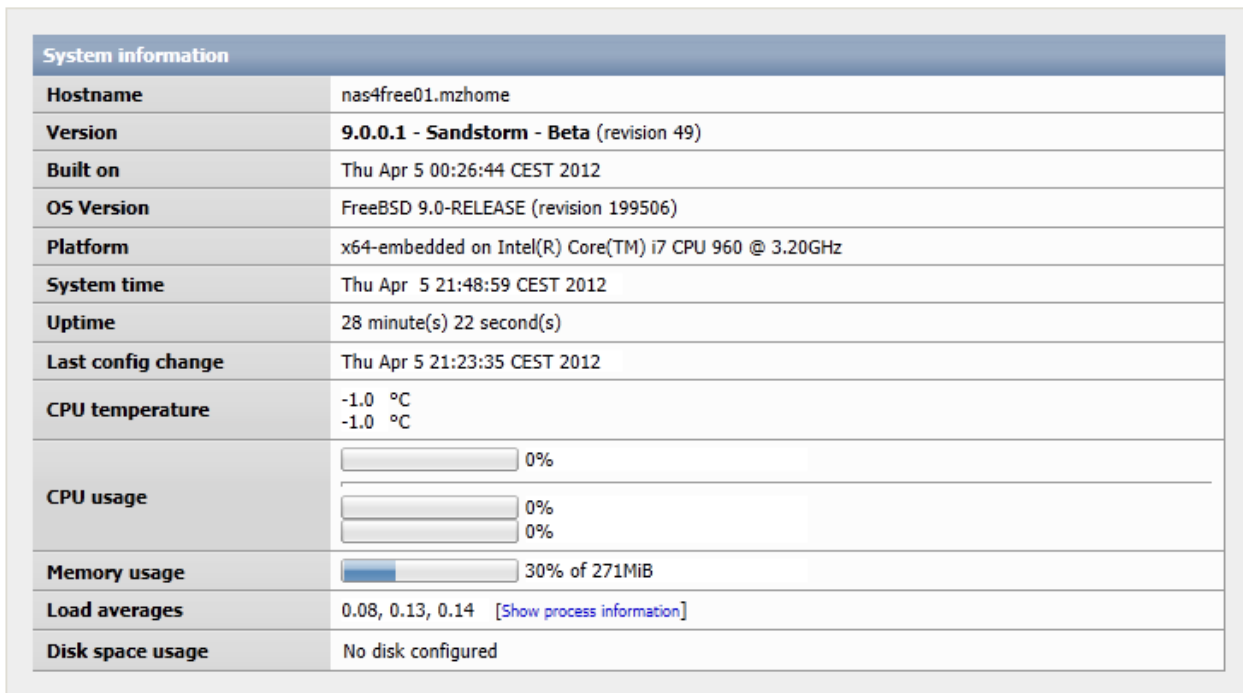


NAS4Free Guide for creating an iSCSI target from a ZFS volume

My Setup

Here is my current setup: Intel(R) Core(TM) i7 CPU 960 @ 3.20GHz. 512MB of RAM. 4 x 2TB Hard drives. Running NAS4Free 9.0.0.1 Sandstorm - Beta (Revision 49) from VMware Workstation.



System information	
Hostname	nas4free01.mzhome
Version	9.0.0.1 - Sandstorm - Beta (revision 49)
Built on	Thu Apr 5 00:26:44 CEST 2012
OS Version	FreeBSD 9.0-RELEASE (revision 199506)
Platform	x64-embedded on Intel(R) Core(TM) i7 CPU 960 @ 3.20GHz
System time	Thu Apr 5 21:48:59 CEST 2012
Uptime	28 minute(s) 22 second(s)
Last config change	Thu Apr 5 21:23:35 CEST 2012
CPU temperature	-1.0 °C -1.0 °C
CPU usage	<input type="text" value="0%"/> 0% <input type="text" value="0%"/> 0% <input type="text" value="0%"/> 0%
Memory usage	<input type="text" value="30% of 271MiB"/> 30% of 271MiB
Load averages	0.08, 0.13, 0.14 [Show process information]
Disk space usage	No disk configured

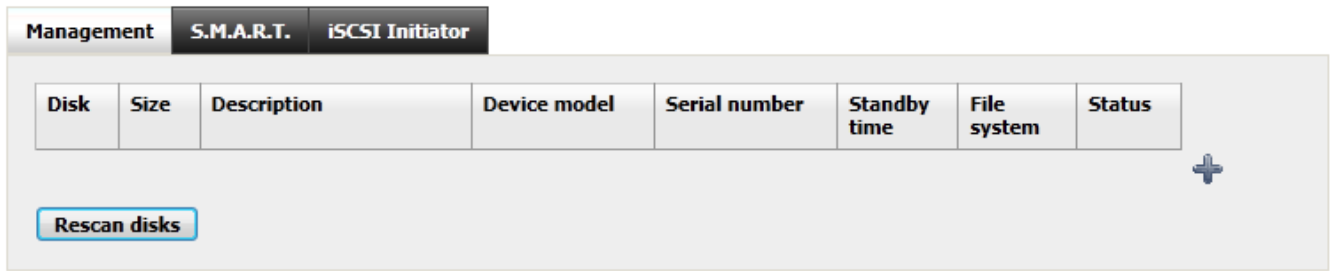
Copyright © 2012 NAS4Free. All rights reserved.

