Bulk data storage with FreeBSD and ZFS in a mixed environment

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Outline

Or

How I learned to stop worrying and love the JBOD

Introduction

- There's always more data
- Object storage is great, but it's a painful transition from standard filesystems.
- To provide a standard filesystem, we need a big block of disk.
  - Hardware RAID is fast but fragile and inflexible.
  - Software RAID is more flexible and about as fast.
- Or what if the filesystem was aware of multiple disks?

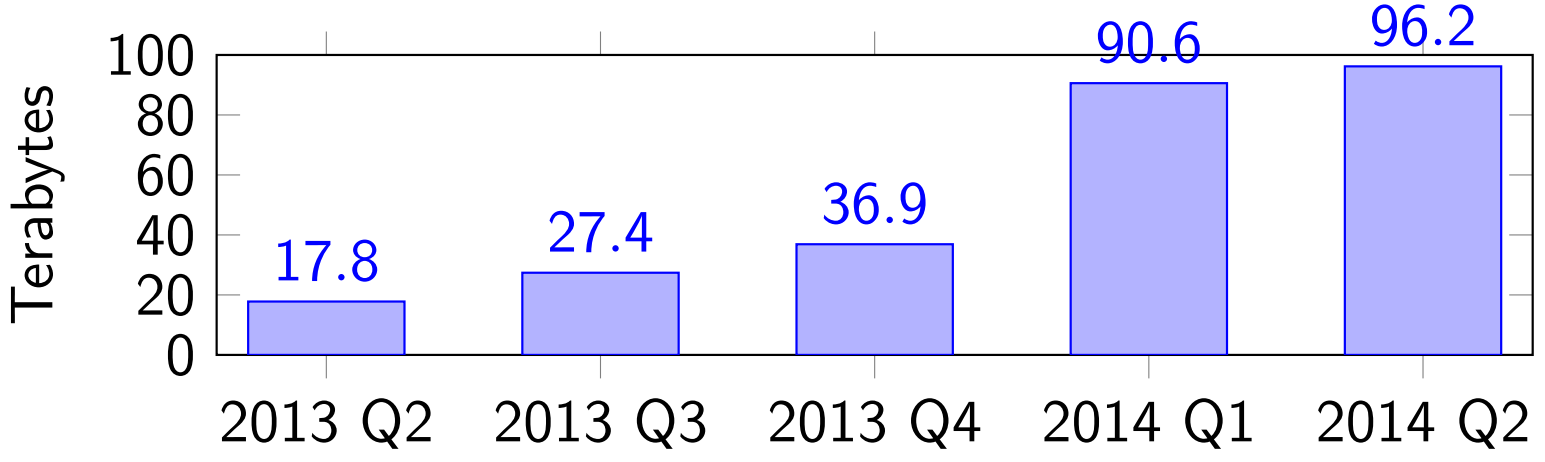
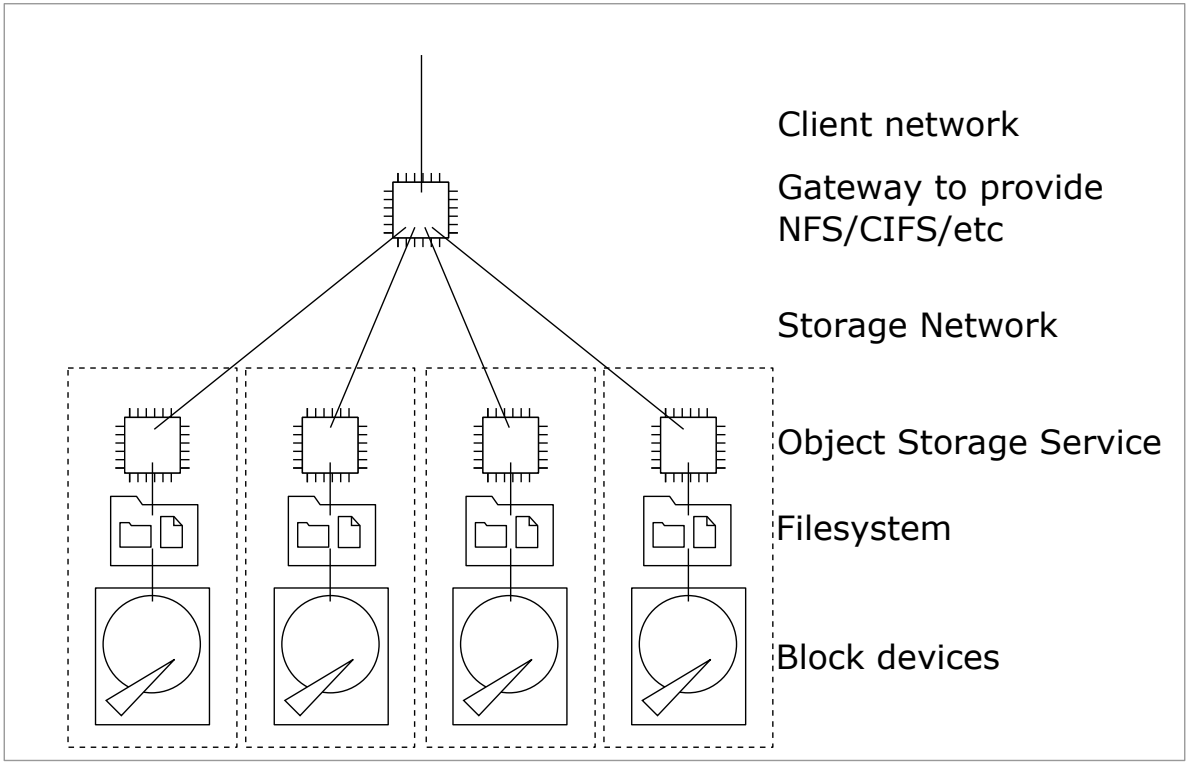


