



Presenting FreeNAS

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- Presentation available at:
<http://www.freenas.org/bsdcan/>
- Special thanks to my employer
for sponsoring my travel:



Silicomp AQL





Plan

- What is FreeNAS ?
- History
- Problems encountered
- Support chain
- Example of use
- Geom RAID 5
- Roadmap
- Conclusion



What is FreeNAS ?

In a few words

- Embedded OS specialized for NAS (Network Attached Storage) services.
- Based on m0n0wall, upgraded to FreeBSD 6.2 with the firewall features replaced with NAS features.



What is FreeNAS

Features from m0n0wall

- Uses the m0n0wall Web GUI
- Single XML configuration file
- Save/backup configuration file
- OS Upgradable from WebGUI

 Appliance oriented



What is FreeNAS ?

Features supported

- Software RAID:
 - RAID 0 with *gstripe/gvinum*
 - RAID 1 with *gmirror/gvinum*
 - RAID 5 with experimental *graid5* and *gvinum*
 - Advanced RAID: 1+0, 0+1, 5+1, etc... (geom power!)
- JBOD with *gconcat*
- Geom GPT used
- Disk encryption with *geli* (patched for script uses)
- iSCSI target (using file) and initiator
- Zeroconf with *mDNSResponder*



What is FreeNAS ?

Features supported

- Protocols:
 - CIFS with Samba
 - FTP with Pure-FTPd
 - RSYNC: server, client and local (disk to disk)
 - SSH (HPN patched)
 - Unison
 - AFP with NetaTalk
 - UPnP using uShare (ported under FreeBSD with Volker Theile)
- User authentication (but not permission!), and MS-AD integration



What is FreeNAS ?

Minimum hardware requirement

- 96 MB of RAM (with a swap file)
- A FreeBSD supported NIC card
- 64MB hard drive/usb stick/compact flash
- PATA/SATA/SCSI/USB/Firewire/iSCSI hard drives

- Or Virtualise it, using Qemu or VMware, etc.



What is FreeNAS ?

Community

- Started in October 2005
- Two regular developers:
 - Olivier Cochard-Labbé and Volker Theile
- Two Document/FAQ authors and user support:
 - Bob Jaggard and Dan Merschi
- One webmaster:
 - Youri Trioreau
- Many translators:
 - French, German, Italian, Spanish, Chinese, Russian, Japanese, Romanian, Dutch,...
- Mailing lists, forum, subversion on Sourceforge



What is FreeNAS ?

Awards and Donators

- Awards
 - VMware Ultimate Virtual Appliance Challenge: Consumer prize
 - Sourceforge: Project of the month, January 2007
- Donators
 - AMD donated a dual Opteron server
 - FreeBSD (Wilko Bulte) donated a Geode-based appliance
 - Orange Business Services (my employer) contributed my travel expenses for BSDCan2007



History

Why a FreeNAS Server ?

- I needed storage (who doesn't?)
- I was looking to transform one of my PCs into a NAS server and my requirements were:
 - Boot from USB key permitting all 4 PATA drives to be used for data storage
 - Small footprint (64MB maximum)
 - Supporting software RAID 5
- I couldn't find one.....so I built one!



History

Why with FreeBSD ?

- Because I'm a FreeBSD guru ?
No ...I never use FreeBSD before starting FreeNAS
- Because I think that FreeBSD is the best OS ?
No...I don't know what is the best OS
- Because FreeBSD have the best filesystem (UFS + Soft updates) that is well suited for a NAS ?
I discovered the UFS file system in the same time as FreeBSD... And I am still unsure what exactly Soft updates are :-)



Why Then?

- Because I found two of Manuel Kasper's guides, for building an embedded FreeBSD, simple enough for be following by a “never used FreeBSD before” as me.
 - Initially, I took just 2 days for the base build!!
- m0n0wall Developers' Handbook
<http://doc.m0n0.ch/dev/>
- miniBSD - reducing FreeBSD
<https://neon1.net/misc/minibsd.html>



Problems encountered FreeBSD as an embedded OS

- No simple circular log
 - Got patched clog from *pfSense*
- No script friendly tools (compared to NetBSD for example)



Problems encountered FreeBSD used as a NAS

- About 90% of FreeNAS users have MS Windows:
 - FreeBSD's Poor Samba performance is a real problem because users like to benchmark...and FreeNAS has no chance against a Linux based NAS, but its better than some hardware NAS appliances☺
 - Samba corrupts files writing to FAT32 drive (bug kern/39043 existing since june 2002)
- No stable software RAID 5 support.
 - Many issues with *gvinum*.
 - FreeNAS now supports use of experimental *graid5* (created by Arne Wörner) that appears more stable

Problems encountered FreeNAS base

BSDCan 2007



- Doesn't use *nanobsd*:
 - I discovered nanobsd when I read some BSDcan 2006 presentations researching for this presentation :-)
- Start from “old” but simple m0n0wall in the place of “new” but complex pfSense
 - That was already based on FreeBSD 6 and permit to add packages.
- As a FreeBSD newbie:
 - The configurations files created by FreeNAS are not optimized.
- I'm not an Operating system admin:
 - I must discover and learning each feature before to add them.
- For resume, I re-invend the wheel..
 - but, as a beginner, I build a square wheel!



