
SlurmctldPidFile=/var/run/slurmctld.pid
SlurmctldPort=6817
SlurmPidFile=/var/run/slurmfd.pid
SlurmfdPort=6818
SlurmFdSpoolDir=/var/share/slurm/d
SlurmUser=root
#SlurmUser=root
#SrunEpilog=
#SrunProlog=
StateSaveLocation=/var/share/slurm/ctld
SwitchType=switch/none
#TaskEpilog=
TaskPlugin=task/affinity
#TaskProlog=
#TopologyPlugin=topology/tree
#TmpFS=/tmp
#TrackWCKey=no
#TreeWidth=
#UnkillableStepProgram=
#UsePAM=0
#
#
# TIMERS
#BatchStartTimeout=10
#CompletedWait=0
#EpilogMsgTime=2000
#GetEnvTimeout=2
#HealthCheckInterval=0
#HealthCheckProgram=
InactivityLimit=0
KillAfter=0
#MessageTimeout=10
#ResvOverRun=0
MinJobAge=300
#OverTamedLimit=0
SlurmctldTimeout=120
SlurmfdTimeout=300
#UnkillableStepTimeout=60
#VSizeFactor=0
  
```

86,1 40%

root@master:~ inter outside or press Ctrl+Alt.

13°C Clear 0625 ENG 29-01-2023

[root@master ~]# mkdir -p /var/share/slurm/ctld

[root@master ~]# chown -R slurm:slurm /var/share/slurm/

[root@master ~]# touch /var/log/slurmctld.log

[root@master ~]# slurmd -C

```

slurm-slurmdbd-22.05.7-1.el7.x86_64.rpm: does not update installed package.
Examining slurm-torque-22.05.7-1.el7.x86_64.rpm: slurm-torque-22.05.7-1.el7.x86_64
slurm-torque-22.05.7-1.el7.x86_64.rpm: does not update installed package.
Error: Nothing to do
[root@master x86_64]# cd
[root@master ~]# export SLURMUSER=1005
[root@master ~]# groupadd -g $SLURMUSER slurm
[root@master ~]# useradd -c "SLURM workload manager" -d /var/lib/slurm -u $SLURMUSER -g slurm -s /bin/bash slurm
[root@master ~]# id slurm
uid=1005(slurm) gid=1005(slurm) groups=1005(slurm)
[root@master ~]# chroot /install/slurmboot/centos7.9/x86_64/compute/
initrd-stateless-gzip-minimalstatefile.gz kernel rootimg rootimg.cpio.gz
[root@master ~]# chroot /install/slurmboot/centos7.9/x86_64/compute/rootimg
bash: vte_prompt_command: command not found
[root@master ~]# export SLURMUSER=1005
bash: vte_prompt_command: command not found
[root@master ~]# groupadd -g $SLURMUSER slurm
bash: vte_prompt_command: command not found
[root@master ~]# useradd -c "SLURM workload manager" -d /var/lib/slurm -u $SLURMUSER -g slurm -s /bin/bash slurm
bash: vte_prompt_command: command not found
[root@master ~]# id slurm
uid=1005(slurm) gid=1005(slurm) groups=1005(slurm)
bash: vte_prompt_command: command not found
[root@master ~]# exit
exit
[root@master ~]# cp /etc/slurm/slurm.conf.example /etc/slurm/slurm.conf
[root@master ~]# vim /etc/slurm/slurm.conf
[root@master ~]# vim /etc/slurm/slurm.conf
[root@master ~]# scp /etc/slurm/slurm.conf root@cn00:/etc/slurm/slurm.conf
root@cn00's password:
scp: /etc/slurm/slurm.conf: No such file or directory
[root@master ~]# mkdir -p /var/share/slurm/ctld
[root@master ~]# chown -R slurm:slurm /var/share/slurm/
[root@master ~]# touch /var/log/slurmctld.log
[root@master ~]# slurmd -c
slurmd: fatal: Unable to determine this slurmd's NodeName
[root@master ~]# slurmd -c
NodeName=master CPUs=4 Boards=1 SocketsPerBoard=2 CoresPerSocket=2 ThreadsPerCore=1 RealMemory=7802
Uptime=0:01:18:53
[root@master ~]# vim /etc/slurm/slurm.conf
[root@master ~]# 
```

root@master:~ inter outside or press Ctrl+G.

13°C Clear 0636 ENG 29-01-2023

```
[root@master ~]# vim /etc/slurm/slurm.conf

[root@master ~]# yum --installroot=/install/netboot/centos7.9/x86_64/compute/rootimg/
install slurm*

[root@master ~]# mkdir /install/netboot/centos7.9/x86_64/compute/rootimg/etc/slurm

[root@master ~]# scp /etc/slurm/slurm.conf root@cn00:/etc/slurm/
[root@master ~]# scp /etc/slurm/slurm.conf root@cn01:/etc/slurm/

[root@master ~]# chroot /install/netboot/centos7.9/x86_64/compute/rootimg/

[root@master /]# systemctl enable munge

[root@master ~]# chown -R slurm:slurm
/install/netboot/centos7.9/x86_64/compute/rootimg/var/share/slurm

[root@master ~]# chown -R munge:munge
/install/netboot/centos7.9/x86_64/compute/rootimg/etc/munge/

[root@master ~]# systemctl start slurmmctld

[root@master ~]# systemctl status slurmmctld
[root@master ~]# systemctl start munge

[root@master ~]# systemctl status munge
```

```
[root@master ~]# slurmrd -C
NodeName=master CPUs=4 Boards=1 SocketsPerBoard=2 CoresPerSocket=2 ThreadsPerCore=1 RealMemory=7802
[07-01-2023 12:26:06] root@master:~# vim /etc/slurm/slurm.conf
[root@master ~]# yum -y install netboot/install/netboot/centos7.9/x86_64/compute/rootimg/ install slurm*
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
 * base: mirrors.nxtgen.com
 * epel: repo extreme-ix.org
 * extras: mirrors.nxtgen.com
 * updates: repo extreme-ix.org
No package slurm-22.05.7.tar.bz2 available.
No package slurm-22.05.7.tar.bz2.1 available.
Error: Nothing to do
[root@master ~]# mkdir /install/
[root@master ~]# cp /etc/slurm/slurm.conf /install/
[root@master ~]# cp /etc/slurm/slurm.conf /install/netboot/centos7.9/x86_64/compute/rootimg/etc/slurm
[root@master ~]# scp /etc/slurm/slurm.conf root@cn00:/etc/slurm/
root@cn00's password:
slurm.conf
[100% 3134 6.4MB/s 00:00]
[root@master ~]# chroot /install/netboot/centos7.9/x86_64/compute/rootimg/
bash: _vte_prompt_command: command not found
[100% 3134 2.5MB/s 00:00]
[root@master ~]# systemctl enable munge
Created symlink /etc/systemd/system/multi-user.target.wants/munge.service, pointing to /usr/lib/systemd/system/munge.service.
bash: _vte_prompt_command: command not found
[root@master ~]# exit
exit
[100% 3134 2.5MB/s 00:00]
[root@master ~]# scp /etc/slurm/slurm.conf root@cn01:/etc/slurm/
root@cn01's password:
slurm.conf
[100% 3134 2.5MB/s 00:00]
[root@master ~]# cp /etc/slurm/slurm.conf /install/
[root@master ~]# cp /etc/slurm/slurm.conf /install/netboot/centos7.9/x86_64/compute/rootimg/etc/munge
[root@master ~]# mkdir -p /etc/slurm/slurm.conf /install/netboot/centos7.9/x86_64/compute/rootimg/var/share/slurm/ctld
mkdir: cannot create directory '/etc/slurm/slurm.conf': File exists
[root@master ~]# chown -R slurm:slurm /install/netboot/centos7.9/x86_64/compute/
[root@master ~]# cp /etc/slurm/slurm.conf /install/netboot/centos7.9/x86_64/compute/rootimg/
[root@master ~]# chown -R slurm:slurm /install/netboot/centos7.9/x86_64/compute/rootimg/var/share/slurm
[root@master ~]# chown -R munge:munge /install/netboot/etc/munge
netboot/
[100% 3134 2.5MB/s 00:00]

```

