Hydra WWTorqueMaster

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Objective

To describe how to provision Torque a master node using the Warewulf master for the Hydra Cluster.

Assumes working setup of WWMaster. To test this run `wwinit ALL`.

NOTE: Most changes to the chroot environment require rebuild of VNFS and reboot of provisioned node:

```
$ wwvnfs --chroot /var/chroots/hydratm-centos-7
```

Reboot provisioned node.

Initial Setup

Setup chroot:

```
$ wwmkchroot centos-7 /var/chroots/hydratm-centos-7
```

Update packages:

```
$ rpm --root /var/chroots/hydratm-centos-7 -ivh /root/rpm/epel-release-7-5.noarch.rpm
$ yum --tolerant --installroot /var/chroots/hydratm-centos-7 update
```

NTP

```
$ yum --tolerant --installroot /var/chroots/hydratm-centos-7 install ntp
$ chroot /var/chroots/hydratm-centos-7
# systemctl enable ntpd
# exit
```

SSH Key

```
$ chmod 700 /var/chroots/hydratm-centos-7/root/.ssh
$ chmod 400 ~/.ssh/authorized_keys
$ cp ~/.ssh/authorized_keys /var/chroots/hydratm-centos-7/root/.ssh/
```

Mount SAN Filesystems

```
$ vi /var/chroots/hydratm-centos-7/etc/fstab
192.168.13.10:/mnt/KLEINMAN_BACKUP /mnt/KLEINMAN_BACKUP nfs defaults,async,_netdev 0 0
192.168.13.10:/mnt/GREENWOOD_BACKUP /mnt/GREENWOOD_BACKUP nfs defaults,async,_netdev 0 0
192.168.13.10:/mnt/KLEINMAN_SCRATCH /mnt/KLEINMAN_SCRATCH nfs defaults,async,_netdev 0 0
192.168.13.10:/mnt/GREENWOOD_SCRATCH /mnt/GREENWOOD_SCRATCH nfs defaults,async,_netdev 0 0
```

```
$ mkdir /var/chroots/hydratm-centos-7/mnt/KLEINMAN_BACKUP /var/chroots/hydratm-
centos-7/mnt/GREENWOOD_BACKUP /var/chroots/hydratm-centos-7/mnt/KLEINMAN_SCRATCH
/var/chroots/hydratm-centos-7/mnt/GREENWOOD_SCRATCH
```

Prepare VNFS

```
$ wwvnfs --chroot /var/chroots/hydratm-centos-7
```

Setup WW environment

```
$ vi ~/wwscripts/wwconfig-torquemaster.sh

wwsh -y node new ${NODE} --netdev=eth0 --hwaddr=${GE_HWADDR} --ipaddr=${GE_IPADDR} --
groups=HYDRATM --domain=ldi.lan --netmask 255.255.255.0

wwsh -y provision set --lookup groups HYDRATM --vnfs=hydratm-centos-7 --
bootstrap=3.10.0-229.14.1.el7.x86_64

wwsh -y provision set --fileadd passwd,group,shadow ${NODE}

wwsh -y node set ${NODE} --netdev=eth3 --ipaddr=${XE_IPADDR} --netmask=255.255.255.0
--hwaddr=${XE_HWADDR}

wwsh -y provision set --fileadd=ifcfg-eth3.ww ${NODE}

wwsh -y provision set --fileadd=resolv.conf.ww ${NODE}

wwsh -y provision set --fileadd=network.ww ${NODE}

wwsh -y file sync \* ${NODE}

systemctl restart dhcpd
```

Restart services:

```
$ wwsh dhcp update
$ systemctl restart dhcpd
$ systemctl restart httpd
```

Reboot node.