Problems encountered

Managing an open source Project

- Time consuming...
 - Big impact on my private life:
 - Receiving lot's of user support request regarding project.
- Project Time management
 - How to share what free time I have between answering emails, improving communication, support, bug fix, new features, etc?
- How to answer the question...“I want to contribute, what can I do ?”
 - It's difficult to impose a task on someone.
- User support: Can't reproduce all users problems!



Support Chain

- Think about the Support Chain
 - Before to look for other developers, found volunteer for user support!
- End User documentation and FAQs
 - These help run interference for the developers – permits the devs to concentrate more on the code than the ‘nut behind the wheel’
- Multiple Users/multiple hardware combinations
 - A two-edged sword, forces more Feature Requests on the Project, but permits more combinations to be tested.
- Development/Communication Tools
 - Sourceforge Toolkit – Forums, notification via Mailing Lists, SVN, etc. One less thing for a dev to have to think about.



Example of use

Step 1: Installing FreeNAS

```
Console setup
*****
1) Assign Interfaces
2) Set LAN IP address
3) Reset webGUI password
4) Reset to factory defaults
5) Ping host
6) Shell
7) Reboot system
8) PowerOff system
9) Install to an hard drive/memory drive/USB pen, etc.

Enter a number: 9
```

```
Install
*****
1) Install on HD, CF or USB key: Create 1 UFS partition
2) Install on HD: Create 2 UFS partitions (OS and DATA)
3) Upgrade existing installed version from CDROM
4) Return to main menu

Enter a number: 1
```

```
Here is the list of detected CDROM:
acd0 (desc: QEMU CD-ROM/0.9.0)
```

```
Enter the name of the CD-ROM drive: acd0
```

```
Here is the list of detected disk:
ad0 (desc: QEMU HARDDISK/0.9.0)
ad1 (desc: QEMU HARDDISK/0.9.0)
ad3 (desc: QEMU HARDDISK/0.9.0)
```

```
Enter the name of the USB key or CF: ad0
```

```
Creating mount point for the CDROM...
Mount CDROM...
Installation...
Unmount CDROM...
```

```
FreeNAS has been installed on ad0.
You can now remove the CD-ROM and reboot the PC.
```

```
Press ENTER to continue.
```



Example of use

Step 2: Configuring IP address

```
Console setup
```

```
*****
```

- 1) Assign Interfaces
- 2) Set LAN IP address
- 3) Reset webGUI password
- 4) Reset to factory defaults
- 5) Ping host
- 6) Shell
- 7) Reboot system
- 8) PowerOff system

```
Enter a number: 2
```

```
Do you want to use DHCP? (y/n) n
```

```
Enter the new LAN IP address: 192.168.1.10
```

```
Subnet masks are entered as bit counts (as in CIDR notation) in FreeNAS.
```

```
e.g. 255.255.255.0 = 24
```

```
      255.255.0.0   = 16
```

```
      255.0.0.0    = 8
```

```
Enter the new LAN subnet bit count: 24
```

```
The LAN IP address has been set to 192.168.1.10/24.
```

```
You can now access the webGUI by opening the following URL  
in your browser:
```

```
http://192.168.1.10/
```

```
Press ENTER to continue.
```



Example of use

Step 3: Access to the Web GUI

4. Adding disk

5. Formatting

6. Mounting

7. Services

FreeNAS

- System
 - General setup
 - Static routes
 - Hosts
 - Advanced
 - Firmware
- Interfaces (Assign)
 - LAN
- Disks
 - Management
 - Software RAID
 - Encryption
 - Format
 - Mount Point
- Services
 - CIFS
 - FTP
 - NFS
 - RSYNCD
 - SSHD
 - Unison
 - AFP
 - UPnP
 - iSCSI Target
- Access
 - Users and Groups
 - Active Directory
 - LDAP
 - NIS
- Status
 - System
 - Process
 - Interfaces
 - Disks

webGUI Configuration freenas.local

FreeNAS

System information	
Name	freenas.local
Version	0.684b built on Wed Mar 28 19:35:22 UTC 2007
OS Version	FreeBSD 6.2-RELEASE-p3 (revision 199506)
Platform	generic-pc on Intel(R) Core(TM)2 CPU T5600 @ 1.83GHz running at 1836 MHz
Date	Wed Apr 11 16:32:49 UTC 2007
Uptime	00:07
Last config change	Wed Apr 11 16:31:15 UTC 2007
Memory usage	<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 10px; background-color: #333; border: 1px solid #ccc; margin-right: 5px;"></div> 21% of 71MB </div>
Load averages	0.15, 0.17, 0.09 [show process information]
Disk space usage	No disk configured



Example of use

Step 4: Adding disk

Disks: Management

Manage **iSCSI Initiator**

Disk	Size	Description	Standby time	File system	Status
------	------	-------------	--------------	-------------	--------



Note:

First configuration step: Add your hardrive to the disk list.