```
[root@cn00 ~]# systemctl status munge
● munge.service - MUNGE authentication service
   Loaded: loaded (/usr/lib/systemd/system/munge.service; disabled; vendor preset: disabled)
     Active: active (running) since Sun 2023-01-29 12:26:06 IST; 6s ago
       Docs: man:munged(8)
     Process: 1663 ExecStart=/usr/sbin/munged (code=exited, status=0/SUCCESS)
    Main PID: 1665 (munged)
      CGroup: /system.slice/munge.service
              └─1665 /usr/sbin/munged

Jan 29 12:26:06 cn00.xcat.in systemd[1]: Starting MUNGE authentication service...
Jan 29 12:26:06 cn00.xcat.in systemd[1]: Started MUNGE authentication service.
[100% 3134 2.5MB/s 00:00]
[root@cn00 ~]#
[root@cn00 ~]# mkdir -p /etc/slurm/slurm.conf /install/netboot/centos7.9/x86_64/compute/rootimg/etc/munge
[root@cn00 ~]# chown -R slurm:slurm /etc/slurm/slurm.conf /install/netboot/centos7.9/x86_64/compute/
[root@cn00 ~]# cp /etc/slurm/slurm.conf /install/netboot/centos7.9/x86_64/compute/rootimg/
[root@cn00 ~]# chown -R slurm:slurm /install/netboot/centos7.9/x86_64/compute/rootimg/var/share/slurm
[root@cn00 ~]# chown -R munge:munge /install/netboot/etc/munge
netboot/
[100% 3134 2.5MB/s 00:00]
```

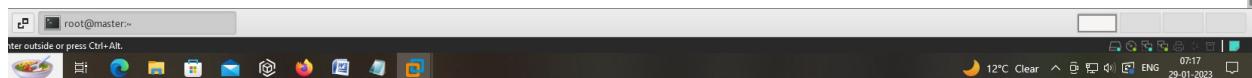
```
[root@cn01 ~]# systemctl status munge
● munge.service - MUNGE authentication service
   Loaded: loaded (/usr/lib/systemd/system/munge.service; disabled; vendor preset: disabled)
     Active: active (running) since Sun 2023-01-29 12:26:29 IST; 5s ago
       Docs: man:munged(8)
     Process: 1646 ExecStart=/usr/sbin/munged (code=exited, status=0/SUCCESS)
    Main PID: 1648 (munged)
      CGroup: /system.slice/munge.service
              └─1648 /usr/sbin/munged

Jan 29 12:26:29 cn01.xcat.in systemd[1]: Starting MUNGE authentication service...
Jan 29 12:26:29 cn01.xcat.in systemd[1]: Started MUNGE authentication service.
[100% 3134 2.5MB/s 00:00]
[root@cn01 ~]#
[root@cn01 ~]#
```

```
[root@master ~]# systemctl status slurmctld
● slurmctld.service - Slurm Controller daemon
   Loaded: loaded (/usr/lib/systemd/system/slurmctld.service; disabled; vendor preset: disabled)
     Active: active (running) since Sun 2023-01-29 12:28:08 IST; 5s ago
       Main PID: 10711 (slurmctld)
          Tasks: 0
         CGroup: /system.slice/slurmctld.service
             └─10711 /usr/sbin/slurmctld -D -s
                 ├─10715 slurmctld: slurmscriptd

Jan 29 12:28:08 master systemd[1]: Started Slurm controller daemon.
[root@master ~]# systemctl start munge
[root@master ~]# systemctl status munge
● munge.service - MUNGE authentication service
   Loaded: loaded (/usr/lib/systemd/system/munge.service; disabled; vendor preset: disabled)
     Active: active (running) since Sun 2023-01-29 12:28:27 IST; 6s ago
       Docs: man:munged(8)
     Process: 10759 ExecStart=/usr/sbin/munged (code=exited, status=0/SUCCESS)
    Main PID: 10761 (munged)
       Tasks: 4
      CGroup: /system.slice/munge.service
              └─10761 /usr/sbin/munged

Jan 29 12:28:27 master systemd[1]: Starting MUNGE authentication service...
Jan 29 12:28:27 master systemd[1]: Started MUNGE authentication service.
[root@master ~]#
```



GANGLIA INSTALLATION

[root@master ~]# systemctl status firewalld.service

[root@master ~]# sestatus

[root@master ~]# yum install ganglia rrdtool ganglia-gmetad ganglia-gmond ganglia-web

```
[root@master ~]# systemctl status firewalld.service
● firewalld.service - dynamic firewall daemon
   Loaded: loaded (/usr/lib/systemd/system/firewalld.service; disabled; vendor preset: enabled)
     Active: inactive (dead)
       Docs: man:firewalld(1)

[root@master ~]# sestatus
SELinux status:                 disabled

[root@master ~]# ^C
[root@master ~]# yum install ganglia rrdtool ganglia-gmetad ganglia-gmond ganglia-web
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
 * base: repo.extreme-ix.org
 * epel: repo.extreme-ix.org
 * extras: repo.extreme-ix.org
 * updates: repo.extreme-ix.org
Resolving Dependencies
--> Running transaction check
--> Package ganglia.x86_64 0:3.7.2-40.el7 will be installed
--> Processing Dependency: libconfuse.so.0()(64bit) for package: ganglia-3.7.2-40.el7.x86_64
--> Package ganglia-gmetad.x86_64 0:3.7.2-40.el7 will be installed
--> Processing Dependency: libmemcached.so.11()(64bit) for package: ganglia-gmetad-3.7.2-40.el7.x86_64
--> Processing Dependency: libmemcachedutil.so.2()(64bit) for package: ganglia-gmetad-3.7.2-40.el7.x86_64
--> Package ganglia-gmond.x86_64 0:3.7.2-40.el7 will be installed
--> Package ganglia-web.x86_64 0:3.7.5-40.el7 will be installed
--> Processing Dependency: php for package: ganglia-web-3.7.5-40.el7.x86_64
--> Processing Dependency: php-gd for package: ganglia-web-3.7.5-40.el7.x86_64
--> Package rrdtool.x86_64 0:1.4.8-9.el7 will be installed
--> Running transaction check
--> Package libconfuse.x86_64 0:2.7-7.el7 will be installed
--> Package libmemcached.x86_64 0:1.0.16-5.el7 will be installed
--> Package php.x86_64 0:5.4.16-48.el7 will be installed
--> Processing Dependency: php-common(x86-64) = 5.4.16-48.el7 for package: php-5.4.16-48.el7.x86_64
--> Processing Dependency: php-cli(x86-64) = 5.4.16-48.el7 for package: php-5.4.16-48.el7.x86_64
--> Package php-gd.x86_64 0:5.4.16-48.el7 will be installed
--> Processing Dependency: libt1.so.5()(64bit) for package: php-gd-5.4.16-48.el7.x86_64
--> Running transaction check
--> Package php-cli.x86_64 0:5.4.16-48.el7 will be installed
--> Package php-common.x86_64 0:5.4.16-48.el7 will be installed
--> Processing Dependency: libzip.so.2()(64bit) for package: php-common-5.4.16-48.el7.x86_64
[  root@master:~ ] 16°C Sunny 08:53 ENG 29-01-2023
```

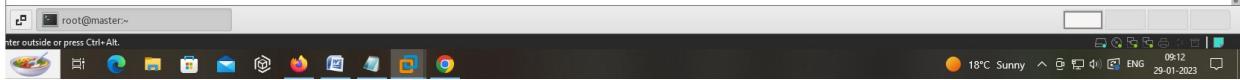
[root@master ~]# htpasswd -c /etc/httpd/auth.basic admganglia

[root@master ~]# vi /etc/httpd/conf.d/ganglia.conf

```
root@master:~#
#
# Ganglia monitoring system php web frontend
#
Alias /ganglia /usr/share/ganglia
<Location /ganglia>
  AuthType basic
  AuthName "Ganglia web UI"
  AuthBasicProvider file
  AuthUserFile "/etc/httpd/auth.basic"
  Require user admganglia
</Location>
```

[root@master ~]# vi /etc/ganglia/gmetad.conf