Torque

Download source, build RPMs

```
$ yum install libtool openssl-devel libxml2-devel boost-devel gcc gcc-c++
$ cd ~/src
# Download Torque 5.1.1.2 from Adaptive Computing website, rename root dir to base
version number so rpmbuild works
$ tar xvzf torque-5.1.1.2-1_18e4a5f1.tar.gz
$ mv torque-5.1.1.2-1_18e4a5f1 torque-5.1.1.2
$ tar cvzf torque-5.1.1.2.tar.gz torque-5.1.1.2
# Build RPMs
```

```
$ rpmbuild --define '_prefix /mnt/KLEINMAN_BACKUP/opt/torque' --define '_includedir
/mnt/KLEINMAN_BACKUP/opt/torque/include' --define 'torque_home
/mnt/KLEINMAN_BACKUP/opt/torque' -ta torque-5.1.1.2.tar.gz
```

Install RPMs

This will install into `/var/chroots/hydratm-centos-7/opt/torque`:

```
$ yum --tolerant --installroot /var/chroots/hydratm-centos-7 install torque-5.1.1.2-
1.adaptive.el7.centos.x86_64.rpm torque-server-5.1.1.2-
1.adaptive.el7.centos.x86_64.rpm torque-scheduler-5.1.1.2-
1.adaptive.el7.centos.x86_64.rpm torque-devel-5.1.1.2-
1.adaptive.el7.centos.x86_64.rpm
```

Move files to NFS:

```
cd /var/chroots/hydratm-centos-7/mnt/KLEINMAN_BACKUP/opt/
mv torque /mnt/KLEINMAN_BACKUP/opt
```

Add Munge user:

```
$ useradd -s /bin/nologin munge -b /var/lib -c "Munge User"
```

Make sure services start in correct order:

```
$ vi /var/chroots/hydratm-centos-7/lib/systemd/system/trqauthd.service
[Unit]
Description=TORQUE trqauthd daemon
Requires=network.target
After=network.target remote-fs.target

[Service]
Type=forking
User=root

ExecStart=/mnt/KLEINMAN_BACKUP/opt/torque/sbin/trqauthd
ExecStop=/mnt/KLEINMAN_BACKUP/opt/torque/sbin/trqauthd -d

[Install]
WantedBy=multi-user.target
```

Remove server lock if exists:

```
$ rm /mnt/KLEINMAN_BACKUP/opt/torque/server_priv/server.lock
```

Edit server name:

```
$ vi /mnt/KLEINMAN_BACKUP/opt/torque/server_name
D1P-HYDRATM01.ldi.lan
```

Add NFS paths to profile:

```
$ cp ~/wwtemplates/ww-profile.d-hydra.sh /var/chroots/hydratm-centos-
7/etc/profile.d/hydra.sh
```

If missing, create checkpoint directory:

```
$ mkdir /mnt/KLEINMAN_BACKUP/opt/torque/checkpoint/
```

Rebuild VNFS. Reboot Torque master node.

```
wwvnfs --chroot /var/chroots/hydratm-centos-7
```

Login to D1P-HYDRATM01, setup Torque:

```
$ export
PATH=$PATH:/mnt/KLEINMAN_BACKUP/opt/torque/sbin:/mnt/KLEINMAN_BACKUP/opt/torque/bin
/mnt/KLEINMAN_BACKUP/opt/torque/share/doc/torque-server-5.1.1.2/torque.setup root
```

Make sure services are running:

```
$ systemctl | egrep 'pbs|trq'
pbs_sched.service      loaded active running   TORQUE pbs_sched daemon
pbs_server.service     loaded active running   TORQUE pbs_server daemon
trqauthd.service       loaded active running   TORQUE trqauthd daemon
```

Add Execution Nodes

```
$ vi /mnt/KLEINMAN_BACKUP/opt/torque/server_priv/nodes
D1P-HYDRAEX01.ldi.lan np=20
D1P-HYDRAEX02.ldi.lan np=20
D1P-HYDRAEX03.ldi.lan np=20
D1P-HYDRAEX04.ldi.lan np=20
D1P-HYDRAEX05.ldi.lan np=20
D1P-HYDRAEX06.ldi.lan np=20
D1P-HYDRAEX07.ldi.lan np=20
D1P-HYDRAEX08.ldi.lan np=20
```