Figure 1 : Size of quarterly full backups

Comparisons

- Object storage expects clients (or a gateway) to talk to multiple servers & disks themselves.



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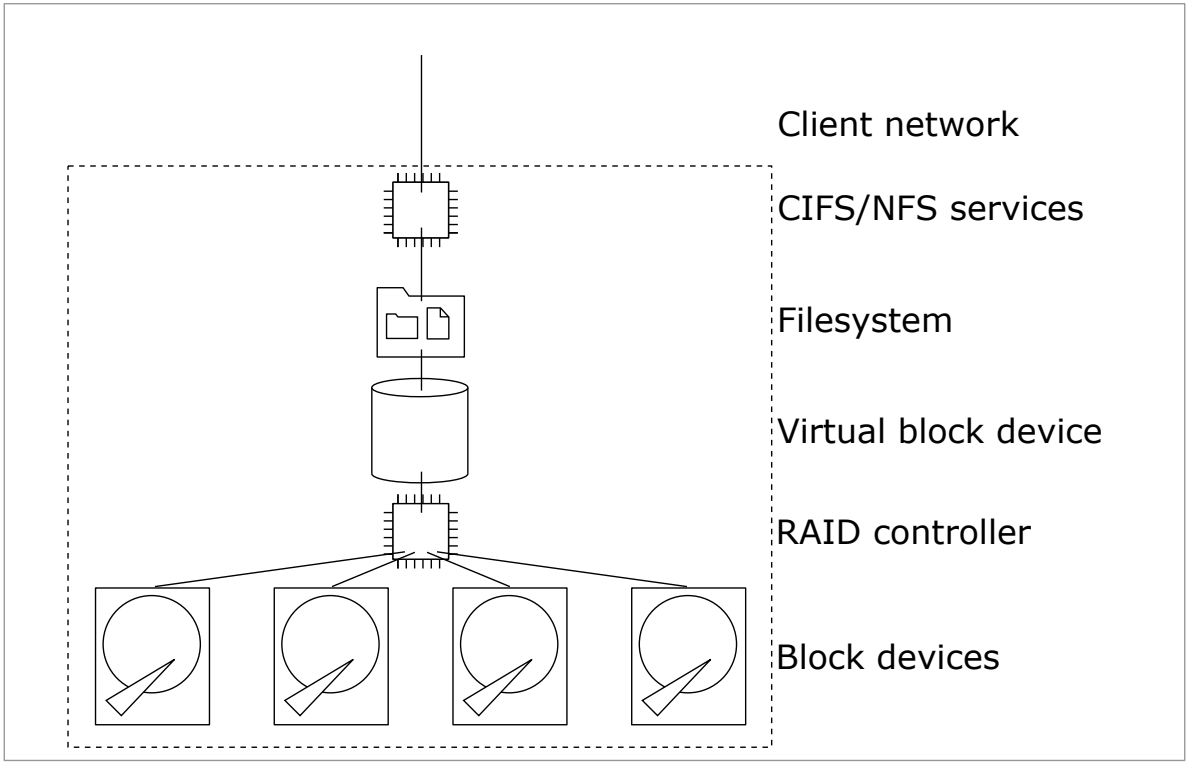