```
# If the polling interval is omitted, 15sec is assumed.
#
# If you choose to set the polling interval to something other than the default,
# note that the web frontend determines a host as down if its TN value is less
# than 4 * TMAX (20sec by default). Therefore, if you set the polling interval
# to something around or greater than 80sec, this will cause the frontend to
# incorrectly display hosts as down even though they are not.
#
# A list of machines which service the data source follows, in the
# format ip:port, or name:port. If a port is not specified then 8649
# (the default gmond port) is assumed.
# default: There is no default value
#
# data_source "my cluster" 10 localhost my.machine.edu:8649 1.2.3.5:8655
# data_source "my grid" 50 1.3.4.7:8655 grid.org:8651 grid-backup.org:8651
# data_source "another source" 1.3.4.7:8655 1.3.4.8
#
# data_source "Labs" 60 192.168.174.227:8649
# data_source "Labs" 60 192.168.160.60
# data_source "Labs" 60 192.168.160.70
gridname "Home office"
#
# Round-Robin Archives
# You can specify custom Round-Robin archives here (defaults are listed below)
#
# Old Default RRA: Keep 1 hour of metrics at 15 second resolution. 1 day at 6 minute
# # RRAs "RRA:AVERAGE:0.5:1:244" "RRA:AVERAGE:0.5:24:244" "RRA:AVERAGE:0.5:672:244" \
# # "RRA:AVERAGE:0.5:5760:374"
# New Default RRA
# Keep 5856 data points at 15 second resolution assuming 15 second (default) polling. That's 1 day
# Two weeks of data points at 1 minute resolution (average)
#RRAs "RRA:AVERAGE:0.5:1:5856" "RRA:AVERAGE:0.5:4:20160" "RRA:AVERAGE:0.5:40:52704"
#
#+-----+
# Scalability mode. If on, we summarize over downstream grids, and respect
# authority tags. If off, we take on 2.5.0-era behavior: we do not wrap our output
# in <GRID></GRID> tags, we ignore all <GRID> tags we see, and always assume
# we are the "authority" on data source feeds. This approach does not scale to
```



[root@master ~]# vi /etc/ganglia/gmond.conf

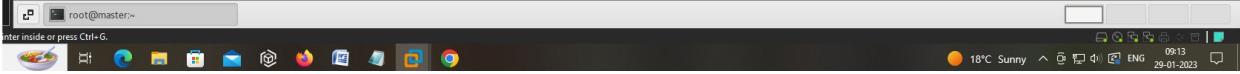
```
* tag that will wrap all hosts collected by this instance.
cluster {
    name = "Labs"
    owner = "unspecified"
    latlong = "unspecified"
    url = "unspecified"
}

/* The host section describes attributes of the host, like the location */
host {
    location = "unspecified"
}

/* Feel free to specify as many udp_send_channels as you like. Gmond
used to only support having a single channel */
udp_send_channel {
    bind_hostname = yes # Highly recommended, soon to be default.
    # This option tells gmond to use a source address
    # that resolves to the machine's hostname. Without
    # this, the metrics may appear to come from any
    # interface and its DNS names associated with
    # those IPs will be used to create the RRDs.
    #mcast_join = 239.2.11.71
    port = 8649
    ttl = 1
}

/* You can specify as many udp_recv_channels as you like as well. */
udp_recv_channel {
    #mcast_join = 239.2.11.71
    port = 8649
    #bind = 239.2.11.71
    retry_bind = true
    # Size of the UDP buffer. If you are handling lots of metrics you really
    # should bump it up to e.g. 10MB or even higher.
    # buffer = 10485760
}

/* You can specify as many tcp_accept_channels as you like to share
```



[root@master ~]# setsebool -P httpd_can_network_connect 2

```
[root@master ~]# systemctl restart httpd gmetad gmond
[root@master ~]# setsebool -P httpd can_network_connect 2
setsebool: SELinux is disabled.
[root@master ~]# systemctl restart httpd gmetad gmond
[root@master ~]# systemctl enable httpd gmetad gmond
```

```
[root@master ~]# systemctl restart httpd gmetad gmond
```

```
[root@master ~]# systemctl enable httpd gmetad httpd
```

```
[root@master ~]# systemctl restart httpd gmetad httpd
[root@master ~]# systemctl enable httpd gmetad httpd
Created symlink from /etc/systemd/system/multi-user.target.wants/gmetad.service to /usr/lib/systemd/system/gmetad.service.
[root@master ~]# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
        inet6 ::1/128 scope host
            valid_lft forever preferred_lft forever
2: ens33: <NO-CARRIER,BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:1e:7a:45 brd ff:ff:ff:ff:ff:ff
    inet 192.168.169.174/24 brd 192.168.169.255 scope global noprefixroute dynamic ens33
        valid_lft 1645sec preferred_lft 1645sec
        inet6 fe80::d305:a84d%ens33/64 scope link noprefixroute
            valid_lft forever preferred_lft forever
3: ens36: <NO-CARRIER,BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:1e:7a:45 brd ff:ff:ff:ff:ff:ff
    inet 192.168.169.19/24 brd 192.168.169.255 scope global noprefixroute ens36
        valid_lft forever preferred_lft forever
        inet6 fe80::e836:5d9e%ens36/64 scope link noprefixroute
            valid_lft forever preferred_lft forever
4: virbr0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc noqueue state DOWN group default qlen 1000
    link/ether 52:54:00:d7:c8:55 brd ff:ff:ff:ff:ff:ff
    inet 192.168.122.1/24 brd 192.168.122.255 scope global virbr0
        valid_lft forever preferred_lft forever
5: virbr0-nic: <NO-CARRIER,BROADCAST,MULTICAST> mtu 1500 qdisc pfifo_fast master virbr0 state DOWN group default qlen 1000
    link/ether 52:54:00:d7:c8:55 brd ff:ff:ff:ff:ff:ff
[root@master ~]# vim /etc/httpd/conf.d/ganglia.conf
[root@master ~]# vi /etc/ganglia/gmetad.conf
[root@master ~]# vi /etc/ganglia/gmond.conf
[root@master ~]# systemctl status httpd gmetad httpd
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; vendor preset: disabled)
   Active: active (running) since Sun 2023-01-29 14:35:22 IST; 8min ago
     Docs: man:httpd(8)
           man:apachectl(8)
 Main PID: 21722 (httpd)
   Status: "Total requests: 1; Current requests/sec: 0; Current traffic: 0 B/sec"
   CGroup: /system.slice/httpd.service
          └─21722 /usr/sbin/httpd -DFOREGROUND

[root@master ~]#
```

```
[root@master ~]# systemctl status httpd gmetad httpd
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; vendor preset: disabled)
   Active: active (running) since Sun 2023-01-29 14:35:22 IST; 8min ago
     Docs: man:htpd(8)
           man:apachectl(8)
Main PID: 21722 (httpd)
   Status: "Total requests: 1; Current requests/sec: 0; Current traffic:  0 B/sec"
CGroup: /system.slice/httpd.service
        ├─21722 /usr/sbin/httpd -DFOREGROUND
        ├─21723 /usr/sbin/httpd -DFOREGROUND
        ├─21724 /usr/sbin/httpd -DFOREGROUND
        ├─21725 /usr/sbin/httpd -DFOREGROUND
        ├─21726 /usr/sbin/httpd -DFOREGROUND
        ├─21730 /usr/sbin/httpd -DFOREGROUND
        └─21849 /usr/sbin/httpd -DFOREGROUND

Jan 29 14:35:22 master systemd[1]: Starting The Apache HTTP Server...
Jan 29 14:35:22 master httpd[21722]: [Sun Jan 29 14:35:22.837301 2023] [so:warn] [pid 21722] AH01574: module rewrite_module is already loaded, skipping
Jan 29 14:35:22 master httpd[21722]: AH00558: httpd: Could not reliably determine the server's fully qualified domain name, using 192.168.174.227. Set the 'ServerName'...this message
Jan 29 14:35:22 master systemd[1]: Started The Apache HTTP Server.

