

# ZFS Quick Guide

The ZFS file system is used widely on BSD, and is coming into more use on Linux. Following are some of my notes on it.

## Initial Setup (FreeBSD)

### Start ZFS service

FreeBSD comes with the ZFS service installed, but not active. We need to start the service, and also tell the system to start it when the system reboots.

```
echo 'zfs_enable="YES"' >> /etc/rc.conf
service zfs start
```

### Create a zpool

Now that we have ZFS running, we'll create a zpool, the basic container for all of our stuff. In this case, I want to use the raidz2 for redundancy (two drives are used for checksumming). Since I don't know the correct names for everything, I'll egrep /var/run/dmesg.boot to find them

```
# find the drives on the system
egrep 'da[0-9]|cd[0-9]' /var/run/dmesg.boot | sort
# we want RAID-6, name it storage, and us /dev/da0 through 7
zpool create -f storage raidz2 /dev/da[01234567]
```

## Use a ZFS Volume for swap space

It is perfectly fine to set up swap on a ZFS volume, but we do want to turn off checksumming. Here, we'll create a 2G ZFS volume named swap (in storage, so storage/swap), add an entry to fstab, and turn it on.

```
zfs create -V 2G -o checksum=off storage/swap
echo '/dev/zvol/storage/swap none swap sw 0 0' >> /etc/fstab
swapon /dev/zvol/storage/swap
```

NOTE: you can add space to this swap area in real time, if you do it at a time when the swap is not necessary to the continued operating of the machine. Simply turn off swap, increase the volume size, then turn swap back on again.

```
# turn off swap
swapoff /dev/zvol/storage/swap
```

```
# increase volume size to 4G
zfs set volsize=4096M storage/swap
# check that it worked
zfs get volsize,reservation storage/swap
# turn swap back on (could also use swapon /dev/zvol/storage/swap, but I'm
lazy)
swapon -aL
```

## Getting and setting properties

ZFS has properties that allow you to modify the way the file system works. The following example sets a quota of 100 Megabytes for storage/varlog so our logs do not fill up the system.

Note the last line showing you can set multiple properties at one time by separating the properties by spaces

```
zfs get all storage/varlog
zfs get quota storage/varlog
zfs set quota=100M storage/varlog
zfs set exec=off checksum=off storage/varlog
```

If you want to return to the default settings, where a property is inherited from the container, use the following code

```
zfs inherit -r quota storage/varlog
```

## Find differences between two snapshots

So, you have zfs running, and you have some automated process running every morning at 4am. Now, you want to see what changed in the 24 hour period.

```
# get a list of snapshots so we know exactly what to ask for
zfs list -r -t snapshot storage/someplace
# find the differences. First one should be the most recent
zfs diff storage/someplace/subdir@20181209_041339
storage/someplace/subdir@20181209_041339
# same thing, but looking only for one subdir named joe
zfs diff storage/someplace/subdir@20181209_041339
storage/someplace/subdir@20181208_041339 | grep '/joe/'
```

output is similar to Subversion, ie a 'M' indicates it was modified, a - indicates it was removed, and a + indicates it was added. Note that your snapshots do not have to be consecutive; you can look at the diff between your oldest and newest snapshot, or even your current copy, as this shows:

```
# compare snapshot taken 20181209_041339 with the current copy
zfs diff storage/someplace/subdir@20181209_041339 storage/someplace/subdir
```

## Useful commands

List all snapshots in a particular tree. gives USED (space used by snapshot) and REFER (data referred to in original set)

```
zfs list -r -t snapshot /storage/varlog
```

Remove an existing snapshot (use above command to find the correct name)

```
zfs destroy -r tank/storage/varlog/@20181026_054020
```

Get a nice list of stats on every dataset in a tree (does the whole tree). Gives AVAIL, ie amount of space available, USED, USED SNAP (space used by snapshots), USED DS (space used by the dataset exclusive of snapshots, ie actual data), USED REFRESERV (whatever that is) and USED CHILD (used by children of the dataset).

```
zfs list -o space -r storage/varlog
```

## References

- <https://www.freebsd.org/doc/handbook/zfs.html>
- <https://www.freebsd.org/doc/handbook/zfs-quickstart.html>
- <https://forums.freebsd.org/threads/is-swap-on-zfs-safe.27855/>
- <https://www.freebsd.org/doc/handbook/adding-swap-space.html>
- <https://www.cyberciti.biz/faq/freebsd-hard-disk-information/>
- <https://www.thegeekdiary.com/how-to-find-the-space-consumed-by-zfs-snapshots/>

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