

# Building the XNAT Relays

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This is a verbose documentation of the build process used to assemble and build the DICOM and RAW data relays used for the Lifespan studies.

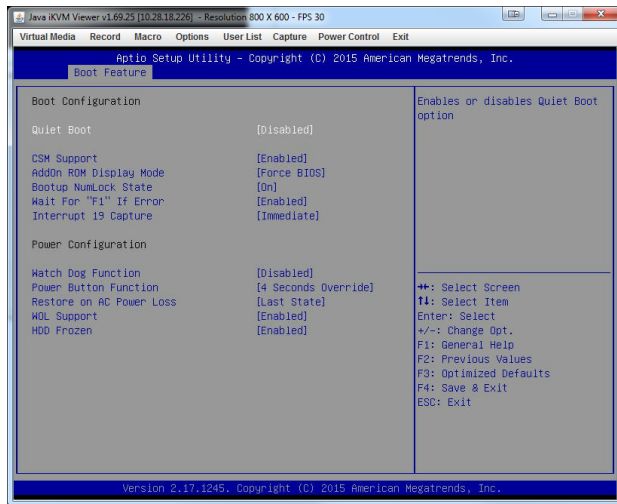
## Server Setup

### Hardware

1. Set boot disk(s) to the SSDs and disable spinning disks from booting
2. Label disks using [XNAT DICOM/RAW Relay Build](#)
3. Label network ports [XNAT DICOM/RAW Relay Build](#)

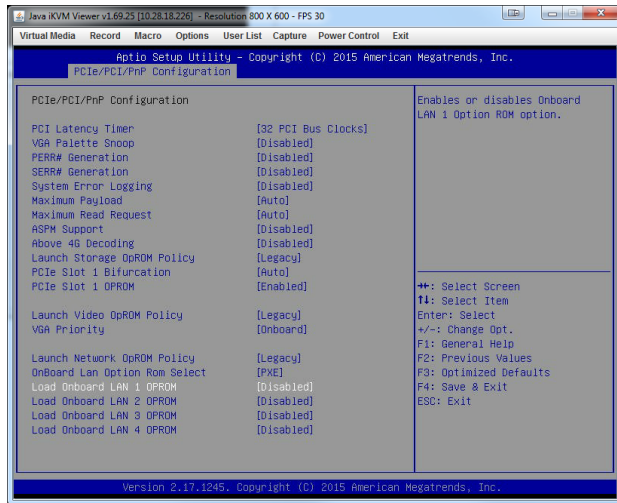
### BIOS Settings

Boot Features

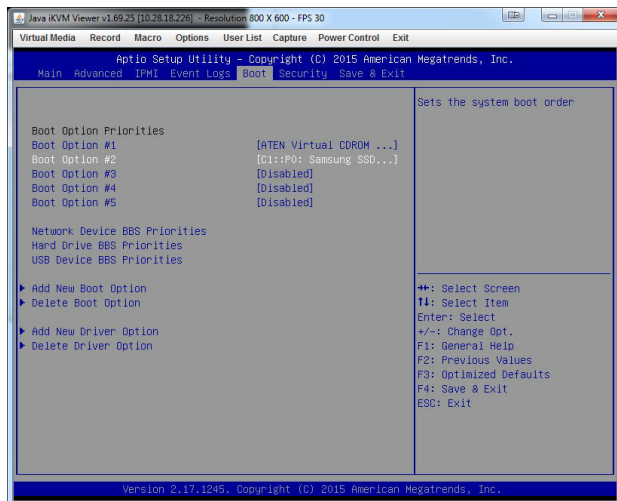


### PCIe/PCI/PnP Configuration

- Turn off LAN OPROM on all ports

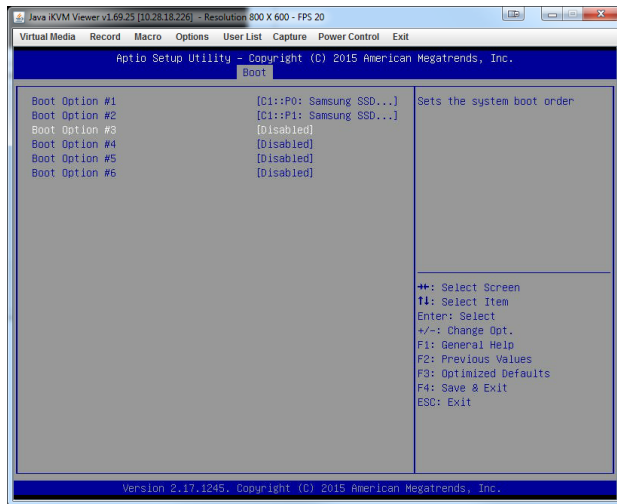


### Set the boot order



### Set Hard Drive BBS Priorities

Set boot to the C1::P0: and C1::P1: attached SSD and disable booting from the data disks.