● gmetad.service - Ganglia Meta Daemon
   Loaded: loaded (/usr/lib/systemd/system/gmetad.service; enabled; vendor preset: disabled)
   Active: active (running) since Sun 2023-01-29 14:35:21 IST; 8min ago
Main PID: 21701 (gmetad)
  CGroup: /system.slice/gmetad.service
          ├─21701 /usr/sbin/gmetad -d 1

Jan 29 14:39:25 master gmetad[21701]: data_thread() for [Labs] failed to contact node 192.168.160.70
Jan 29 14:39:25 master gmetad[21701]: data_thread() got no answer from any [Labs] datasource
Jan 29 14:40:25 master gmetad[21701]: data_thread() for [Labs] failed to contact node 192.168.160.70
Jan 29 14:40:25 master gmetad[21701]: data_thread() got no answer from any [Labs] datasource
Jan 29 14:41:23 master gmetad[21701]: data_thread() for [Labs] failed to contact node 192.168.160.70
Jan 29 14:41:23 master gmetad[21701]: data_thread() got no answer from any [Labs] datasource
Jan 29 14:42:22 master gmetad[21701]: data_thread() for [Labs] failed to contact node 192.168.160.70
Jan 29 14:42:22 master gmetad[21701]: data_thread() got no answer from any [Labs] datasource
Jan 29 14:43:26 master gmetad[21701]: data_thread() for [Labs] failed to contact node 192.168.160.70
```

```

● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; vendor preset: disabled)
   Active: active (running) since Sun 2023-01-29 14:35:22 IST; 8min ago
     Docs: man:apachectl(8)
Main PID: 21722 (httpd)
   Status: "Total requests: 1; Current requests/sec: 0; Current traffic: 0 B/sec"
   CGroup: /system.slice/httpd.service
           ├─21722 /usr/sbin/httpd -DFOREGROUND
           ├─21723 /usr/sbin/httpd -DFOREGROUND
           ├─21724 /usr/sbin/httpd -DFOREGROUND
           ├─21725 /usr/sbin/httpd -DFOREGROUND
           ├─21726 /usr/sbin/httpd -DFOREGROUND
           ├─21730 /usr/sbin/httpd -DFOREGROUND
           └─21849 /usr/sbin/httpd -DFOREGROUND

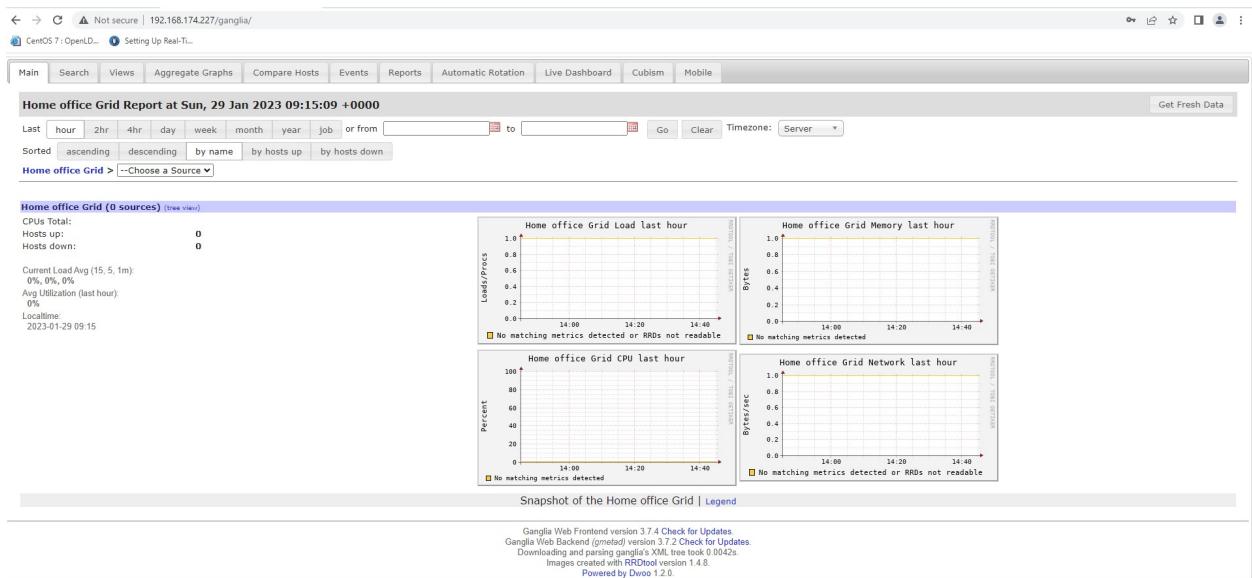
Jan 29 14:35:22 master systemd[1]: Starting The Apache HTTP Server...
Jan 29 14:35:22 master httpd[21722]: [Sun Jan 29 14:35:22.837301 2023] [so:warn] [pid 21722] AH01574: module rewrite_module is already loaded, skipping
Jan 29 14:35:22 master httpd[21722]: AH00558: httpd: Could not reliably determine the server's fully qualified domain name, using 192.168.174.227. Set the 'ServerName'...this message
Jan 29 14:35:22 master systemd[1]: Started The Apache HTTP Server.
Hint: Some lines were ellipsized, use -l to show in full.
[root@master ~]#

```

root inside or press Ctrl+G.

18°C Sunny 09:14 ENG 29-01-2023

[GO TO BROWSER: <http://192.168.174.227/ganglia/>](http://192.168.174.227/ganglia/)



[root@master ~]# yum -y --installroot=/install/netboot/centos7.9/x86_64/compute/rootimg/install ganglia rrdtool ganglia-gmetad ganglia-gmond ganglia-web

```
[root@master ~]# yum -y --installroot=/install/netboot/centos7.9/x86_64/compute/rootimg/ install ganglia_rrdtool ganglia-gmetad ganglia-gmond ganglia-web
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
 * base                                http://mirrors.nxtgen.com
 * epel                                 http://repo.extreme-ix.org
 * extras                               http://mirrors.nxtgen.com
 * updates                             http://repo.extreme-ix.org
Resolving Dependencies
--> Running transaction check
--> Package ganglia.x86_64 0:3.7.2-40.el7 will be installed
--> Processing Dependency: libapr-1.so.0()(64bit) for package: ganglia-3.7.2-40.el7.x86_64
--> Package ganglia-gmetad.x86_64 0:3.7.2-40.el7 will be installed
--> Processing Dependency: libmemcached.so.11()(64bit) for package: ganglia-gmetad-3.7.2-40.el7.x86_64
--> Processing Dependency: libmemcachedutil.so.2()(64bit) for package: ganglia-gmetad-3.7.2-40.el7.x86_64
--> Package ganglia-gmond.x86_64 0:3.7.2-40.el7 will be installed
--> Processing Dependency: php for package: ganglia-web-3.7.5-40.el7.x86_64
--> Processing Dependency: php-gd for package: ganglia-web-3.7.5-40.el7.x86_64
--> Package rrdtool.x86_64 0:1.4.8-9.el7 will be installed
--> Processing Dependency: dejavu-sans-mono-fonts for package: rrdtool-1.4.8-9.el7.x86_64
--> Processing Dependency: libpangocairo-1.0.so.0()(64bit) for package: rrdtool-1.4.8-9.el7.x86_64
--> Processing Dependency: libpango-1.0.so.0()(64bit) for package: rrdtool-1.4.8-9.el7.x86_64
--> Processing Dependency: libcairo.so.2()(64bit) for package: rrdtool-1.4.8-9.el7.x86_64
--> Running transaction check
--> Package apr.x86_64 0:1.4.8-7.el7 will be installed
--> Package cairo.x86_64 0:1.15.12-4.el7 will be installed
--> Processing Dependency: libpixman-1.50.0()(64bit) for package: cairo-1.15.12-4.el7.x86_64
--> Processing Dependency: libpango-1.0.so.0()(64bit) for package: cairo-1.15.12-4.el7.x86_64
--> Processing Dependency: libpangoft2-1.0.so.0()(64bit) for package: cairo-1.15.12-4.el7.x86_64
--> Processing Dependency: libtiff.so.4()(64bit) for package: cairo-1.15.12-4.el7.x86_64
--> Package dejavu-sans-mono-fonts.noarch 0:2.33-6.el7 will be installed
--> Package libconfuse.x86_64 0:2.2.7-7.el7 will be installed
--> Package pango.x86_64 0:1.0.16-5.el7 will be installed
--> Processing Dependency: libthai(x86-64) >= 0.1.9 for package: pango-1.42.4-4.el7.7.x86_64
--> Processing Dependency: harfbuzz(x86-64) >= 1.4.2 for package: pango-1.42.4-4.el7.7.x86_64
--> Processing Dependency: fribidi(x86-64) >= 1.0 for package: pango-1.42.4-4.el7.7.x86_64
--> Processing Dependency: libthai.so.0(LIBTHAI 0.1)(64bit) for package: pango-1.42.4-4.el7.7.x86_64
```

[root@master ~]# chroot /install/netboot/centos7.9/x86_64/compute/rootimg

[root@master /]# vim /etc/ganglia/gmond.conf