My 4 x 2 Terabyte drives are in no HARDWARE RAID configuration. This is important as ZFS employs its own RAID structure in its file system so the Mother Board BIOS had its RAID settings disabled (this is what worked for me).

Adding Discs to NAS4Free


1 - Pull down the “**DISKS**” Menu from the top navigation bar and then select “**MANAGEMENT**”. See [SUG Section 5.1 - Disks Management](#) for details.

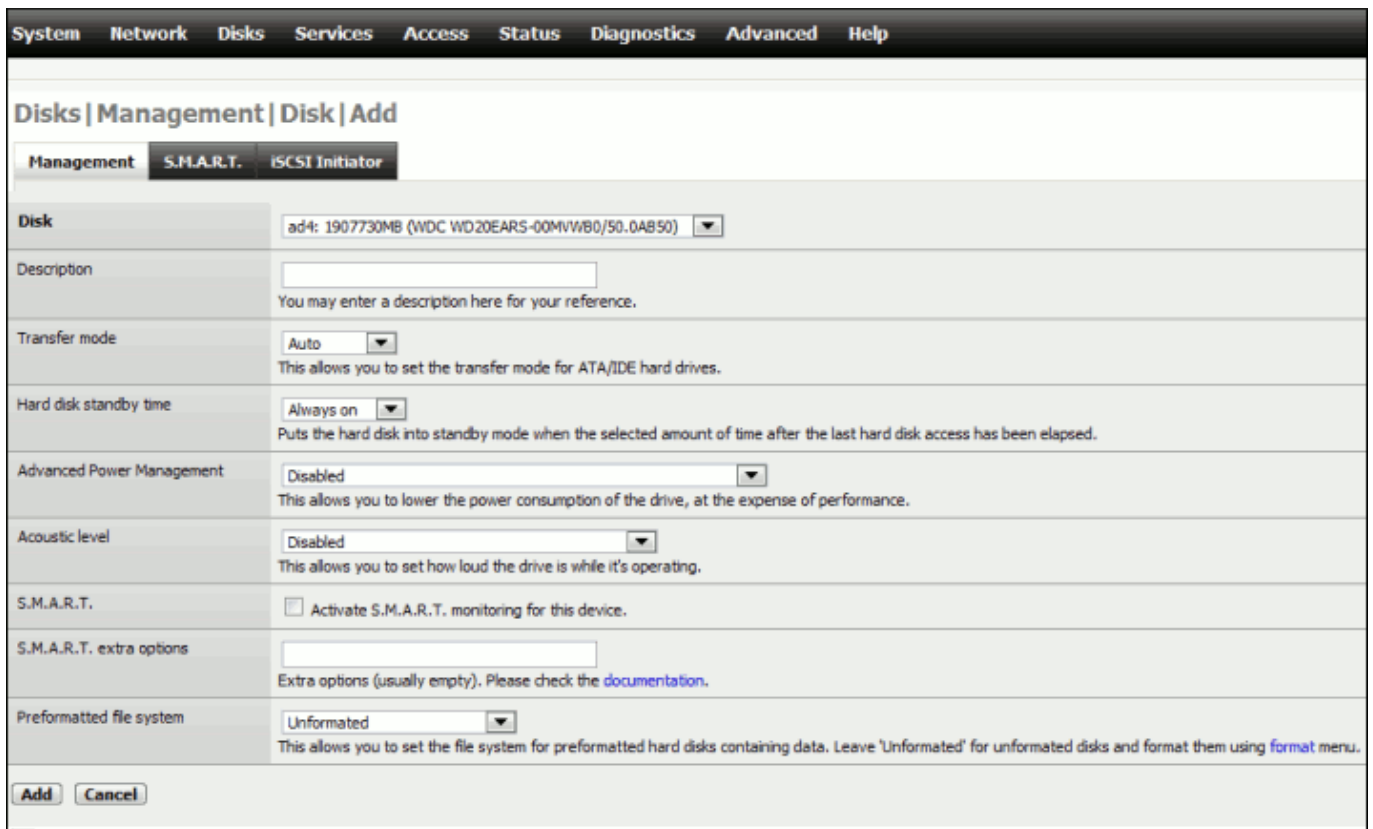
Disks | Management



Disk	Size	Description	Device model	Serial number	Standby time	File system	Status
------	------	-------------	--------------	---------------	--------------	-------------	--------

[Rescan disks](#)

2 - Click the  this will load up the Disk Add Page.



Disks | Management | Disk | Add

Disk

Description
You may enter a description here for your reference.

Transfer mode
This allows you to set the transfer mode for ATA/IDE hard drives.

Hard disk standby time
Puts the hard disk into standby mode when the selected amount of time after the last hard disk access has been elapsed.

Advanced Power Management
This allows you to lower the power consumption of the drive, at the expense of performance.

Acoustic level
This allows you to set how loud the drive is while it's operating.

S.M.A.R.T. Activate S.M.A.R.T. monitoring for this device.