## Operating System

### 1. CentOS 7 - Graphical Server install

- a. Use manual partitioning
  - i. Select SSD and auto generate legacy layout
  - ii. Delete the /home partition (This space will be used for ZFS cache)
- b. Set timezone to US/Central (Chicago)
  - i. Turn on network time
- c. Create hcpadmin user
- d. Set root password (needed if runlevel 1 is necessary)
- e. Install additional packages

#### Packages

```
yum install httpd tomcat mutt pgadmin3 httpd-devel gcc gcc-c++ make libtool apxs mod_ssl xinetd tree
```

### 2. ZFS

- a. Install ZFS

#### Install ZFS

```
yum -y install epel-release
yum -y install http://download.zfsonlinux.org/epel/zfs-release.el7_3.noarch.rpm

# Disable DKMS and enable KMOD
vim /etc/yum.repos.d/zfs.repo

yum -y install zfs zfs-dracut
yum update
```

- b. Reboot to apply updated kernel
- c. Create /etc/zfs/vdev\_id.conf with the following contents:

#### vdev\_id.conf

```
alias disk1 pci-0000:00:17.0-ata-1.0
alias disk2 pci-0000:00:17.0-ata-2.0
alias disk3 pci-0000:00:17.0-ata-3.0
alias disk4 pci-0000:00:17.0-ata-4.0
alias ssd1 pci-0000:00:18.0-ata-1.0
alias ssd2 pci-0000:00:18.0-ata-2.0
```

- d. Reboot to populate /dev/disk/by-vdev
- e. Create the zpool and set it up.

```

Create zpool

zpool create -f relaypool raidz2 disk1 disk2 disk3 disk4
zfs set compression=lz4 relaypool
zfs set sync=disabled relaypool
zfs create relaypool/zfs_tools
zfs create -o mountpoint=/raw relaypool/raw
zfs create relaypool/raw/data
zfs create relaypool/raw/scripts
zfs create -o mountpoint=/xnat relaypool/xnat
zfs create relaypool/xnat/archive
zfs create relaypool/xnat/prearchive
zfs create relaypool/xnat/tmp
zfs create relaypool/xnat/build
zfs create relaypool/xnat/cache
zfs create relaypool/xnat/logs
zfs create relaypool/xnat/home
zfs create -p relaypool/xnat/pgsql/9.4
zfs create relaypool/rpool_backup
zfs set reservation=100G relaypool/zfs_tools

zfs set quota=7T relaypool
zfs set edu.wustl.nrg:quotareports=2 relaypool
zfs set edu.wustl.nrg:quotareport:1="2T|warning|relay-ops@nrg.wustl.edu|2d" relaypool
zfs set edu.wustl.nrg:quotareport:2="512G|critical|relay-ops@nrg.wustl.edu|12h" relaypool
# Make pool auto import and mount on boot
systemctl enable zfs-import-cache.service
systemctl enable zfs-mount.service
# Enable ZFS event daemon
systemctl enable zfs-zed.service

```

- f. Reboot the system so the kernel is familiar with the changes.
- g. Limit ARC to 1/2 the system ram. (Assuming 16GB ram installed)

```

Limit ARC

echo "options zfs zfs_arc_max=8589934592" >> /etc/modprobe.d/zfs.conf
echo "8589934592" > /sys/module/zfs/parameters/zfs_arc_max

```

- h. Install OZMT and create snapshot jobs

```

Install OZMT

yum install mercurial
cd /opt
hg clone https://bitbucket.org/ozmt/ozmt
cd ozmt
./install-ozmt.sh
ozmt-snapjobs-add.sh relaypool/raw/scripts daily/7 weekly/4 monthly/3
ozmt-snapjobs-add.sh relaypool/raw/data hourly/6 daily/1
ozmt-snapjobs-add.sh relaypool/zfs_tools hourly/12 daily/7 weekly/4 monthly/3
ozmt-snapjobs-add.sh relaypool/xnat/archive hourly/6 daily/1
ozmt-snapjobs-add.sh relaypool/xnat/prearchive hourly/6 daily/1
ozmt-snapjobs-add.sh relaypool/xnat/home daily/7 weekly/4
ozmt-snapjobs-add.sh relaypool/xnat/logs daily/7 weekly/4 monthly/6
ozmt-snapjobs-add.sh relaypool/xnat/pgsql/9.4 daily/7 weekly/4 monthly/6

```

- i. Scrub the pool daily  
Add to root's crontab:

### Scrub zpool

```
# Scrub the zpool
0 10 * * * /sbin/zpool scrub relaypool
1 10 * * * /sbin/zpool scrub rpool
```

- j. Comment out the replication jobs in root's crontab:

### Disable ZFS Replication

```
## * * * * * /opt/ozmt/replication/schedule-replication.sh
#1,11,21,31,41,51 * * * * /opt/ozmt/replication/replication-job-runner.sh
#5,15,25,35,45,55 * * * * /opt/ozmt/replication/replication-job-cleaner.sh
```