```
/*
 * The cluster attributes specified will be used as part of the <CLUSTER>
 * tag that will wrap all hosts collected by this instance.
 */
cluster {
    name = "Labs"
    owner = "unspecified"
    latlong = "unspecified"
    url = "unspecified"
}

/* The host section describes attributes of the host, like the location */
host {
    location = "unspecified"
}

/* Feel free to specify as many udp send channels as you like. Gmond
   used to only support having a single channel */
udp_send_channel {
    #bind_hostname = yes # Highly recommended, soon to be default.
                           # This option tells gmond to use a source address
                           # that resolves to the machine's hostname. Without
                           # this, the metrics may appear to come from any
                           # interface and the DNS names associated with
                           # those IPs will be used to create the RRDs.
    mcast_join = 239.2.11.71
    port = 8649
    ttl = 1
}

/* You can specify as many udp_recv_channels as you like as well. */
udp_recv_channel {
    mcast_join = 239.2.11.71
    port = 8649
    bind = 239.2.11.71
    #retry_bind = true
    # Size of the UDP buffer. If you are handling lots of metrics you really
    # should bump it up to e.g. 10MB or even higher.
    # buffer = 10485760
}
```

[root@master ~]# chroot /install/netboot/centos7.9/x86_64/compute/rootimg systemctl enable gmond

[root@master /]# exit

[root@master ~]# lsdef -t osimage

[root@master ~]# packimage centos7.9-x86_64-netboot-compute

```

[111111.000 0:0.1.2.3.4.5.6.7]
Complete!
[root@master ~]# vi /etc/ganglia/gmond.conf
[root@master ~]# systemctl restart httpd gmetad gmond
[root@master ~]# systemctl enable httpd gmetad httpd
[root@master ~]# vi /etc/ganglia/gmond.conf
[root@master ~]# systemctl restart httpd gmetad gmond
[root@master ~]# systemctl enable httpd gmetad httpd
[root@master ~]# chroot /install/netboot/centos7.9/x86_64/compute/rootimg
bash: _vte_prompt_command: command not found
[root@master ~]# vim /etc/ganglia/gmond.conf
bash: _vte_prompt_command: command not found
[root@master ~]# exit
[root@master ~]# chroot /install/netboot/centos7.9/x86_64/compute/rootimg systemctl enable gmond
Created symlink /etc/systemd/system/multi-user.target.wants/gmond.service, pointing to /usr/lib/systemd/system/gmond.service.
[root@master ~]# systemctl restart httpd gmetad gmond
[root@master ~]# setselinux -P httpd_can_network_connect_2
setsebool: SELinux is disabled.
[root@master ~]# systemctl restart httpd gmetad gmond
[root@master ~]# systemctl enable httpd gmetad gmond
Created symlink from /etc/systemd/system/multi-user.target.wants/gmond.service to /usr/lib/systemd/system/gmond.service.
[root@master ~]# chroot /install/netboot/centos7.9/x86_64/compute/rootimg systemctl enable gmond gmetad httpd
Created symlink /etc/systemd/system/multi-user.target.wants/gmetad.service, pointing to /usr/lib/systemd/system/gmetad.service.
Created symlink /etc/systemd/system/multi-user.target.wants/httpd.service, pointing to /usr/lib/systemd/system/httpd.service.
[root@master ~]# lsdef -t osimage
centos7.9-x86_64-installer-compute (osimage)
centos7.9-x86_64-netboot-compute (osimage)
centos7.9-x86_64-stationary-compute (osimage)
[root@master ~]# packimage centos7.9-x86_64-netboot-compute
Packing contents of /install/netboot/centos7.9/x86_64/compute/rootimg
archive method:gzip
compress method:gzip
[root@master ~]# ^C
[root@master ~]#

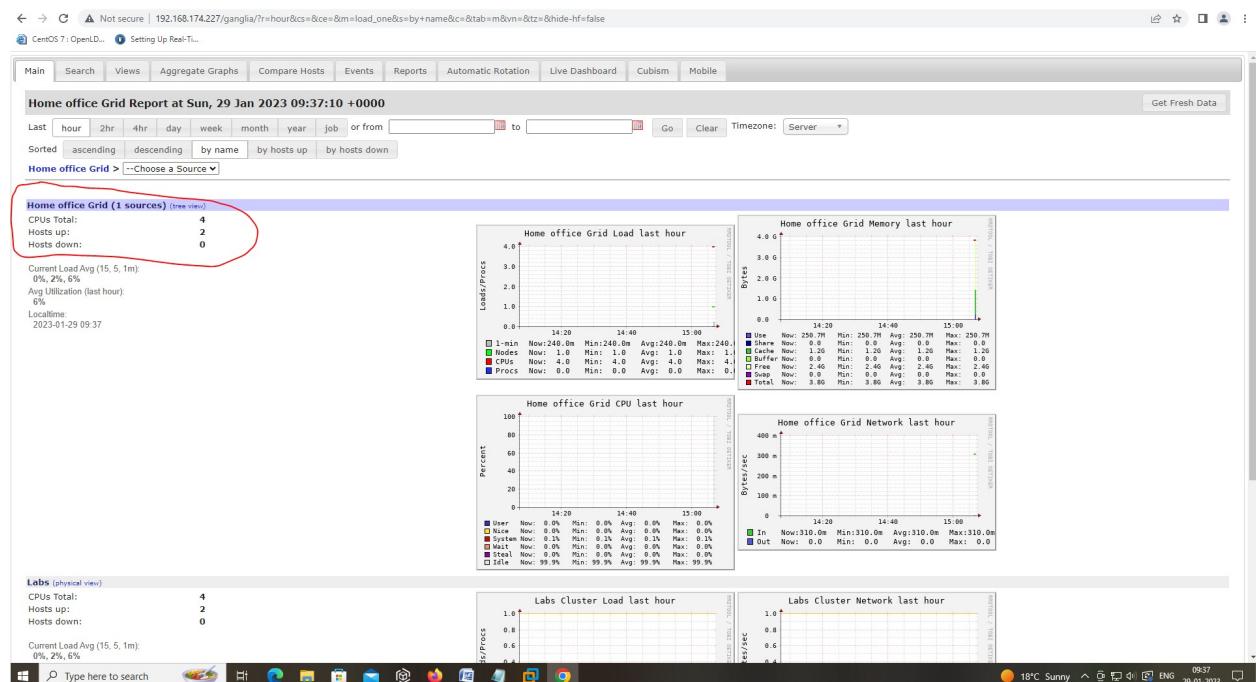
```

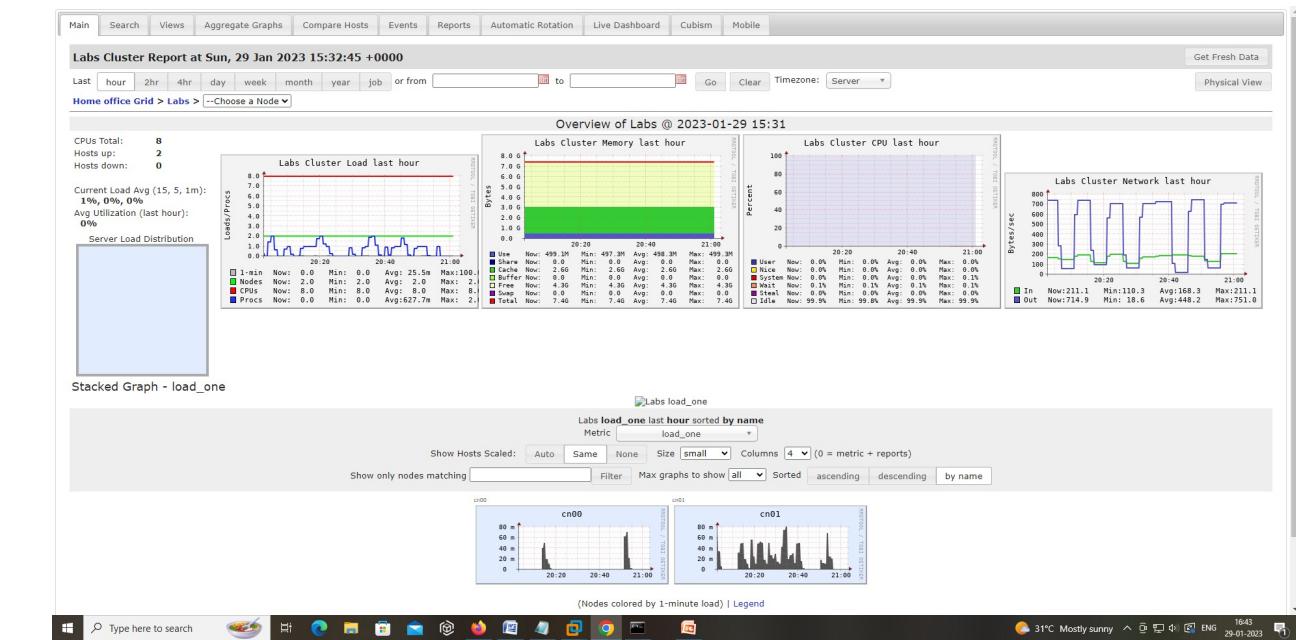
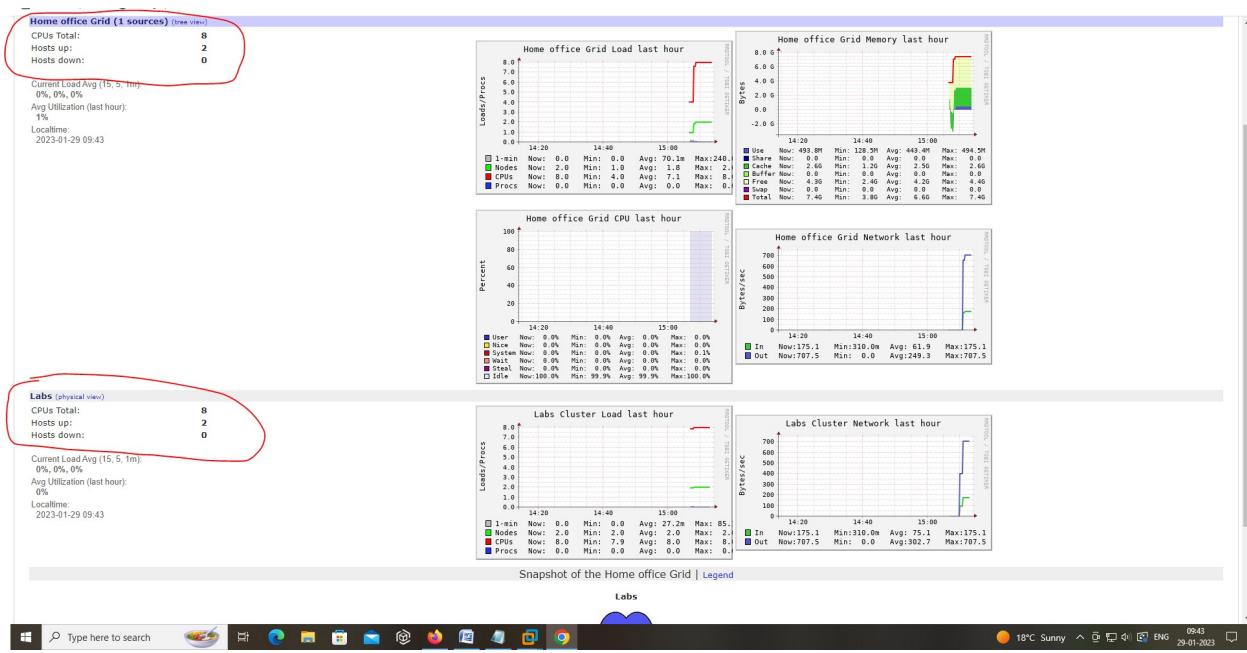
root@master:~

Switch outside or press Ctrl+Alt.

18°C Sunny 09:40 ENG 29-01-2023

NOW AGAIN GO TO THE BROWSER: <http://192.168.174.227/ganglia/>





HPL BENCHMARKING