Check that it works:

```
$ systemctl restart pbs_server; systemctl restart pbs_sched
$ pbsnodes –a
# If nodes are running, but without torque mon, should see nodes are listed but are
down.
```

Build Maui

Disable pbs_sched, on D1P-HYDRAFS01:

```
$ chroot /var/chroots/hydratm-centos-7/
$ systemctl disable pbs_sched
```

```
$ exit
```

Install development tools:

```
$ yum --tolerant --installroot /var/chroots/hydratm-centos-7 groupinstall
"Development Tools"
```

Rebuild VNFS:

```
wwvnfs --chroot /var/chroots/hydratm-centos-7
```

Reboot D1P-HYDRATM01.

Download and unpack Maui 3.3.1 to `/mnt/KLEINMAN_BACKUP/opt/`.

Login to D1P-HYDRATM01 as `root`.

```
$ cd /mnt/KLEINMAN_BACKUP/opt/maui-3.3.1/
$ ./configure --prefix=/mnt/KLEINMAN_BACKUP/opt/maui --exec-
prefix=/mnt/KLEINMAN_BACKUP/opt/maui --with-spooldir=/mnt/KLEINMAN_BACKUP/opt/maui
$ make
$ make install
```

Test Maui:

```
$ cd /mnt/KLEINMAN_BACKUP/opt/maui/sbin
$ ./maui
```

Login to D1P-HYDRATM01 as regular user, e.g. vforget, and submit test job:

```
$ echo “hostname” | qsub
```

Add Maui to system

On D1P-HYDRAFS01:

```
$ vi /var/chroots/hydratm-centos-7/etc/systemd/system/maui.service
[Unit]
Description=Maui Scheduler
Requires=network.target
After=network.target remote-fs.target

[Service]
Type=forking
User=root
PIDFILE=/mnt/KLEINMAN_BACKUP/opt/maui/maui.pid
ExecStart=/mnt/KLEINMAN_BACKUP/opt/maui/sbin/maui

[Install]
WantedBy=multi-user.target
```

Copy to VNFS, enable service:

```
$ chroot /var/chroots/hydratm-centos-7
$ systemctl enable maui
$ exit
```

Rebuild VNFS:

```
$ wwvnfs --chroot /var/chroots/hydratm-centos-7 && wwsh vnfs list
```

Local Storage

Format

Create node partition layout, store somewhere on NFS mounted partition so node can see it:

```
$ vi /home/node-partitions
# This will create 2 partitions on device. First is a swap of about 16Gb,
# and the second is the remainder of the filesystem
,2034,82
,,83
```

Partition local disk on node:

```
pdsh -w D1P-HYDRATM01 'cat /home/node-partitions | sfdisk /dev/sda'
```

Create filesystems:

```
$ pdsh -w D1P-HYDRATM01 'mkswap /dev/sda1'
$ pdsh -w D1P-HYDRATM01 'mkfs.ext4 /dev/sda2'
```

Add filesystems to mount on boot of node:

```
$ vi /var/chroots/hydratm-centos-7/etc/fstab
# LOCAL DISK
/dev/sda2 /scratch ext4 defaults 0 0
/dev/sda1 none swap defaults 0 0
```

Rebuild VNFS, reboot node(s). Make sure mounts are active.

```
wwvnfs --chroot /var/chroots/hydratm-centos-7 && wwsh vnfs list
```

Packages

```
$ yum --tolerant --installroot /var/chroots/hydratm-centos-7 groupinstall x-window-system
$ yum --tolerant --installroot /var/chroots/hydratm-centos-7 install atlas environment-modules emacs vim screen tmux gsl pandoc libcurl-devel.x86_64 libxml2-devel.x86_64 texlive-* numpy scipy python-matplotlib ipython python-pandas sympy python-nose htop docker R ruby zsh vsftpd
```

Disable SELinux, because Docker re-enables it:

```
# vi /var/chroots/hydratm-centos-7/etc/selinux/config

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

Add docker group:

```
$ groupadd docker
$ wwsh file sync \*
```

Rebuild VNFS, reboot nodes(s).