S.M.A.R.T. extra options
Extra options (usually empty). Please check the [documentation](#).

Preformatted file system
This allows you to set the file system for preformatted hard disks containing data. Leave 'Unformatted' for unformatted disks and format them using [format](#) menu.

3 - Using the drop down Menu, select the drive you are adding.

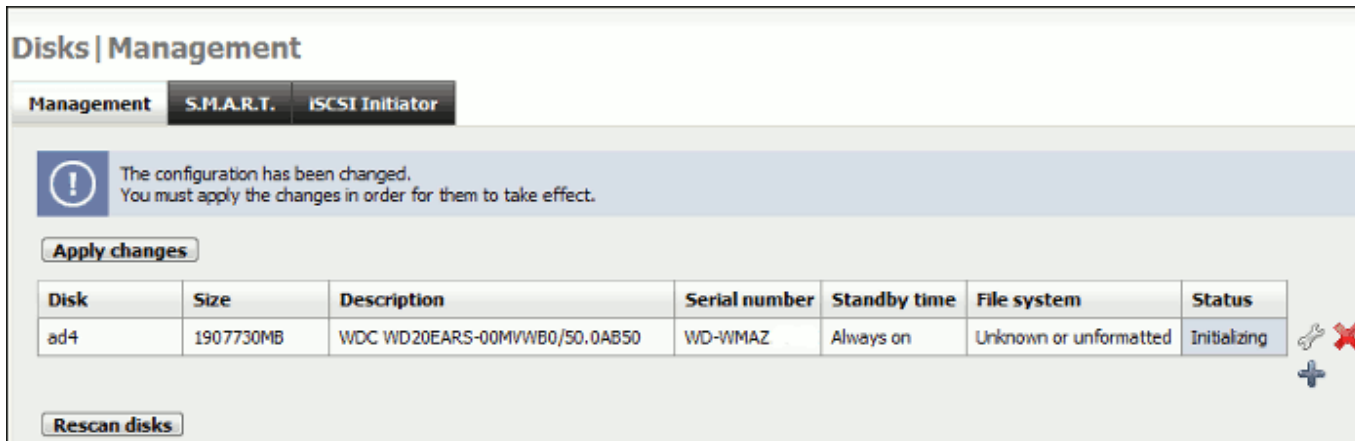
4 - Give it a Description

5 - I left the following settings in their default positions, but depending on your configuration you can change them.

- A - Transfer Mode at Auto.
- B - Hard Disk Standby Time to "Always on".
- C - Advanced Power Management to "Disabled".
- D - Acoustic Level.
- E - S.M.A.R.T NOT Ticked.

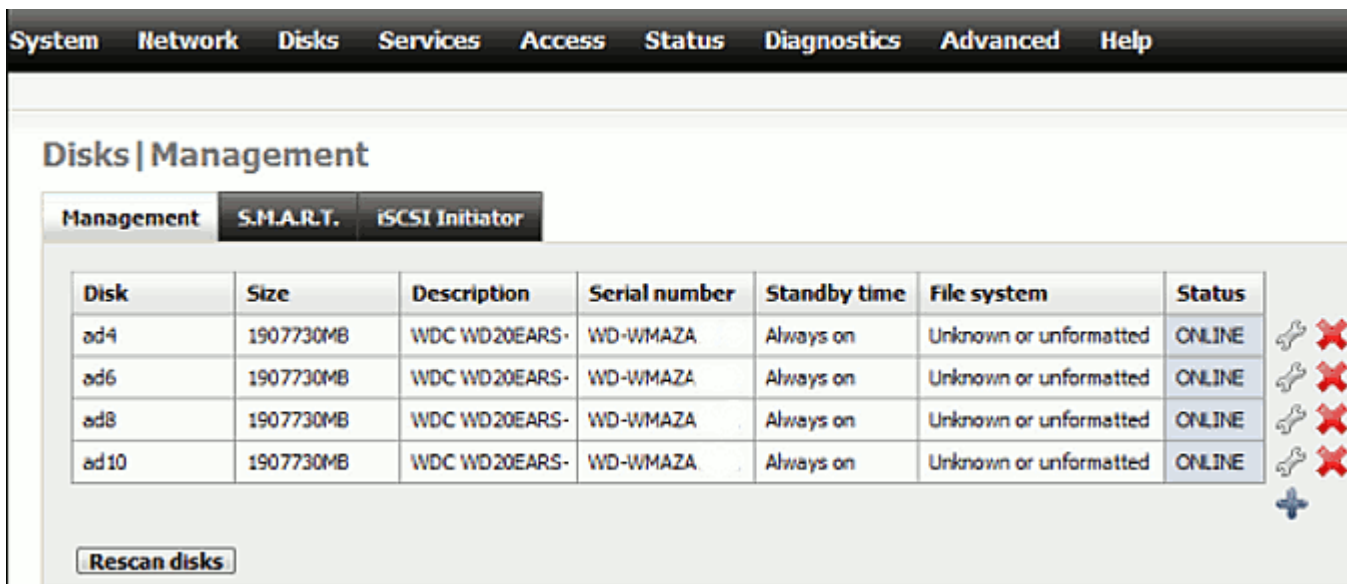
6 - Preformatted file System was left to Unformatted. By setting this to Unformatted we can use the format option in NAS4Free.