## 3. ZFS root

- a. Setup second SSD

### Setup rpool

```
sgdisk -al -n2:34:2047 -t2:EF02 /dev/disk/by-vdev/ssd2
sgdisk -n9:-8M:0 -t9:BF07 /dev/disk/by-vdev/ssd2
# rpool
sgdisk -n1:0:40G -t1:BF01 /dev/disk/by-vdev/ssd2
# cache
sgdisk -n3:0:+40G -t3:BF01 /dev/disk/by-vdev/ssd2
# swap
sgdisk -n4:0:+8G -t4:8200 /dev/disk/by-vdev/ssd2

zpool create -f -d -o feature@async_destroy=enabled -o feature@empty_bpobj=enabled \
-o feature@lz4_compress=enabled -o ashift=12 -O compression=lz4 -O canmount=off \
-O mountpoint=/ -R /mnt/rpool \
rpool /dev/disk/by-vdev/ssd2-part1

zfs create -o canmount=off -o mountpoint=none rpool/ROOT
zfs create -o canmount=noauto -o mountpoint=/ rpool/ROOT/centos
zfs mount rpool/ROOT/centos
zfs create -o setuid=off rpool/home
zfs create -o mountpoint=/root rpool/home/root
zfs create -o canmount=off -o setuid=off -o exec=off rpool/var
zfs create -o com.sun:auto-snapshot=false rpool/var/cache
zfs create rpool/var/log
zfs create rpool/var/spool
zfs create -o com.sun:auto-snapshot=false -o exec=on rpool/var/tmp
zfs create -o mountpoint=/owncloud rpool/owncloud

mkdir /mnt/tmp
mount --bind / /mnt/tmp

rsync -avhX --stats /mnt/tmp/. /mnt/rpool/.
rsync -avhX --stats /boot/. /mnt/rpool/boot/.

for dir in proc sys dev;do mount --rbind /$dir /mnt/rpool/$dir;done

chroot /mnt/rpool /bin/bash --login

cd /dev;ln -s /dev/disk/by-vdev/* .;cd

rm /etc/zfs/zpool.cache
```

- b. Comment out all mounts in /etc/fstab

### **/etc/fstab**

```
#
# /etc/fstab
# Created by anaconda on Mon Oct 31 10:11:52 2016
#
# Accessible filesystems, by reference, are maintained under '/dev/disk'
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info
#
#UUID=0078e373-f435-4b66-b08d-df5cf1300554 / xfs defaults 0 0
#UUID=c952f347-1ebe-49eb-be3d-213f8f69f37d /boot xfs defaults 0 0
#UUID=fa96a497-bbd0-42ef-9507-1c6b6a27586a swap swap defaults 0 0
```

- c. Add two lines to /etc/default/grub

### **/etc/default/grub**

```
GRUB_CMDLINE_LINUX="crashkernel=auto boot=zfs rpool=rpool bootfs=rpool/ROOT/centos zfsforce=1"
GRUB_PRELOAD_MODULES="part_gpt zfs"
```

You might need to comment-out GRUB\_HIDDEN\_TIMEOUT so you get grub menu during boot. This is needed to be able to select other boot entries.

```
#GRUB_HIDDEN_TIMEOUT=0
```

- d. Generate new grub config, and verify it has the correct root entry

### **grub config**

```
grub2-mkconfig -o /boot/grub2/grub.cfg
grep ROOT /boot/grub2/grub.cfg
grub2-install /dev/disk/by-vdev/ssd2
```

- e. Enable ZFS services

```
systemctl enable zfs-import-cache
systemctl enable zfs-import-scan
systemctl enable zfs-mount
systemctl enable zfs-share
systemctl enable zfs-zed
systemctl enable zfs.target
```

- f. Add zfs to the list of modules dracut should include by default to /etc/dracut.conf

### **/etc/dracut.conf**

```
# PUT YOUR CONFIG HERE OR IN separate files named *.conf
# in /etc/dracut.conf.d
# SEE man dracut.conf(5)
# Sample dracut config file
#logfile=/var/log/dracut.log
#fileloglvl=6
# Exact list of dracut modules to use.  Modules not listed here are not going
# to be included.  If you only want to add some optional modules use
# add_dracutmodules option instead.
#dracutmodules+=" "
# dracut modules to omit
#omit_dracutmodules+=" "
# dracut modules to add to the default
add_dracutmodules+="zfs"
# additional kernel modules to the default
#add_drivers+=" "
# list of kernel filesystem modules to be included in the generic initramfs
#filesystems+=" "
# build initrd only to boot current hardware
#hostonly="yes"
#
# install local /etc/mdadm.conf
#mdadmconf="no"
# install local /etc/lvm/lvm.conf
#lvmconf="no"
# A list of fsck tools to install.  If it's not specified, module's hardcoded
# default is used, currently: "umount mount /sbin/fsck* xfs_db xfs_check
# xfs_repair e2fsck jfs_fsck reiserfsck btrfsck".  The installation is
# opportunistic, so non-existing tools are just ignored.
#fscks=""
# inhibit installation of any fsck tools
#nofscks="yes"
# mount / and /usr read-only by default
#ro_mnt="no"
# set the directory for temporary files
# default: /var/tmp
#tmpdir=/tmp
```