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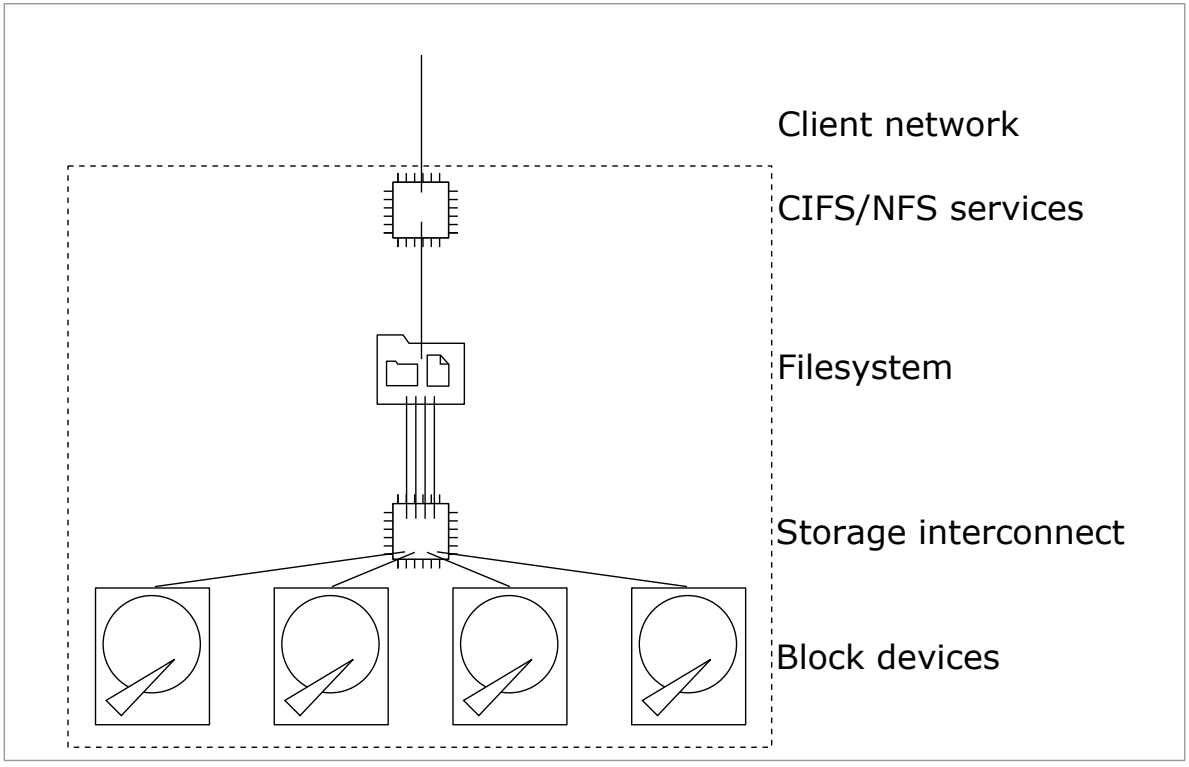
- RAID attempts to give something that looks like a big hard disk.
- ZFS provides a filesystem (more or less) directly.



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- NFSv4 ACLs (more or less a copy of NTFS ACLs.)
- Filesystem streaming, including incremental streams.

Practical Example

Bought in two phases:

- Nov 2010 Server with 8 2TB SATA disks, 3ware controller, 24GB RAM
- Jul 2012 JBOD, better controller, nearline SAS disks, more RAM, SSDs

Server Chassis	Supermicro SC836 3U 16 disk
Motherboard	Supermicro X8DT6
Processor	Dual Xeon E5620
RAM	64 gigabytes DDR3 1066MHz
Host Bus Adaptors	LSI SAS 9200-8i (Internal backplane) LSI SAS 9200-8e (JBOD backplanes)
JBOD chassis	Supermicro SC847 4U 45 disk JBOD
Cache	2x Intel SSD 320 80GB
Disks	60x Seagate Constellation 2TB ES.2

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- It's not actually magic
  - You still need off-site backups.
  - Good idea to run smartd too.

FreeBSD in brief

- It's a UNIX
- Very light weight base system
- Third party software can be installed by three routes:
  - Packages: Pre compiled `pkg install bash`
  - Ports: source `cd /usr/ports/net/samba4 && make install`
  - Traditional: Download and compile the source yourself
- Third party software ends up in `/usr/local/`
- Most non-service specific config in `/etc/rc.conf`

Curious?