7 - Click the **"ADD"** Button.



8 - Click the “**APPLY CHANGES**” Button.

I repeated this process (steps 2 - 8) for the remaining three drives. I DID NOT ADD MY USB stick as this holds the NAS4Free OS and I don't want that to be formatted by ZFS etc.



All drives should now appear in the disc Management Page. All Drives should have a “**STATUS**” of “**ONLINE**”

Formatting Drives

When all the drives are added I now format them into ZFS.

1 - Pull down the “**DISKS**” Menu on the top Navigation Bar and select “**FORMAT**”.

Disks | Format

Disk

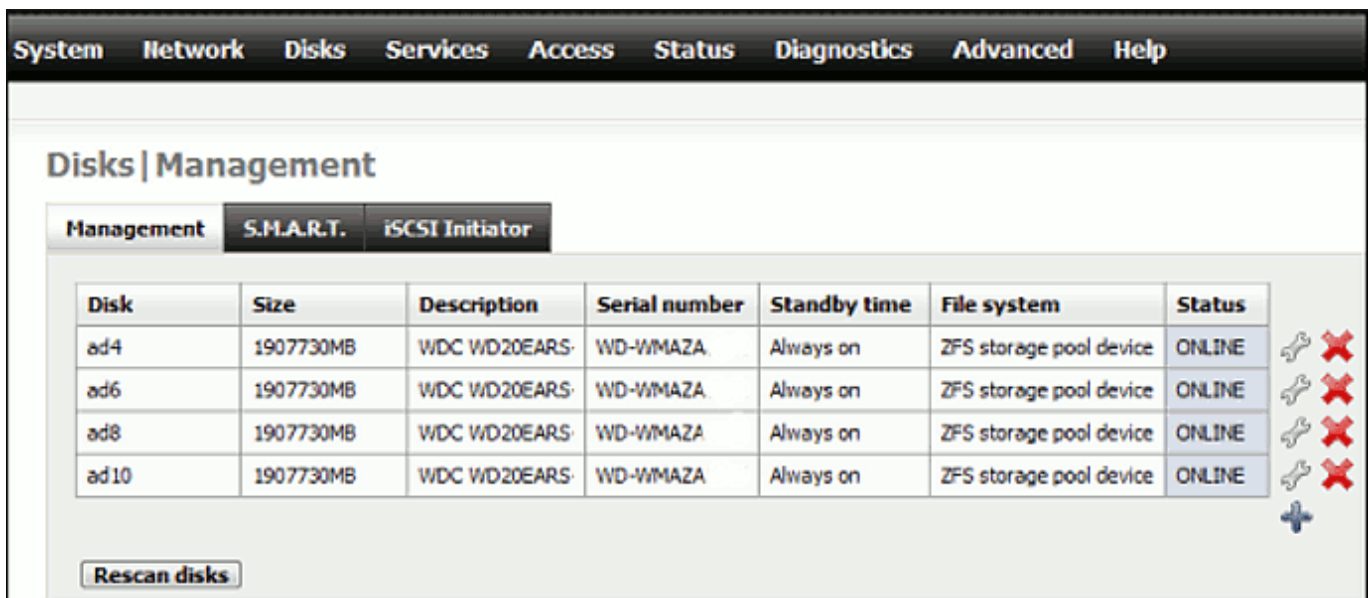
File system

Don't Erase MBR Don't erase the MBR (useful for some RAID controller cards)

Format disk

Warning:
UFS is the NATIVE file format for FreeBSD (the underlying OS of NAS4Free). Attempting to use other file formats such as FAT, FAT32, EXT2, EXT3, or NTFS can result in unpredictable results, file corruption, and loss of data!

- 2 - Select Drive which should now appear in the dropdown.
 - 3 - Select ZFS Storage Pool Device for the File System.
 - 4 - I erased my MBR so left the "Don't Erase MBR" Setting UNCHECKED.
 - 5 - Click the "**FORMAT DISK**" Button.
- Repeat steps 2-5 for all additional drives that you have.



Pull down the "**DISKS**" Menu on the top Navigation Bar and then select "**MANAGEMENT**" again to check that the formatting of all drives was successful.

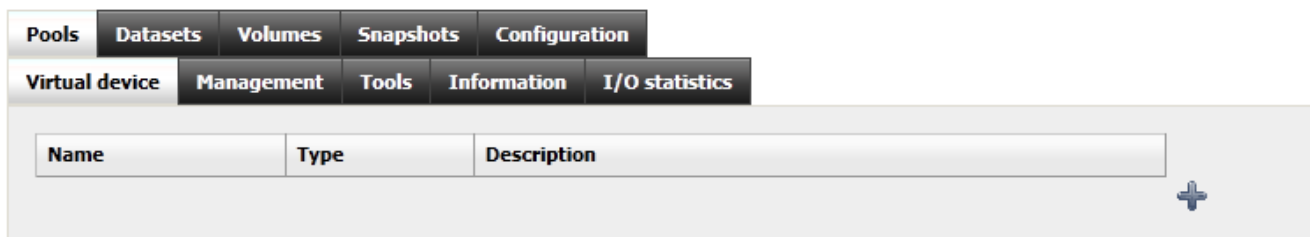
Creating a ZFS Virtual Device.