### **g. Rebuild initramfs**

#### **Rebuild initramfs**

```
dracut -f -v /boot/initramfs-$(uname -r).img $(uname -r)
```

### **h. Setup links in /dev on each boot**

```
chmod +x /etc/rc.local
vim /etc/rc.local
```

## /etc/rc.local

```
#!/bin/bash
# THIS FILE IS ADDED FOR COMPATIBILITY PURPOSES
#
# It is highly advisable to create own systemd services or udev rules
# to run scripts during boot instead of using this file.
#
# In contrast to previous versions due to parallel execution during boot
# this script will NOT be run after all other services.
#
# Please note that you must run 'chmod +x /etc/rc.d/rc.local' to ensure
# that this script will be executed during boot.
touch /var/lock/subsys/local

cd /dev;ln -s /dev/disk/by-id/* .
```

### i. Setup ZED

Edit `/etc/zfs/zed.d/zed.rc`:

## ZED

```
##
# zed.rc
#
# This file should be owned by root and permissioned 0600.
##
##
# Absolute path to the debug output file.
#
#ZED_DEBUG_LOG="/tmp/zed.debug.log"
##
# Email address of the zpool administrator for receipt of notifications;
# multiple addresses can be specified if they are delimited by whitespace.
# Email will only be sent if ZED_EMAIL_ADDR is defined.
# Disabled by default; uncomment to enable.
#
ZED_EMAIL_ADDR="root nrg-admin@nrg.wustl.edu"
##
# Name or path of executable responsible for sending notifications via email;
# the mail program must be capable of reading a message body from stdin.
# Email will only be sent if ZED_EMAIL_ADDR is defined.
#
#ZED_EMAIL_PROG="mail"
##
# Command-line options for ZED_EMAIL_PROG.
# The string @ADDRESS@ will be replaced with the recipient email address(es).
# The string @SUBJECT@ will be replaced with the notification subject;
# this should be protected with quotes to prevent word-splitting.
# Email will only be sent if ZED_EMAIL_ADDR is defined.
#
ZED_EMAIL_OPTS="-s '@SUBJECT@' @ADDRESS@"
##
# Default directory for zed lock files.
#
#ZED_LOCKDIR="/var/lock"
##
# Minimum number of seconds between notifications for a similar event.
#
ZED_NOTIFY_INTERVAL_SECS=3600
##
# Notification verbosity.
# If set to 0, suppress notification if the pool is healthy.
# If set to 1, send notification regardless of pool health.
#
ZED_NOTIFY_VERBOSE=1
##
```



```

# Pushbullet access token.
# This grants full access to your account -- protect it accordingly!
# <https://www.pushbullet.com/get-started>
# <https://www.pushbullet.com/account>
# Disabled by default; uncomment to enable.
#
#ZED_PUSHBULLET_ACCESS_TOKEN=""
##
# Pushbullet channel tag for push notification feeds that can be subscribed to.
# <https://www.pushbullet.com/my-channel>
# If not defined, push notifications will instead be sent to all devices
# associated with the account specified by the access token.
# Disabled by default; uncomment to enable.
#
#ZED_PUSHBULLET_CHANNEL_TAG=""
##
# Default directory for zed state files.
#
#ZED_RUNDIR="/var/run"
##
# Replace a device with a hot spare after N checksum errors are detected.
# Disabled by default; uncomment to enable.
#
#ZED_SPARE_ON_CHECKSUM_ERRORS=10
##
# Replace a device with a hot spare after N I/O errors are detected.
# Disabled by default; uncomment to enable.
#
#ZED_SPARE_ON_IO_ERRORS=1
##
# The syslog priority (e.g., specified as a "facility.level" pair).
#
#ZED_SYSLOG_PRIORITY="daemon.notice"
##
# The syslog tag for marking zed events.
#
#ZED_SYSLOG_TAG="zed"

```

j. Create swap space

Setup swap space				
mkswap	/dev/disk/by-vdev/ssd2-part4			
echo	"/dev/disk/by-vdev/ssd2-part4	swap	swap defaults	0 0" >> /etc
	/fstab			

