Hydra WWRstudio

Author: Vince Forgetta

Last saved: 12/7/2015 11:45 AM

Objective

To describe how to provision RStudio nodes 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/hydrars-centos-7
```

Reboot provisioned node.

Initial Setup

Setup chroot:

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

Update packages:

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

NTP

```
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install ntp
$ systemctl enable ntpd
```

SSH Key

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

Mount SAN Filesystems

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

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

Prepare VNFS

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

Add Nodes to Warewulf

```
$ wwsh –y node new D1P-HYDRARS02 --netdev=eth0 --hwaddr=0c:c4:7a:1d:5c:94 --
ipaddr=172.21.13.21 --groups=HYDRARS --domain=ldi.lan --netmask 255.255.255.0
```

Provision VNFS to nodes:

```
$ wwsh -y provision set --lookup groups HYDRARS --vnfs=hydrars-centos-7 --
bootstrap=3.10.0-229.14.1.el7.x86_64
```

Restart services:

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

Reboot nodes.

Nginx Web Server

Install

```
$ yum install nginx
```

Enable Nginx:

```
$ cd /var/chroots/
$ chroot hydrars-centos-7
$ systemctl enable nginx
$ exit
```

Add nginx user to wwmaster (for RStudio reverse proxy):

```
$ useradd -s /bin/nologin nginx -b /var/lib -c "Nginx web server"
$ vi /etc/shadow
/etc/shadow:nginx:!!:16713::::::
```

Remove exclude on /var/log:

```
$ vi /etc/warewulf/vnfs.conf
# EXCLUDE
# Excluding files will always remove them from the built VNFS.
#
# note: previous config versions used "excludes" which is now the same
# as "hybridize".
#
exclude += /tmp/*
#exclude += /var/log/*
```

```
exclude += /var/chroots/*
exclude += /var/cache
exclude += /usr/src
#exclude += /home/*
```

Rebuild VNFS, reboot nodes(s).

Test nginx by visiting webpage.

General Configuration

Fix permission problem on directory, if necessary:

```
$ chown -R nginx /var/chroots/hydrars-centos-7/var/lib/nginx/
```

Add server URL to config:

```
$ wwsh object modify D1P-HYDRARS01 -s NGINXURL=hydrars01.ladydavis.ca
$ wwsh object modify D1P-HYDRARS02 -s NGINXURL=hydrars02.ladydavis.ca
$ wwsh object modify D1P-HYDRARS03 -s NGINXURL=hydrars03.ladydavis.ca
$ wwsh object modify D1P-HYDRARS04 -s NGINXURL=hydrars04.ladydavis.ca
```

Comment out server declaration in /var/chroots/hydrars-centos-7/etc/nginx/nginx.conf

```
$ vi /var/chroots/hydrars-centos-7/etc/nginx/nginx.conf
# Server {
# < lines of config >
# }
```

Edit default config file:

```
$ vi ~/wwtemplates/nginx.default.conf.ww
#
# The default server
#
server {
    listen       80 default_server;
    server_name  %{NGINXURL};
    return 301 https://$server_name$request_uri;
    #charset koi8-r;

    #access_log  logs/host.access.log  main;

    # Load configuration files for the default server block.
    include /etc/nginx/default.d/*.conf;

    location / {
        root   /usr/share/nginx/html;
        index  index.html index.htm;
        proxy_pass http://localhost:8787;
        proxy_redirect http://localhost:8787/ $scheme://$host/;
   }
```

```
    error_page  404              /404.html;
    location = /404.html {
        root   /usr/share/nginx/html;
    }

    # redirect server error pages to the static page /50x.html
    #
    error_page   500 502 503 504  /50x.html;
    location = /50x.html {
        root   /usr/share/nginx/html;
    }

    # proxy the PHP scripts to Apache listening on 127.0.0.1:80
    #
    #location ~ \.php$ {
    #    proxy_pass   http://127.0.0.1;
    #}