```
[root@master ~]# yum install atlas
```

```
[root@master ~]# yum install atlas
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
 * base: repo.extreme-ix.org
 * epel: repo.epel.org
 * extras: repo.extreme-ix.org
 * updates: repo.extreme-ix.org
Resolving Dependencies
--> Running transaction check
--> Package atlas.x86_64 0:3.10.1-12.el7 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

=====
Package           Arch      Version            Repository        Size
=====
Installing:
atlas             x86_64   3.10.1-12.el7      base             4.5 M

Transaction Summary
=====
Install 1 Package

Total download size: 4.5 M
Installed size: 23 M
Is this ok [y/d/N]: y
downloading atlas-3.10.1-12.el7.x86_64.rpm
| 4.5 MB  00:00:01

Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
  Installing : atlas-3.10.1-12.el7.x86_64
  Verifying   : atlas-3.10.1-12.el7.x86_64

Installed:
  atlas.x86_64 0:3.10.1-12.el7

[  ]  root@master:~
```

GO TO BROWSER: <https://netlib.org/benchmark/hpl/software.html>

Download hpl-2.3.tar.gz file

```
[root@master Downloads]# wget https://netlib.org/benchmark/hpl/hpl-2.3.tar.gz --no-check-certificate
```

```
[root@master Downloads]# wget https://netlib.org/benchmark/hpl/hpl-2.3.tar.gz --no-check-certificate
--2023-01-29 17:35:15 -- https://netlib.org/benchmark/hpl/hpl-2.3.tar.gz
Resolving netlib.org (netlib.org)... 160.36.131.221
Connecting to netlib.org (netlib.org)|160.36.131.221|:443... connected.
WARNING: Cannot verify netlib.org's certificate, issued by '/C=US/0=Let's Encrypt/CN=R3':
Issued certificate has expired.
HTTP request sent, awaiting response... 200 OK
Length: 660871 (645K) [application/x-gzip]
Saving to: 'hpl-2.3.tar.gz'

100%[=====] 6,60,871 1.14KB/s in 15m 12s

2023-01-29 17:50:30 (725 B/s) - 'hpl-2.3.tar.gz' saved [660871/660871]

[root@master Downloads]# ls
hpl-2.3.tar.gz hpl-2.3.tar.gz.gz hpl-2.3.tar.gz.part
```

```
[root@master Downloads]# tar -xvzf hpl-2.3.tar.gz.1
```

```
[root@master Downloads]# tar -xvf hpl-2.3.tar.gz
```

hpl-2.3/
hpl-2.3/.acinclude.m4
hpl-2.3/aclocal.m4
hpl-2.3/AUTHORS
hpl-2.3/BUGS
hpl-2.3/ChangeLog
hpl-2.3/compile
hpl-2.3/config.guess
hpl-2.3/config.sub
hpl-2.3/configure
hpl-2.3/configure.ac
hpl-2.3/COPYING
hpl-2.3/COPYRIGHT
hpl-2.3/decomp
hpl-2.3/HISTORY
hpl-2.3/include/
hpl-2.3/include/hpl.h
hpl-2.3/include/hpl_auxil.h
hpl-2.3/include/hpl_blas.h
hpl-2.3/include/hpl_comm.h
hpl-2.3/include/hpl_gesv.h
hpl-2.3/include/hpl_grid.h
hpl-2.3/include/hpl_matgen.h
hpl-2.3/include/hpl_misc.h
hpl-2.3/include/hpl_panel.h
hpl-2.3/include/hpl_paxil.h
hpl-2.3/include/hpl_pfact.h
hpl-2.3/include/hpl_pgесв.h
hpl-2.3/include/hpl_pmatgen.h
hpl-2.3/include/hpl_pmisc.h
hpl-2.3/include/hpl_ptest.h
hpl-2.3/include/hpl_ptimer.h

[root@master Downloads]# cd