k. Reboot

4. Enter BIOS and change boot to ZFS root disk

 Unknown Attachment

5. Confirm zfs root is running properly

- a. List zpool status and zfs

## Check ZFS

```
# zpool status
pool: rpool
state: ONLINE
status: Some supported features are not enabled on the pool. The pool can
still be used, but some features are unavailable.
action: Enable all features using 'zpool upgrade'. Once this is done,
the pool may no longer be accessible by software that does not support
the features. See zpool-features(5) for details.
scan: none requested
config:
NAME                                STATE      READ WRITE CKSUM
rpool                                ONLINE    0   0   0
  ata-Samsung_SSD_750_EVO_120GB_S33MNB0H911742A-part1 ONLINE    0   0   0
errors: No known data errors

# zfs list
NAME                                USED  AVAIL  REFER  MOUNTPOINT
rpool                                4.96G 33.5G  136K  /
rpool/ROOT                           4.53G 33.5G  136K  none
rpool/ROOT/centos                    4.53G 33.5G  4.39G  /
rpool/home                           4.97M 33.5G  156K  /home
rpool/home/hcpadmin                 4.04M 33.5G  3.85M  /home/hcpadmin
rpool/home/root                     712K 33.5G  540K  /root
rpool/var                           433M 33.5G  136K  /var
rpool/var/cache                     413M 33.5G  412M  /var/cache
rpool/var/log                       17.4M 33.5G  16.8M  /var/log
rpool/var/spool                     1.70M 33.5G  1.19M  /var/spool
rpool/var/tmp                       876K 33.5G  604K  /var/tmp

# zfs list -o name,mounted,mountpoint
NAME                                MOUNTED  MOUNTPOINT
rpool                                no      /
rpool/ROOT                           no      none
rpool/ROOT/centos                    yes     /
rpool/home                           yes     /home
rpool/home/hcpadmin                 yes     /home/hcpadmin
rpool/home/root                     yes     /root
rpool/var                           no      /var
rpool/var/cache                     yes     /var/cache
rpool/var/log                       yes     /var/log
rpool/var/spool                     yes     /var/spool
rpool/var/tmp                       yes     /var/tmp

# Confirm swap is mounted
# free
      total        used        free      shared  buff/cache   available
Mem:   16405364    905724    14940016    9152     559624    14992148
Swap:   8388604         0     8388604
```

If any zfs folders are not mounted besides rpool, rpool/ROOT and rpool/home these need to be corrected before proceeding.

## 6. Setup mirror to original SSD

### a. Re-import relaypool

#### zpool import

```
zpool import relaypool
```

### b. Delete all partitions from original SSD

```
fdisk

fdisk /dev/disk/by-vdev/ssd1
```

c. Setup partition

```
Partition SSD

sgdisk -g -a1 -n2:34:2047 -t2:EF02 /dev/disk/by-vdev/ssd1
sgdisk -n9:-8M:0 -t9:BF07 /dev/disk/by-vdev/ssd1
# rpool
sgdisk -n1:0:40G -t1:BF01 /dev/disk/by-vdev/ssd1
# cache
sgdisk -n3:0:+40G -t3:BF01 /dev/disk/by-vdev/ssd1
# swap
sgdisk -n4:0:+8G -t4:8200 /dev/disk/by-vdev/ssd1
```

d. Mirror rpool.

First determine the device name of the existing disk.

```
zpool status

# zpool status
pool: rpool
state: ONLINE
status: Some supported features are not enabled on the pool. The pool can
still be used, but some features are unavailable.
action: Enable all features using 'zpool upgrade'. Once this is done,
the pool may no longer be accessible by software that does not support
the features. See zpool-features(5) for details.
scan: none requested
config:
NAME                                STATE    READ WRITE CKSUM
rpool                                ONLINE  0     0     0
  ata-Samsung_SSD_750_EVO_120GB_S33MNB0H911742A-part1  ONLINE  0     0     0
errors: No known data errors
```

Attach the other SSD. (Substitute the device name returned from zpool status).

```
zpool attach

# zpool attach rpool ata-Samsung_SSD_750_EVO_120GB_S33MNB0H911742A-part1 ssd1-part1
```

Wait for the rpool to resilver.

### zpool status

```
# zpool status
pool: rpool
state: ONLINE
status: One or more devices is currently being resilvered.  The pool will
        continue to function, possibly in a degraded state.
action: Wait for the resilver to complete.
        scan: resilver in progress since Wed Nov 30 11:30:23 2016
              3.03G scanned out of 4.97G at 73.9M/s, 0h0m to go
              3.03G resilvered, 61.06% done
config:
      NAME                                STATE     READ WRITE CKSUM
      rpool                                ONLINE      0   0   0
        mirror-0
          ata-Samsung_SSD_750_EVO_120GB_S33MNB0H911742A-part1  ONLINE      0   0   0
          ssd1-part1                                ONLINE      0   0   0
(resilvering)
errors: No known data errors
```

- e. Reboot
- f. Re-apply grub setup

### grub config

```
cd /dev;ln -s /dev/disk/by-id/*
grub2-mkconfig -o /boot/grub2/grub.cfg
grep ROOT /boot/grub2/grub.cfg
grub2-install /dev/disk/by-vdev/ssd1
grub2-install /dev/disk/by-vdev/ssd2
```

- g. Create snapshot policies

### Snapshots

```
zfs create -o mountpoint=/rpool/zfs_tools rpool/zfs_tools
ozmt-snapjobs-mod.sh rpool/ROOT/centos daily/7 weekly/4 monthly/6
ozmt-snapjobs-mod.sh rpool/home/root daily/7 weekly/4 monthly/6
```

- h. Add additional zfs cache

### Additional ZFS cache

```
zpool add relaypool cache ssd1-part3
```

- i. Add additional swap space

### Setup swap space

```
mkswap /dev/disk/by-vdev/ssd1-part4
echo "/dev/disk/by-vdev/ssd1-part4 swap swap defaults 0 0" >> /etc
fstabswapon -afree
```

## 7. Addition server configuration

- a. Setup email  
Preserve [main.cf](#)

### Setup email

```
cd /etc/postfix
mv main.cf main.dist
```

Create new [main.cf](#). Update as necessary per site.