If you want more history, specifics see `http://www.freebsd.org`

SFTP

- Very simple, probably running already
- Quite secure, becoming very secure with good key management
- Rarely blocked on the public Internet
- Doesn't (reliably) give access to ACLs

Security

You probably don't want non-administrative users to log in and run commands. At the bottom of `/etc/ssh/sshd_config` append

```
Match User *,!co
    ForceCommand /usr/libexec/sftp-server
```

If you use passwords it's worth running "Denyhosts" or similar to block brute force guessing.

NFS Server

- Version 3 spoken by almost all UNIX systems
- Trivial to set up
- You've got to trust your clients explicitly
- Version 4 a bit better, uses Kerberos

NFSv3 quick start

Add `nfs_server_enable="YES"` to `/etc/rc.conf`

```
zfs set sharenfs="-maproot=nobody client.hostname" \
      pool/home
zfs set sharenfs="-mapall=nobody -ro -network 10/8" \
      pool/public
```

More sharenfs options documented in the `exports(5)` manpage.

NFS Clients

- Standard model for ZFS is one file system per user/group
- You'll probably want to use autofs
- I use autofs 5 on Debian

/etc/auto.home

```
* server.hostname:/pool/home/&
```

/etc/auto.master

```
/home /etc/auto.home
```

mount output (trimmed)

```
/etc/auto.home on /home type autofs
server:/pool/home/user on /home/user type nfs
```

Stand-alone Samba server

/usr/local/etc/smb4.conf

```
[global]
 workgroup = EXAMPLE
 security = user
 # Samba's wrapper for FreeBSD's kqueue has a bug
 kernel change notify = no
[share]
 comment = A share
 browseable = yes
 writable = yes
 vfs objects = zfsacl
 nfs4:mode = special
 nfs4:chown = yes
 zfsacl:acesort = dontcare
```

AD Domain Member: Overview

1. Ensure ports & packages are up to date
2. Install package “net/samba4”
3. Remove it (but not its dependencies)
4. Rebuild the port, ensuring “experimental modules” are enabled
5. Create a new /usr/local/etc/smb4.conf
6. Create a computer account in the domain
7. Enable & Start the services
8. Configure Name Services & Pluggable Authentication Modules

AD Domain Member: Configuration

/usr/local/etc/smb4.conf

```
[global]
 workgroup = AD
 realm = AD.EXAMPLE.COM
 security = ads
 winbind enum groups = yes
 winbind enum users = yes
 winbind nss info = rfc2307
 idmap config * : backend = tdb
 idmap config * : range = 1000000-1999999
 idmap config AD : schema_mode = rfc2307
 idmap config AD : backend = ad
 idmap config AD : range = 1000-50000
 kernel change notify = no
```

AD Domain Member: More configuration

/usr/local/etc/smb4.conf (Continued)

```
[homes]
 comment = Home Directories
 browseable = yes
 writable = yes
 hide files = /.*/desktop.ini/$RECYCLE.BIN/
 vfs objects = zfsacl
 nfs4:mode = special
 nfs4:chown = yes
 zfsacl:acesort = dontcare
 root preexec = /usr/local/bin/updatehome.pl '%U'
```

AD Domain Member: Creating a computer account

1. Join the domain:

```
# net ads join -U Administrator
Administrator@AD.EXAMPLE.COM's password:
Using short domain name -- AD
Joined 'SERVER' to realm 'AD.EXAMPLE.COM'
DNS update failed!
```

2. Enable services:

```
# echo 'samba_server_enable="YES"' >>
/etc/rc.conf
# echo 'winbindd_enable="YES"' >> /etc/rc.conf
```

3. Start services:

```
# service samba_server start
```

4. Test it:

```
# wbinfo -P
checking the NETLOGON dc connection to
"dc0.ad.example.com" succeeded
```

AD Domain Member: winbind

Winbindd is a service that acts as a shim between the UNIX standard authentication/user database functions and Active Directory.

- User database: `/etc/nsswitch.conf`. Comment out:
  ```
  passwd:  compat
  ```
  and
  ```
  group:  compat
  ```
  Add:
  ```
  passwd:  files winbind
  group:  files winbind
  ```
- Authentication: `/etc/pam.d/ssh`. Add:
  ```
  auth sufficient /usr/local/lib/pam_winbind.so
  ```
  in the auth section.

Future work & Thanks

Future work

- Test FreeNAS
- Use ZFS snapshot streaming for backups
- Samba 4 directory services
- Test ZFS on Linux

Thanks

- Transec & ANS for supplying what I ask for
- Paul Sumption for off-site rack space
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- ZFS internals `https://blogs.oracle.com/bonwick/en/`
- LaTeX editing `http://www.writelatex.com`