```
[root@master ~]# cd hpl-2.3/  
[root@master hpl-2.3]# ls
```

```
[root@master hpl-2.3]# cd setup/
```

[root@master setup]# ls

```
[root@master setup]# vim Make.Linux_Intel64
```

```
[root@master setup]# rpm -ql atlas
```

```
[root@master ~]# cd hpl-2.3/
[root@master hpl-2.3]# ls
ainclude.m4 AUTHORS ChangeLog config.guess configure COPYING depcomp include install-sh Makefile.am makes man NEWS setup testing TODO Tuning WWW
aclocal.m4 BUGS config.h config.h.in configure.ac COPYRIGHT HISTORY INSTALL Makefile Makefile.in Make.top missing README src tests THANKS TUNING
[root@master hpl-2.3]# cd setup/
[root@master hpl-2.3]# ./configure
[root@master setup]# ls
Makefile F90 F90IPI FBLAS
Make.IRIX_FBLAS Make.Linux_Intel64 Make.Linux_PII_FBLAS_gm Make.PMR2_FBLAS Make.SUN4SOL2_g_FBLAS Make.Tru64_FBLAS_elan
Make.generic Make.IRIX_ATHLON_CBLAS Make.Linux_PII_CBLAS Make.Linux_PII_VSIPL_gm Make.PMR3_FBLAS Make.SUN4SOL2_g_VSIPL Make.UNKNOWN.in
Make.HPUX_FBLAS Make.ILinux_ATHLON_FBLAS Make.Linux_PII_CBLAS_gm Make.Linux_PII_VSIPL_gm Make.PRPC_FBLAS Make.T3E_FBLAS
Make.I860_FBLAS Make.ILinux_ATHLON_VSIPL Make.Linux_PII_FBLAS Make.MacOSX_Accelerate Make.SUN4SOL2_FBLAS Make.Tru64_FBLAS
[root@master setup]# vim Make_Linux_Intel64
[root@master setup]# rpm -qI atlas
/etc/ld.so.conf.d/atlas-x86_64.conf
/usr/lib64/atlas
/usr/lib64/atlas/libsatlas.so.3
/usr/lib64/atlas/libsatlas.so.3.10
/usr/lib64/atlas/libatblas.so.3
/usr/lib64/atlas/libatblas.so.3.10
/usr/share/doc/atlas-3.10.1
/usr/share/doc/atlas-3.10.1/README.dist
[root@master setup]#
```

Go to Browser: <https://www.open-mpi.org/software/ompi/v4.1/>

Download: [openmpi-4.1.4.tar.gz](#) file

[root@master setup]# cd

[root@master ~]# tar -xvf /root/Downloads/openmpi-4.1.4.tar.gz

```
[root@master ~]# cd
[root@master ~]# tar -xvf /root/Downloads/openmpi-4.1.4.tar.gz
openmpi-4.1.4/
openmpi-4.1.4/config/
openmpi-4.1.4/config/c_get_alignment.m4
openmpi-4.1.4/config/c_weak_symbols.m4
openmpi-4.1.4/config/libtool.m4
openmpi-4.1.4/config/lto.m4
openmpi-4.1.4/config/ltsuper.m4
openmpi-4.1.4/config/lversion.m4
openmpi-4.1.4/config/lt-obsolete.m4
openmpi-4.1.4/config/mpi_check_gfps.m4
openmpi-4.1.4/config/mpi_check_ime.m4
openmpi-4.1.4/config/mpi_check_l1.m4
openmpi-4.1.4/config/mpi_check_l1coll.m4
openmpi-4.1.4/config/mpi_check_lustre.m4
openmpi-4.1.4/config/mpi_check_mxm.m4
openmpi-4.1.4/config/mpi_check_psm.m4
openmpi-4.1.4/config/mpi_check_psm2.m4
openmpi-4.1.4/config/mpi_check_pvfs2.m4
openmpi-4.1.4/config/mpi_check_uar.m4
openmpi-4.1.4/config/mpi_check_ucx.m4
openmpi-4.1.4/config/mpi_config_files.m4
openmpi-4.1.4/config/mpi_configure_options.m4
openmpi-4.1.4/config/omp_contraint.m4
openmpi-4.1.4/config/omp_cxx_std_exception_flags.m4
openmpi-4.1.4/config/omp_cxx_find_template_parameters.m4
openmpi-4.1.4/config/omp_cxx_find_template_repository.m4
openmpi-4.1.4/config/omp_cxx_have_exceptions.m4
openmpi-4.1.4/config/omp_endpoint_tag.m4
openmpi-4.1.4/config/omp_ext.m4
openmpi-4.1.4/config/omp_fortran_mpaint_count_offset.m4
openmpi-4.1.4/config/omp_fortran_check.m4
openmpi-4.1.4/config/omp_fortran_check_abstract.m4
openmpi-4.1.4/config/omp_fortran_check_asynchronous.m4
openmpi-4.1.4/config/omp_fortran_check_bind_c.m4
openmpi-4.1.4/config/omp_fortran_check_c_funcloc.m4
```

[root@master ~]# mv /root/Downloads/

[root@master ~]# ls

[root@master ~]# cd openmpi-4.1.4/

[root@master openmpi-4.1.4]# ./configure --prefix=/opt/openmpi-4.1.4 --enable-orterun-prefix-by-default

```
[root@master openmpi-4.1.4]# ./configure --prefix=/opt/openmpi-4.1.4 --enable-orterun-prefix-by-default
checking for perl... perl
=====
== Configuring Open MPI
=====

*** Startup tests
checking build system type... x86_64-pc-linux-gnu
checking host system type... x86_64-pc-linux-gnu
checking target system type... x86_64-pc-linux-gnu
checking for gcc... gcc
checking whether the C compiler works... yes
checking for compiler default output file name... a.out
checking for suffix of executables...
checking whether we are cross compiling... no
checking for suffix of object files... o
checking whether we are using the GNU C compiler... yes
checking whether gcc accepts -g... yes
checking for gcc option to accept ISO C89... none needed
checking whether we can run the C preprocessor... gcc -E
checking for grep that handles long lines and -e... /usr/bin/grep
checking for egrep... /usr/bin/grep -E
checking for ANSI C header files... yes
checking for sys/types.h... yes
checking for sys/stat.h... yes
checking for stdlib.h... yes
checking for string.h... yes
checking for memory.h... yes
checking for strings.h... yes
checking for inttypes.h... yes
checking for stdint.h... yes
checking for unistd.h... yes
checking minix/config.h usability... no
checking minix/config.h presence... no
checking for minix/config.h... no
checking if it is safe to define _EXTENSIONS_... yes
checking for a BSD-style install... /usr/bin/install -c
checking whether build environment is sane... yes
checking for a thread-safe mkdir -p... /usr/bin/mkdir -p
```

[root@master openmpi-4.1.4]# make -j6

```
[root@master openmpi-4.1.4]# make install
```

```
[root@master openmpi-4.1.4]# echo $PATH
```

```
[root@master openmpi-4.1.4]# export PATH=/opt/openmpi-4.1.4:$PATH  
[root@master openmpi-4.1.4]# echo $PATH
```

```
[root@master openmpi-4.1.4]# echo $PATH  
/opt/xcat/bin:/opt/xcat/sbin:/opt/xcat/share/xcat/tools:/usr/local/sbin:/usr/local/bin:/sbin:/bin:/usr/sbin:/usr/bin:/root/bin  
[root@master openmpi-4.1.4]# export PATH=/opt/openmpi-4.1.4:$PATH  
[root@master openmpi-4.1.4]# echo $PATH  
/opt/openmpi-4.1.4:/opt/xcat/bin:/opt/xcat/sbin:/opt/xcat/share/xcat/tools:/usr/local/sbin:/usr/local/bin:/sbin:/bin:/usr/sbin:/usr/bin:/root/bin  
[root@master openmpi-4.1.4]#  
[root@master openmpi-4.1.4]#  
[root@master openmpi-4.1.4]#
```

```
[root@master openmpi-4.1.4]# export LD_LIBRARY_PATH=/opt/openmpi-4.1.4/lib:$LD_LIBRARY_PATH
```

```
[root@master openmpi-4.1.4]# echo $LD_LIBRARY_PATH
```

```
[root@master openmpi-4.1.4]# cd
```

```
[root@master ~]# cd hpl-2.3/bin/Linux PII CBLAS
```

```
[root@master Linux PII CBLAS]# vim HPL.dat
```

```
HPLinpack benchmark input file
Innovative Computing Laboratory, University of Tennessee
HPL.out          output file name (if any)
6              device out (6=stdout,7=stderr,file)
2              # of problems sizes (N)
N=12428
NBS=128
# of NBs
128
# of process grids (P x Q)
1
P=1
Q=1
OS
threshold
# of panel fact
RFACTS (0=left, 1=Crount, 2=Right)
# of recursive stopping criterium
NBMINS (>= 1)
# of panels in recursion
NDIVs
# of recursive panel fact
RFACTS (0=left, 1=Crount, 2=Right)
# of broadcast
BCASTS (0=lrq,1=lrm,2=zrg,3=2rm,4=lng,5=lnm)
# of lookahead depth
DEPTH=2
SWAP (1=bin-exch,1=long,2=mx)
swapping threshold
L1 in (0=transposed,1=no-transposed) form
U1 in (0=transposed,1=no-transposed) form
Equilibration (0=no,1=yes)
memory alignment in double (> 0)