### main.cf

```
# See /usr/share/postfix/main.cf.dist for a commented, more complete version
smtpd_banner = $myhostname ESMTP $mail_name
biff = no
append_dot_mydomain = no
# this will add 'POP.yourdomain.tld' to the domain
#sender_canonical_maps = regexp:/etc/postfix/sender_regexp
# Uncomment the next line to generate "delayed mail" warnings
#delay_warning_time = 4h
alias_maps = hash:/etc/aliases
alias_database = hash:/etc/aliases
myorigin = nrg.wustl.edu
relayhost = mail.nrg.wustl.edu
recipient_delimiter = +
inet_interfaces = 127.0.0.1
local_transport = error:local delivery is disabled
```

Add email alias for root

### Setup email

```
echo "root:          nrg-admin@nrg.wustl.edu" >> /etc/aliases
newaliases
```

Create `/etc/ozmt/reporting.muttrc` Adjust as necessary.

### reporting.muttrc

```
set realname="lifespan-relay1"
set hostname=lifespan-relay1.nrg.mir
set from="lifespan-relay1-no-reply@myrealdomain.com"
set use_envelope_from=yes
set ssl_use_sslv3=no
set ssl_use_tlsv1=no
```

Set `email_to` in `/etc/ozmt/config`

### /etc/ozmt/config

```
# Address to send reports to
email_to="nrg-admin@nrg.wustl.edu"
```

Setup rpool backups

### rpool backup

```
echo "
```

b. Setup Tomcat for XNAT

- i. Add xnat user

#### **XNAT user**

```
useradd -c "XNAT system user" -d /xnat/home -s /bin/false xnat
```

- ii. Fix up /xnat directories

#### **/xnat**

```
cd /xnat
mkdir -p logs/{catalina,xnat,tomcat} tmp/{catalina,xnat,tomcat} home/{config,plugins,work}
cd home
ln -s ../logs/xnat logs
ln -s ../tmp/xnat tmp
cd ..
chmod -R g-rx,o-rx .
chown -R xnat .
```

- iii. Fix up the symlinks in /usr/share/tomcat

#### **/usr/share/tomcat**

```
cd /usr/share/tomcat
rm -f temp logs
ln -s /xnat/tmp/tomcat temp
ln -s /xnat/logs/tomcat logs
```

- iv. Create XNAT Tomcat service

#### **systemctl**

```
systemctl enable tomcat@xnat.service
```

- v. Fix up /etc/tomcat/server.xml  
Make the Host block match

#### **server.xml**

```
<Host name="localhost" appBase="webapps"
      unpackWARs="true" autoDeploy="true"
      xmlValidation="false" xmlNamespaceAware="false">
  <!-- SingleSignOn valve, share authentication between web applications
       Documentation at: /docs/config/valve.html -->
  <!--
  <Valve className="org.apache.catalina.authenticator.SingleSignOn" />
  -->
  <!-- Access log processes all example.
       Documentation at: /docs/config/valve.html
       Note: The pattern used is equivalent to using pattern="common" -->
  <!--
  <Valve className="org.apache.catalina.valves.AccessLogValve" directory="logs"
        prefix="localhost_access_log." suffix=".txt"
        pattern="%h %l %u %t &quot;%r&quot; %s %b" />
  -->
</Host>
```