Once you have gotten NAS4Free to recognise, format and present your drives in the WebGUI, you will now proceed to create a virtual device consisting of these drives.

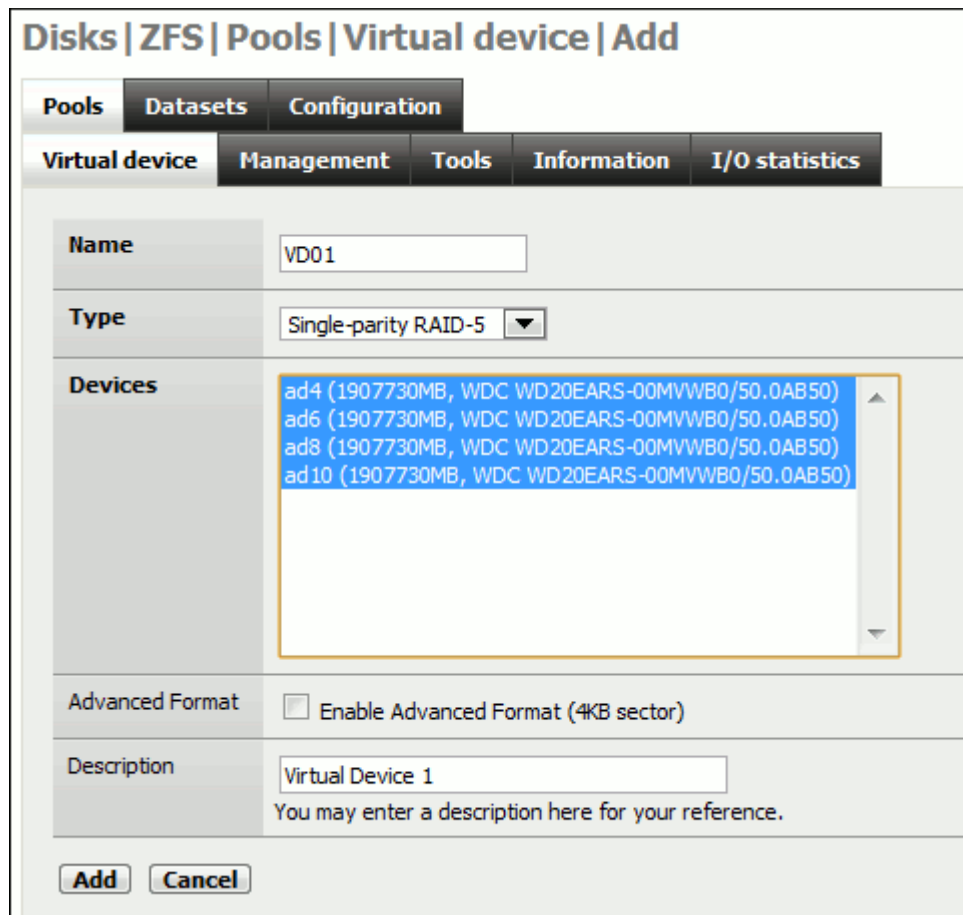
- 1 - Go to "**DISKS**" Tab at the top navigation bar and then select "**ZFS**".

2 - Click on the **“Virtual Device”** Tab.

Disks | ZFS | Pools | Virtual device



3 - Click the **+**.



4 - Enter a Name (I called mine VD01).

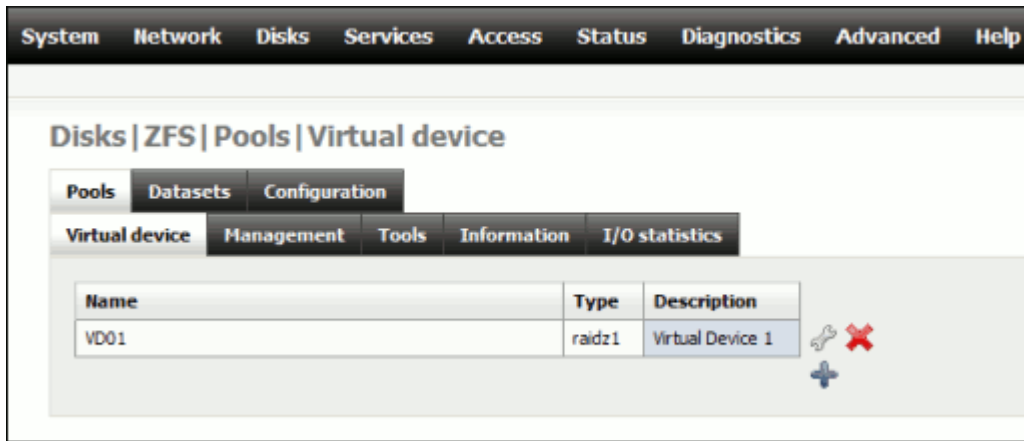
5 - Select a Type (I personally selected Single Parity Raid 5 which is RAIDz1 in ZFS speak).