1. Click on +

2. Choosing disk

Disks: Disk: Add

Disk	ad1: 100MB (QEMU HARDDISK/0.9.0)
UDMA mode	Auto <small>You can force UDMA mode if you have 'UDMA_ERROR.... LBA' message with your hard drive.</small>
Hard disk standby time	Always on <small>Puts the hard disk into standby mode when the selected amount of time after the last access has elapsed. Do not set this for CF cards.</small>
Advanced Power Management	Disabled <small>This allows you to lower the power consumption of the drive, at the expense of performance. Do not set this for CF cards.</small>
Acoustic level	Disabled <small>This allows you to set how loud the drive is while it's operating. Do not set this for CF cards.</small>
Preformatted FS	Unformatted <small>This allows you to set FS type for preformatted disk with data. Leave 'unformatted' for unformatted disk and then use format menu.</small>

3. Click on "Add"

Add



Example of use

Step 5: Formatting

1. Choose previously added disk

Disks: Format

Disk	ad1: 100MB (QEMU HARDDISK/0.9.0) ▼
File system	UFS (GPT and Soft Updates) ▼
Minimum free space	8 ▼ Specify the percentage of space held back from normal users. Note that lowering the threshold can adversely affect performance and auto-defragmentation.
Don't Erase MBR	<input type="checkbox"/> Don't erase the MBR (useful for some RAID controller cards)

Format disk

2. Click on Format



Example of use

Step 5: Mounting

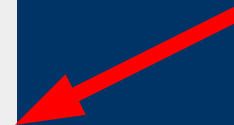
Disks: Mount Point

Manage **Tools** Fsck

Disk	Partition	File system	Share Name	Description	Status
+					

Note:
Second configuration step: Declaring the filesystem used by your [previously configured disk](#).

1. Click on +



2. Choosing previously formatted disk



Disks: Mount Point: Add

Disk ad1: 100MB (QEMU HARDDISK/0.9.0) ▼

Partition EFI GPT ▼
 Select EFI GPT if you want to mount a GPT formatted drive (default method since 0.684b).
 Select 1 for UFS formatted drive or software RAID volume creating since the 0.683b.
 Select 2 for mounting the DATA partition if you select option 2 during installation on hard drive.
 Select old software gmirror/graidd5/gvinum for volume created with old FreeNAS release

File system UFS ▼

Share Name small_drive

Description Little drive for test

Add

3. Click on Add





Example of use

Step 6: Enabling the services

Services: AFP

AFP Server Enable

Server Name

Authentication

- Enable guest access.
- Enable local user authentication.

Save and Restart AFP

Services: RSYNC

Server **Client** **Local**

Rsync Daemon Enable

Read only

Map to user

TCP port
Alternate TCP port. Default is 873

Maximum

Services: FTP

FTP Server

TCP port
Default is 21

Number of clients
Maximum number of simultaneous clients.

Max. conn. per IP
Maximum number of connections per IP address (0)

Timeout
Maximum idle time in minutes.

Permit root login Specifies whether it is allowed to login as superuser.

Anonymous login Enable anonymous login.

Local User Enable local user login.

Banner

Services: CIFS

Settings **Shares**

Common Internet File System Enable

Authentication

NetBiosName

Workgroup
Workgroup to be member of.

Description
Server description. This can usually be left blank.

Dos charset

Unix charset



Geom RAID 5

- Permit to increase the array size by replacing each disk one by one without service interruption (excluding growfs impact)
- Faster read requests : RAID0 striping effect
- Slower write requests than RAID0
- Graceful degradation: Quite tolerant against single disk failure



Roadmap

- 0.69: Coming up
- 0.7: user permissions, quotas. All disk management will be reviewed (simpler to configure)
- 0.8: monitoring (SNMP, email alert, etc...)
- 0.9: Bug fixes and stabilizing
- 1.0: The release!



Conclusion

Contributors needed!!

- FreeBSD guru/administrator
 - Tuning and security advices
 - Configuration file check
- PHP Coder
 - Code review
 - Bug fix
- User support
 - There are still lot's of user question on the forum that need a response