- vi. Modify /etc/sysconfig/tomcat

## /etc/sysconfig/tomcat

```
# Service-specific configuration file for tomcat. This will be sourced by
# the SysV init script after the global configuration file
# /etc/tomcat/tomcat.conf, thus allowing values to be overridden in
# a per-service manner.
#
# NEVER change the init script itself. To change values for all services make
# your changes in /etc/tomcat/tomcat.conf
#
# To change values for a specific service make your edits here.
# To create a new service create a link from /etc/init.d/<your new service> to
# /etc/init.d/tomcat (do not copy the init script) and make a copy of the
# /etc/sysconfig/tomcat file to /etc/sysconfig/<your new service> and change
# the property values so the two services won't conflict. Register the new
# service in the system as usual (see chkconfig and similars).
#
# Where your java installation lives
#JAVA_HOME="/usr/lib/jvm/java"
# Where your tomcat installation lives
#CATALINA_BASE="/usr/share/tomcat"
CATALINA_HOME="/usr/share/tomcat"
#JASPER_HOME="/usr/share/tomcat"
CATALINA_TMPDIR="/xnat/tmp/catalina"
# You can pass some parameters to java here if you wish to
#JAVA_OPTS="-Xminf0.1 -Xmaxf0.3"
# Use JAVA_OPTS to set java.library.path for libtcnative.so
#JAVA_OPTS="-Djava.library.path=/usr/lib64"
JAVA_OPTS="-Xms872m -Xmx2620m -Xmn524m -XX:-OmitStackTraceInFastThrow -XX:MaxPermSize=256m -
Dsun.net.inetaddr.ttl=30 -Dxnat.home=/xnat/home"
# What user should run tomcat
TOMCAT_USER="xnat"
# You can change your tomcat locale here
#LANG="en_US"
# Run tomcat under the Java Security Manager
SECURITY_MANAGER="false"
# Time to wait in seconds, before killing process
SHUTDOWN_WAIT="30"
# Whether to annoy the user with "attempting to shut down" messages or not
#SHUTDOWN_VERBOSE="false"
# Connector port is 8080 for this tomcat instance
#CONNECTOR_PORT="8080"
# If you wish to further customize your tomcat environment,
# put your own definitions here
# (i.e. LD_LIBRARY_PATH for some jdbc drivers)
TOMCAT_LOG="/xnat/logs/tomcat/catalina.out"
CATALINA_OPTS="-Xdebug -Xrunjdwp:transport=dt_socket,server=y,suspend=n,address=8000 -
Dcatalina.ext.dirs=/usr/share/tomcat/shared/lib:/usr/share/tomcat/common/lib -Dcom.sun.
management.jmxremote -Dcom.sun.management.jmxremote.port=9004 -Dcom.sun.management.
jmxremote.authenticate=false -Dcom.sun.management.jmxremote.ssl=false"
```

vii. Edit Tomcat systemd unit. (Change the User line and disable OOM kill)

```
systemctl edit --full tomcat.service
```

### tomcat@xnat.service

```
# Systemd unit file for tomcat instances.
#
# To create clones of this service:
# 0. systemctl enable tomcat@name.service
# 1. create catalina.base directory structure in
#    /var/lib/tomcats/name
# 2. profit.

[Unit]
Description=Apache Tomcat Web Application Container
After=syslog.target network.target

[Service]
Type=simple

EnvironmentFile=/etc/tomcat/tomcat.conf
Environment="NAME=%I"
EnvironmentFile=-/etc/sysconfig/tomcat@%I

ExecStart=/usr/libexec/tomcat/server start
ExecStop=/usr/libexec/tomcat/server stop
SuccessExitStatus=143
User=xnat
Group=tomcat

# Disable OOM kill on tomcat
OOMScoreAdjust=-1000

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

## c. Setup PostgreSQL

### i. Install PostgreSQL

#### PostgreSQL 9.4

```
yum install -y https://download.postgresql.org/pub/repos/yum/9.4/redhat/rhel-7-x86_64/pgdg-
centos94-9.4-3.noarch.rpm
yum install -y postgresql94-server
```

### ii. Edit postgresql-9.4.service

```
systemctl edit --full postgresql-9.4.service
```



## postgresql-9.4.service

```
# It's not recommended to modify this file in-place, because it will be
# overwritten during package upgrades.  If you want to customize, the
# best way is to create a file "/etc/systemd/system/postgresql-9.4.service",
# containing
#     .include /lib/systemd/system/postgresql-9.4.service
#     ...make your changes here...
# For more info about custom unit files, see
# http://fedoraproject.org/wiki/Systemd#How\_do\_I\_customize\_a\_unit\_file.
2F_add_a_custom_unit_file.3F

# Note: changing PGDATA will typically require adjusting SELinux
# configuration as well.

# Note: do not use a PGDATA pathname containing spaces, or you will
# break postgresql-setup.

[Unit]
Description=PostgreSQL 9.4 database server
After=syslog.target
After=network.target

[Service]
Type=forking

User=postgres
Group=postgres

# Note: avoid inserting whitespace in these Environment= lines, or you may
# break postgresql-setup.

# Location of database directory
Environment=PGDATA=/xnat/pgsql/9.4
Environment=PGLOG=/xnat/logs/pgsql/pgstartup-9.4.log

# Where to send early-startup messages from the server (before the logging
# options of postgresql.conf take effect)
# This is normally controlled by the global default set by systemd
# StandardOutput=syslog

# Disable OOM kill on the postmaster
OOMScoreAdjust=-1000

ExecStartPre=/usr/pgsql-9.4/bin/postgresql94-check-db-dir ${PGDATA}
ExecStart=/usr/pgsql-9.4/bin/pg_ctl start -D ${PGDATA} -s -w -t 300
ExecStop=/usr/pgsql-9.4/bin/pg_ctl stop -D ${PGDATA} -s -m fast
ExecReload=/usr/pgsql-9.4/bin/pg_ctl reload -D ${PGDATA} -s

# Give a reasonable amount of time for the server to start up/shut down
TimeoutSec=300

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

### iii. Start Postgres for the first time

### Start Postgres

```
cd /xnat/pgsql
chown postgres:postgres 9.4
chmod 755 /xnat

cd /xnat/logs
mkdir pgsql
chown postgres pgsql

cd
/usr/pgsql-9.4/bin/postgresql94-setup initdb

systemctl start postgresql-9.4.service
```