6 - Now select ALL the DEVICES SO THEY TURN BLUE!! OTHERWISE YOU WILL GET AN ERROR.

7 - I didn't select Advanced Format.

8 - Enter a Description.

9 - Click the **“ADD”** Button. After clicking the **“ADD”** Button you will be returned to the Virtual Device page in ZFS.



Now the drives have been added to NAS4Free they still have to be made available for NAS4Free to manage.

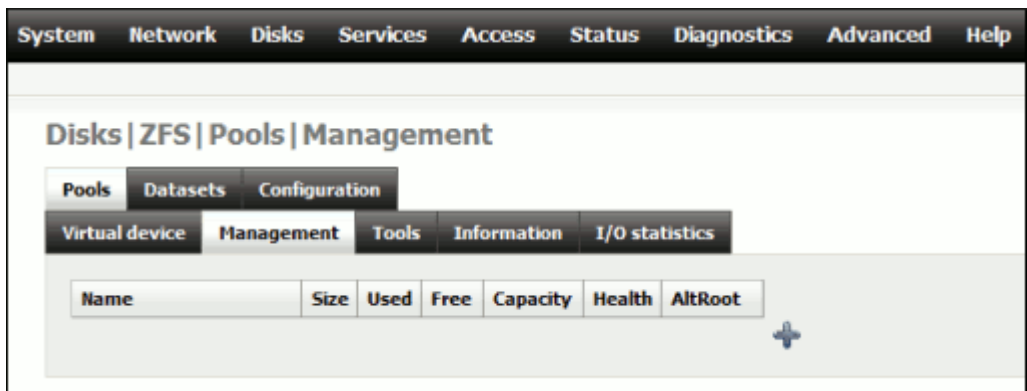
System information	
Hostname	nas4free01.mzhome
Version	9.0.0.1 - Sandstorm - Beta (revision 49)
Built on	Thu Apr 5 00:26:44 CEST 2012
OS Version	FreeBSD 9.0-RELEASE (revision 199506)
Platform	x64-embedded on Intel(R) Core(TM) i7 CPU 960 @ 3.20GHz
System time	Thu Apr 5 21:48:59 CEST 2012
Uptime	28 minute(s) 22 second(s)
Last config change	Thu Apr 5 21:23:35 CEST 2012
CPU temperature	-1.0 °C -1.0 °C
CPU usage	0% 0% 0%
Memory usage	30% of 271MiB
Load averages	0.08, 0.13, 0.14 [Show process information]
Disk space usage	No disk configured

Copyright © 2012 NAS4Free. All rights reserved.

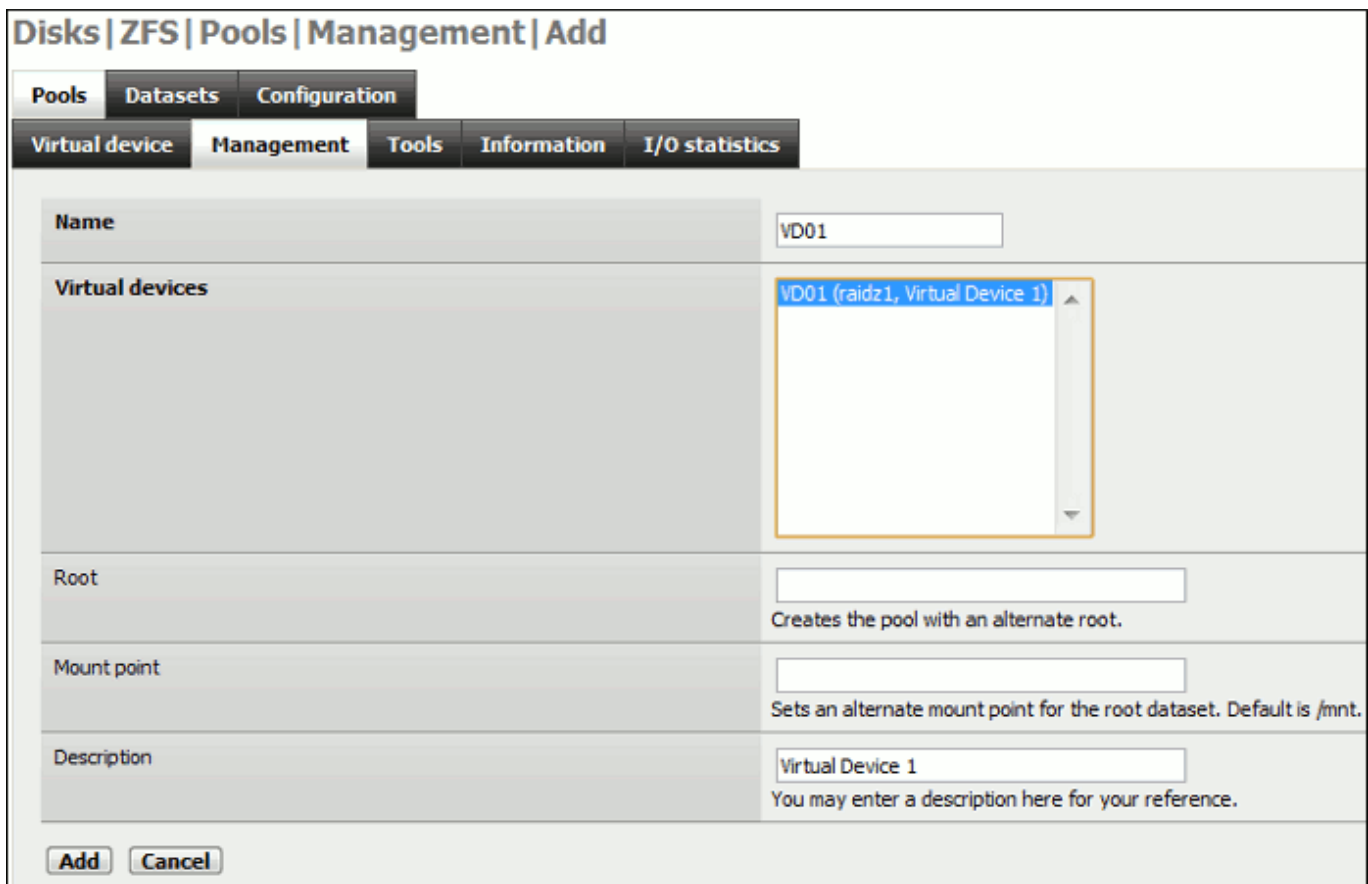
Pull down the “**STATUS**” Menu on the top navigation bar and select “**SYSTEM**”, you will see the Disc you have been setting up are still not here “No Disc Configured”.