    # pass the PHP scripts to FastCGI server listening on 127.0.0.1:9000
    #
    #location ~ \.php$ {
    #    root           html;
    #    fastcgi_pass   127.0.0.1:9000;
    #    fastcgi_index  index.php;
    #    fastcgi_param  SCRIPT_FILENAME  /scripts$fastcgi_script_name;
    #    include        fastcgi_params;
    #}

    # deny access to .htaccess files, if Apache's document root
    # concurs with nginx's one
    #
    #location ~ /\.ht {
    #    deny  all;
    #}
}
```

Edit `/var/chroots/hydrars-centos-7/etc/nginx/nginx.conf` and add:

```
http {
  proxy_connect_timeout       600;
  proxy_send_timeout          600;
  proxy_read_timeout          600;
  send_timeout                600;
  client_max_body_size        50M;
}
```

```
$ wwsh file import ~/wwtemplates/nginx.default.conf.ww --
path=/etc/nginx/conf.d/default.conf --name=nginx.default.conf.ww
$ wwsh provision set --fileadd=nginx.default.conf.ww D1P-HYDRARS[01-04]
$ wwsh file sync \*
```

HTTPS

SSL certificates:

```
$ ls -al /root/wwtemplates/
-rw-r--r--   1 root root 1675 Oct 14 13:14 private.key.ww
-rw-r--r--   1 root root   64 Oct 13 15:43 resolv.conf.ww
```

Setup transfer of certificates to provisioned nodes:

```
$ mkdir /var/chroots/hydrars-centos-7/etc/nginx/ssl/
$ wwsh file import ~/wwtemplates/private.key.ww --path=/etc/nginx/ssl/private.key --
name=private.key.ww
$ wwsh file import ~/wwtemplates/domain.intermediate.crt.ww --
path=/etc/nginx/ssl/domain.intermediate.crt --name=domain.intermediate.crt.ww
$ wwsh –y provision set --fileadd=private.key.ww D1P-HYDRARS[01-04]
$ wwsh –y provision set --fileadd=domain.intermediate.crt.ww D1P-HYDRARS[01-04]
$ wwsh file sync
```

Alter configuration files to enable SSL:

```
$ vi /var/chroots/hydrars-centos-7/etc/nginx/conf.d/ssl.conf
#
# HTTPS server configuration
#

server {
    listen       443;
    server_name  _;

    ssl                  on;
    ssl_certificate      /etc/nginx/ssl/domain.intermediate.crt;
    ssl_certificate_key  /etc/nginx/ssl/private.key;

#    ssl_session_timeout  5m;

#    ssl_protocols  SSLv2 SSLv3 TLSv1;
#    ssl_ciphers  ALL:!ADH:!EXPORT56:RC4+RSA:+HIGH:+MEDIUM:+LOW:+SSLv2:+EXP;
#    ssl_prefer_server_ciphers   on;

    location / {
         proxy_pass http://localhost:8787;
         proxy_redirect http://localhost:8787/ $scheme://$host/;
#        root   html;
#        index  index.html index.htm;
    }
}
```

Rebuild VNFS, reboot nodes.

VSFTPD

```
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install vsftpd
```

```
$ chroot /var/chroots/hydrars-centos-7
# systemctl enable vsftpd
# exit
$
```

R

Install

```
yum --tolerant --installroot /var/chroots/hydrars-centos-7 install R
```

Configure

Reduce size of VNFS (w/ R and dependencies VNFS is ~300MB, up from ~80MB). Below are directories in /usr/share, /usr/lib and /usr/lib64 of > 10MB each, plus defaults for Warewulf:

```
hybridize += /usr/X11R6
hybridize += /usr/lib/locale
hybridize += /usr/lib64/locale
hybridize += /usr/include
hybridize += /usr/share/man
hybridize += /usr/share/doc
hybridize += /usr/share/locale

hybridize += /usr/lib64/libicudata.so.50.1.2
hybridize += /usr/lib64/R
hybridize += /usr/lib64/python2.7
hybridize += /usr/lib64/perl5
hybridize += /usr/lib64/libgs.so.9.07
hybridize += /usr/share/texlive
hybridize += /usr/share/perl5
hybridize += /usr/share/poppler
hybridize += /usr/lib/jvm
```

VNFS now:

```
$ wwsh vnfs list
VNFS NAME             SIZE (M) CHROOT LOCATION
hydrars-centos-7      141.4    /var/chroots/hydrars-centos-7
```

RStudio

Install

```
$ wget https://download2.rstudio.org/rstudio-server-rhel-0.99.485-x86_64.rpm
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install rstudio-server-
rhel-0.99.485-x86_64.rpm
```

Configure

Add Rstudio install to hybridize:

```
$ vi /etc/warewulf/vnfs.conf
hybridize += /usr/lib/rstudio-server
```

Make sure RStudio server starts AFTER NFS mounts:

```
# vi /lib/systemd/system/remote-fs.target
#  This file is part of systemd.
#
#  systemd is free software; you can redistribute it and/or modify it
#  under the terms of the GNU Lesser General Public License as published by
#  the Free Software Foundation; either version 2.1 of the License, or
#  (at your option) any later version.

[Unit]
Description=Remote File Systems
Documentation=man:systemd.special(7)
After=remote-fs-pre.target
DefaultDependencies=no
Conflicts=shutdown.target
Before=rstudio-server.service

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

Restrict direct access to RStudio

Edit `/var/chroots/hydrars-centos-7/etc/rstudio/rserver.conf` file as follows:

```
$ vi /var/chroots/hydrars-centos-7/etc/rstudio/rserver.conf
www-address=127.0.0.1
```

Rebuild VNFS, reboot nodes.

Local Storage

Create mount point:

```
$ mkdir /var/chroots/hydrars-centos-7/scratch
$ chmod 777 /var/chroots/hydrars-centos-7/scratch
```

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-HYDRARS01 'cat /home/node-partitions | sfdisk /dev/sda'
```

Create filesystems:

```
$ pdsh -w D1P-HYDRARS01 'mkswap /dev/sda1'
$ pdsh -w D1P-HYDRARS01 'mkfs.ext4 /dev/sda2'
```

Add filesystems to mount on boot of node:

```
$ vi /var/chroots/hydrars-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).

Environment Modules

```
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install environment-
modules
```

Additional Packages

```
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install libcurl-
devel.x86_64
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install libxml2-
devel.x86_64
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 groupinstall x-window-
system
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install mesa-libGL-devel
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install mesa-libGLU
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install libpng-devel
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install mesa-libGLU-
devel
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 groupinstall
"Development Tools"
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install xorg-server-
devel
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install readline-devel
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install libXt-devel
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install gsl


$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install emacs
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install vim
yum --tolerant --installroot /var/chroots/hydrars-centos-7 install screen
yum --tolerant --installroot /var/chroots/hydrars-centos-7 install tmux
```

```
yum --tolerant --installroot /var/chroots/hydrars-centos-7 install octave
yum --tolerant --installroot /var/chroots/hydrars-centos-7 install pandoc
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install texlive-*
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install numpy scipy
python-matplotlib ipython python-pandas sympy python-nose
$ yum --tolerant --installroot /var/chroots/hydrars-centos-7 install htop
```

Rebuild VNFS, reboot nodes(s).

Script to Setup Node

Once VNFS is created, setup of addition node has been scripted.

```
# cat ~/wwscripts/wwconfig-rstudio.sh
#!/bin/sh

NODE=D1P-HYDRARS01
GE_IPADDR=172.21.13.20
XE_IPADDR=192.168.13.20
GE_HWADDR=0c:c4:7a:1d:5d:62
XE_HWADDR=0c:c4:7a:1f:7f:27
EXTERNAL_HOST=hydrars01

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

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

wwsh -y object modify ${NODE} -s NGINXURL=${EXTERNAL_HOST}.ladydavis.ca

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

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

wwsh -y provision set --fileadd=domain.intermediate.crt.ww ${NODE}

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
```