#### iv. Setup postgresql.conf

```
cd /xnat/pgsql/9.4
mv postgresql.conf postgresql.conf.dist
```

### postgresql.conf

```
max_connections = 100
shared_buffers = 612MB
work_mem = 50MB
maintenance_work_mem = 256MB
dynamic_shared_memory_type = posix
archive_mode = off
effective_cache_size = 1225MB
log_destination = 'stderr'
logging_collector = on
log_directory = 'pg_log'
log_filename = 'postgresql-%a.log'
log_truncate_on_rotation = on
log_rotation_age = 1d
log_rotation_size = 0
log_min_duration_statement = 30000
log_line_prefix = '< %m >'
log_timezone = 'US/Central'
datestyle = 'iso, mdy'
timezone = 'US/Central'
lc_messages = 'en_US.UTF-8'
lc_monetary = 'en_US.UTF-8'
lc_numeric = 'en_US.UTF-8'
lc_time = 'en_US.UTF-8'
default_text_search_config = 'pg_catalog.english'
standard_conforming_strings = off
```

#### v. Give 'postgres' user a password

### postgres user password

```
su - postgres
psql -c "ALTER USER postgres with password '<put your postgres password here>'"
exit
```

#### vi. Setup pg\_hba.conf

## Update procedure:

Check the ZFS on Linux wiki for new information before proceeding:

### Remove and re-install zfs for the latest Centos release

```
yum remove zfs zfs-kmod spl spl-kmod libzfs2 libnvpair1 libuutil1 libzpool2 zfs-release
yum install http://download.zfsonlinux.org/epel/zfs-release.el7_4.noarch.rpm
find /lib/modules/ \( -name "splat.ko" -or -name "zcommon.ko" \
    -or -name "zpios.ko" -or -name "spl.ko" -or -name "zavl.ko" -or \
    -name "zfs.ko" -or -name "znpvpair.ko" -or -name "zunicode.ko" \) \
    -exec /bin/rm {} \;
```

Disable [zfs] and enable [zfs-kmod] in the zfs repo:

#### vim /etc/yum.repos.d/zfs.repo

```
[zfs]
name=ZFS on Linux for EL7 - dkms
baseurl=http://download.zfsonlinux.org/epel/7.4/$basearch/
enabled=0
metadata_expire=7d
ggpgcheck=1
ggpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-zfsonlinux

[zfs-kmod]
name=ZFS on Linux for EL7 - kmod
baseurl=http://download.zfsonlinux.org/epel/7.4/kmod/$basearch/
enabled=1
metadata_expire=7d
ggpgcheck=1
ggpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-zfsonlinux

[zfs-source]
name=ZFS on Linux for EL7 - Source
baseurl=http://download.zfsonlinux.org/epel/7.4/SRPMs/
enabled=0
ggpgcheck=1
ggpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-zfsonlinux

[zfs-testing]
name=ZFS on Linux for EL7 - dkms - Testing
baseurl=http://download.zfsonlinux.org/epel-testing/7.4/$basearch/
enabled=0
metadata_expire=7d
ggpgcheck=1
ggpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-zfsonlinux

[zfs-testing-kmod]
name=ZFS on Linux for EL7 - kmod - Testing
baseurl=http://download.zfsonlinux.org/epel-testing/7.4/kmod/$basearch/
enabled=0
metadata_expire=7d
ggpgcheck=1
ggpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-zfsonlinux

[zfs-testing-source]
name=ZFS on Linux for EL7 - Testing Source
baseurl=http://download.zfsonlinux.org/epel-testing/7.4/SRPMs/
enabled=0
ggpgcheck=1
ggpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-zfsonlinux
```

Reinstall ZFS:

```
yum autoremove
yum install zfs zfs-dracut
systemctl preset zfs-import-cache zfs-import-scan zfs-mount zfs-share zfs-zed zfs.target

# Do the system update
yum update

# Re-enable services
systemctl enable zfs-import-cache
systemctl enable zfs-import-scan
systemctl enable zfs-mount
systemctl enable zfs-share
systemctl enable zfs-zed
systemctl enable zfs.target
```

Make the latest kernel the default in grub:

```
grep '^menuentry' /boot/grub2/grub.cfg
vim /etc/default/grub
grub2-mkconfig -o /boot/grub2/grub.cfg
```

## TODO:

Setup Nagios Monitoring:

<http://www.admin-magazine.com/Archive/2014/22/Nagios-Passive-Checks>

## References

<https://github.com/zfsonlinux/zfs/wiki/RHEL-%26-CentOS>

[https://github.com/zfsonlinux/pkg-zfs/wiki/HOWTO-install-EL7-\(CentOS-RHEL\)-to-a-Native-ZFS-Root-Filesystem](https://github.com/zfsonlinux/pkg-zfs/wiki/HOWTO-install-EL7-(CentOS-RHEL)-to-a-Native-ZFS-Root-Filesystem)

<https://github.com/zfsonlinux/zfs/wiki/Ubuntu%2016.04%20Root%20on%20ZFS>