Adding device to ZFS Management page

1 - Pull down the “**DISKS**” Menu on the top Navigation Bar and select “**ZFS**”. This will load up the management page.



2 - Click the + .



3 - Enter a Name (I gave mine the exact same name as what I gave the Virtual Device: VD01)

4 - SELECT THE VIRTUAL DEVICE SO IT IS TURNED BLUE!!! AGAIN THIS HAS TO BE SELECTED.

5 - I kept these options as default:

- A - Root.
- B - Mount Point.

6 - I entered a name for the Description. Click the “**ADD**” Button. You will then be returned to the Management Page.

Disks | ZFS | Pools | Management

Pools | Datasets | Configuration

Virtual device | Management | Tools | Information | I/O statistics

! The configuration has been changed. You must apply the changes in order for them to take effect.

Apply changes

Name	Size	Used	Free	Capacity	Health	AltRoot
VD01	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown

⚙️ ❌ +

Everything is listed as UNKNOWN. DO NOT WORRY. YOU MUST APPLY THE CHANGES!

7 - Click the “**APPLY CHANGES**” Button!

Disks | ZFS | Pools | Management

Pools | Datasets | Configuration

Virtual device | Management | Tools | Information | I/O statistics

! The changes have been applied successfully.

Name	Size	Used	Free	Capacity	Health	AltRoot
VD01	7.25T	103K	5.34T	0%	ONLINE	-

⚙️ ❌ +

8 - Now all the values should have changed and the virtual device is now online. Just to make sure, Pull down the “**STATUS**” Menu on the top navigation bar and select “**SYSTEM**”, you should now see the Disc.

Disk space usage **VD01**

0% of 7.25TB

Total: **7.25T** | Used: **103K** | Free: **5.34T** | State: **ONLINE**

9 - **Take note of the FREE space! You will need this value for later.**

Create an iSCSI target

Now with the disc managed and configured correctly in ZFS we are now going to create an iSCSI Target.

1 - Pull down the “**SERVICES**” Menu on the top Navigation Bar and select “**iSCSI target**”.

Services | iSCSI Target

- Settings
- Targets**
- Portals
- Initiators
- Auths
- Media

iSCSI Target Enable

Base Name	<input type="text" value="iqn.2007-09.jp.ne.peach.istgt"/> <small>The base name (e.g. iqn.2007-09.jp.ne.peach.istgt) will append the target name that is not starting with 'iqn.'</small>
Discovery Auth Method	<input type="text" value="Auto"/> <input type="button" value="v"/> <small>The method can be accepted in discovery session. Auto means both none and authentication.</small>
Discovery Auth Group	<input type="text" value="None"/> <input type="button" value="v"/> <small>The initiator can discover the targets with correct user and secret in specific Auth Group.</small>

Advanced settings

I/O Timeout	<input type="text" value="30"/> <small>I/O timeout in seconds (30 by default).</small>
NOPIN Interval	<input type="text" value="20"/> <small>NOPIN sending interval in seconds (20 by default).</small>
Max. sessions	<input type="text" value="16"/> <small>Maximum number of sessions holding at same time (16 by default).</small>
Max. connections	<input type="text" value="4"/> <small>Maximum number of connections in each session (4 by default).</small>
Max. pre-send R2T	<input type="text" value="32"/> <small>Maximum number of pre-send R2T in each connection (32 by default). The actual number is limited to QueueDepth of the target.</small>
FirstBurstLength	<input type="text" value="262144"/> <small>iSCSI initial parameter (262144 by default).</small>
MaxBurstLength	<input type="text" value="1048576"/> <small>iSCSI initial parameter (1048576 by default).</small>
MaxRecvDataSegmentLength	<input type="text" value="262144"/> <small>iSCSI initial parameter (262144 by default).</small>
MaxOutstandingR2T	<input type="text" value="16"/> <small>iSCSI initial parameter (16 by default).</small>
DefaultTime2Wait	<input type="text" value="2"/> <small>iSCSI initial parameter (2 by default).</small>
DefaultTime2Retain	<input type="text" value="60"/> <small>iSCSI initial parameter (60 by default).</small>

iSCSI Target Logical Unit Controller Enable

Note:
You must have a minimum of 384MB of RAM for using iSCSI target.