HPL.dat* 31L, 1133C
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```

```
[root@master hpl-2.3]# cd setup/
```

```
[root@master openmpi-4.1.4]# echo $PATH  
/opt/xcat/bin:/opt/xcat/bin:/opt/xcat/share/xcat/tools:/usr/local/sbin:/usr/local/bin:/sbin:/bin:/usr/sbin:/usr/bin:/root/bin  
[root@master openmpi-4.1.4]# export PATH=/opt/openmpi-4.1.4:$PATH  
[root@master openmpi-4.1.4]# echo $PATH  
/opt/openmpi-4.1.4:/opt/xcat/bin:/opt/xcat/bin:/opt/xcat/share/xcat/tools:/usr/local/sbin:/usr/local/bin:/sbin:/bin:/usr/sbin:/usr/bin:/root/bin  
[root@master openmpi-4.1.4]# cd ..  
[root@master ~]# ./config-patch-log configure.ac Doxyfile INSTALL Makefile.am Makefile.ompি-rules ompi_orte README test  
AUTHORS config configure contrib examples LICENSE Makefile.in NEWS opal osmme README.JAVA.txt VERSION  
[root@master openmpi-4.1.4]# ./configure --prefix=/opt/openmpi-4.1.4/lib:$LD_LIBRARY_PATH  
[root@master openmpi-4.1.4]# echo $LD_LIBRARY_PATH  
/opt/openmpi-4.1.4/lib  
[root@master openmpi-4.1.4]# cd hpl-2.3/  
[root@master hpl-2.3]# ./configure  
[root@master setup]#
```

```
[root@master setup]# cp Make.Linux_PII_CBLAS /root/hpl-2.3
```

GO TO NEW TAB

```
[root@master ~]# cd hpl-2.3/
```

```
[root@master hpl-2.3]# vim Make.Linux_PII_CBLAS
```

```
#  
# - HPL Directory Structure / HPL library  
# -  
#  
TOPdir      = /root/hpl-2.3  
INCLUDE     = $(TOPdir)/include  
BINDIR     = $(TOPdir)/bin/S(ARCH)  
LIBDIR     = $(TOPdir)/lib/S(ARCH)  
LIB       = $(LIBDIR)/libhpl.a  
  
# -  
# - Message Passing library (MPI)  
# -  
# MPInc tells the C compiler where to find the Message Passing library  
# header files. MPLib is defined to be the name of the library to be  
# used. The variable MPDir is only used for defining MPInc and MPlib.  
  
MPDir      = /opt/openmpi-4.1.4  
MPInc      = -I$(MPDir)/include  
MPLib      = $(MPDir)/lib/libmpich.so.40  
#  
# -  
# - Linear Algebra library (BLAS or LAPACK)  
# -  
# LAinc tells the C compiler where to find the Linear Algebra library  
# header files. LALib is defined to be the name of the library to be  
# used. The variable LADir is only used for defining LAinc and LALib.  
#  
#  
#ADir       = /usr/lib64/atlas/  
LAinc      = $(LADir)/libsatlas.so.3 $(LADir)/libatlas.so.3  
#  
# -  
# - F77 / C Interface  
# -  
# You can skip this section if and only if you are not planning to use  
# a BLAS library featuring a Fortran 77 interface. Otherwise, it is  
# necessary to fill out the FCDEFS variable with the appropriate  
-- INSERT --
```

```
# On some platforms, it is necessary to use the Fortran linker to find
# the Fortran internals used in the BLAS library.
#
LINKER      = /usr/bin/gcc
LINKFLAGS   = $(CCFLAGS)
#
ARCHIVER    = ar
ARFLAGS     = r
RANLIB     = echo
#
#
-- INSERT --
```

[root@master Linux_PII_CBLAS]# mpirun --allow-run-as-root -np 8 ./xhpl HPL.dat

```
||Ax-b||_oo/(eps*(||A||_oo*||x||_oo+||b||_oo)*N)= 1.47255064e-03 ..... PASSED
=====
T/V N NB P Q Time Gflops
-----
WR00R2L4 5240 48 2 1.84 5.2250e+01
HPL_pdgesv() start time Mon Jan 30 11:05:50 2023
HPL_pdgesv() end time Mon Jan 30 11:05:52 2023

||Ax-b||_oo/(eps*(||A||_oo*||x||_oo+||b||_oo)*N)= 1.20476376e-03 ..... PASSED
=====
T/V N NB P Q Time Gflops
-----
WR00R2C2 5240 48 2 1.84 5.2089e+01
HPL_pdgesv() start time Mon Jan 30 11:05:52 2023
HPL_pdgesv() end time Mon Jan 30 11:05:54 2023

||Ax-b||_oo/(eps*(||A||_oo*||x||_oo+||b||_oo)*N)= 1.47255064e-03 ..... PASSED
=====
T/V N NB P Q Time Gflops
-----
WR00R2C4 5240 48 2 1.84 5.2239e+01
HPL_pdgesv() start time Mon Jan 30 11:05:54 2023
HPL_pdgesv() end time Mon Jan 30 11:05:56 2023

||Ax-b||_oo/(eps*(||A||_oo*||x||_oo+||b||_oo)*N)= 1.20476376e-03 ..... PASSED
=====
T/V N NB P Q Time Gflops
-----
WR00R2R2 5240 48 2 1.85 5.1801e+01
HPL_pdgesv() start time Mon Jan 30 11:05:56 2023
HPL_pdgesv() end time Mon Jan 30 11:05:58 2023

||Ax-b||_oo/(eps*(||A||_oo*||x||_oo+||b||_oo)*N)= 1.49140166e-03 ..... PASSED
=====
T/V N NB P Q Time Gflops
-----
WR00R2R4 5240 48 2 1.86 5.1608e+01
HPL_pdgesv() start time Mon Jan 30 11:05:58 2023
HPL_pdgesv() end time Mon Jan 30 11:06:00 2023

HPL_pdgesv() end time Mon Jan 30 11:06:00 2023
=====
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```

```
||Ax-b||_oo/(eps*(||A||_oo*||x||_oo+||b||_oo)*N)= 0.00000000e+00 ..... PASSED
=====
T/V N NB P Q Time Gflops
-----
WR00R2C2 0 48 2 0.00 0.0000e+00
HPL_pdgesv() start time Mon Jan 30 11:06:00 2023
HPL_pdgesv() end time Mon Jan 30 11:06:00 2023

||Ax-b||_oo/(eps*(||A||_oo*||x||_oo+||b||_oo)*N)= 0.00000000e+00 ..... PASSED
=====
T/V N NB P Q Time Gflops
-----
WR00R2C4 0 48 2 0.00 0.0000e+00
HPL_pdgesv() start time Mon Jan 30 11:06:00 2023
HPL_pdgesv() end time Mon Jan 30 11:06:00 2023

||Ax-b||_oo/(eps*(||A||_oo*||x||_oo+||b||_oo)*N)= 0.00000000e+00 ..... PASSED
=====
T/V N NB P Q Time Gflops
-----
WR00R2R2 0 48 2 0.00 0.0000e+00
HPL_pdgesv() start time Mon Jan 30 11:06:00 2023
HPL_pdgesv() end time Mon Jan 30 11:06:00 2023

||Ax-b||_oo/(eps*(||A||_oo*||x||_oo+||b||_oo)*N)= 0.00000000e+00 ..... PASSED
=====
T/V N NB P Q Time Gflops
-----
WR00R2R4 0 48 2 0.00 0.0000e+00
HPL_pdgesv() start time Mon Jan 30 11:06:00 2023
HPL_pdgesv() end time Mon Jan 30 11:06:00 2023

||Ax-b||_oo/(eps*(||A||_oo*||x||_oo+||b||_oo)*N)= 0.00000000e+00 ..... PASSED
=====
```

Finished 36 tests with the following results:
 36 tests completed and passed residual checks,
 0 tests completed and failed residual checks,
 0 tests skipped because of illegal input values.

End of Tests.

```
[root@localhost Linux_PII_CBLAS]#
```

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