2. Click the “**ENABLE**” checkbox for iSCSI Target in the upper right corner of the page.

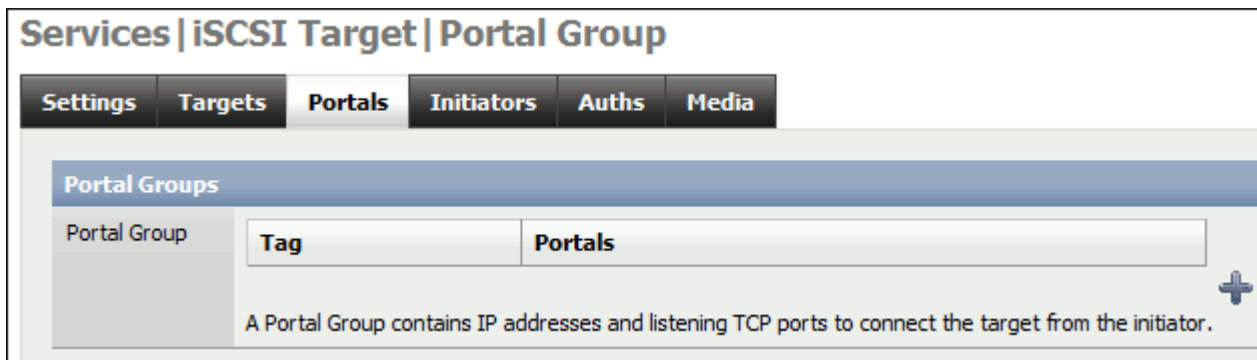
3. Leave everything else alone, change nothing.

4. Click the “**Save and Restart**” Button.

Adding a Portal

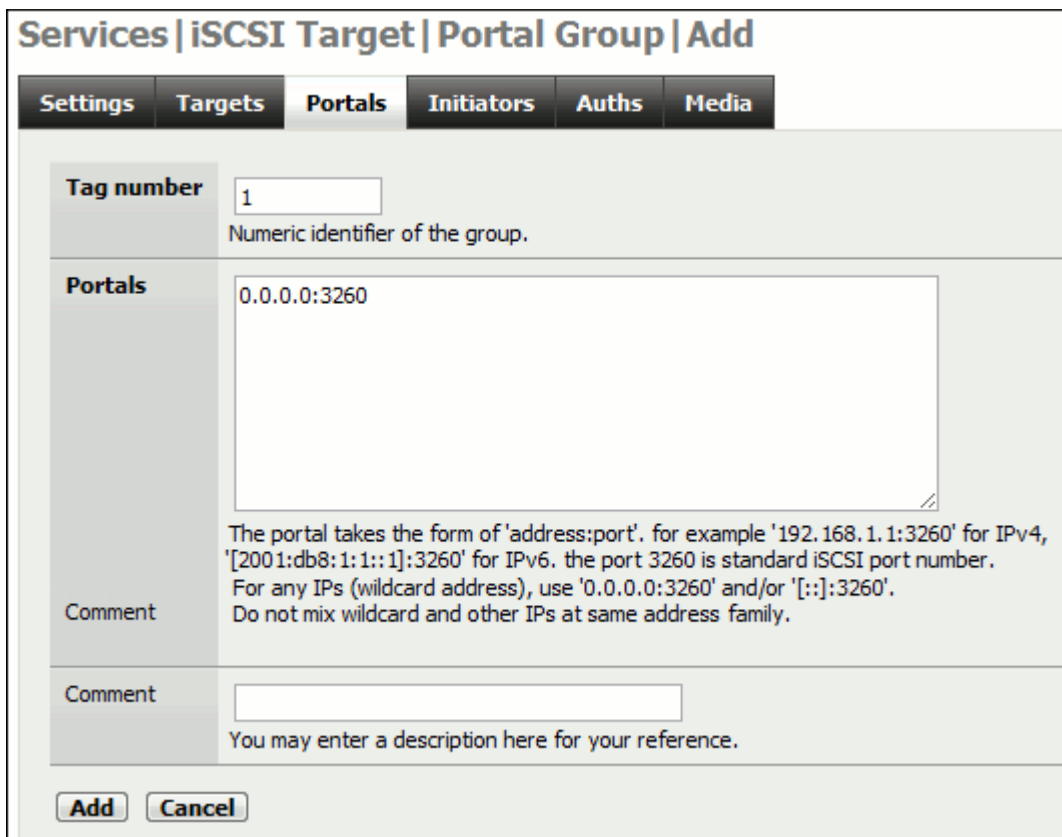
This will allow you to configure how the iSCSI target will be seen or reported on the network.

Now click the “**PORTALS**” tab.

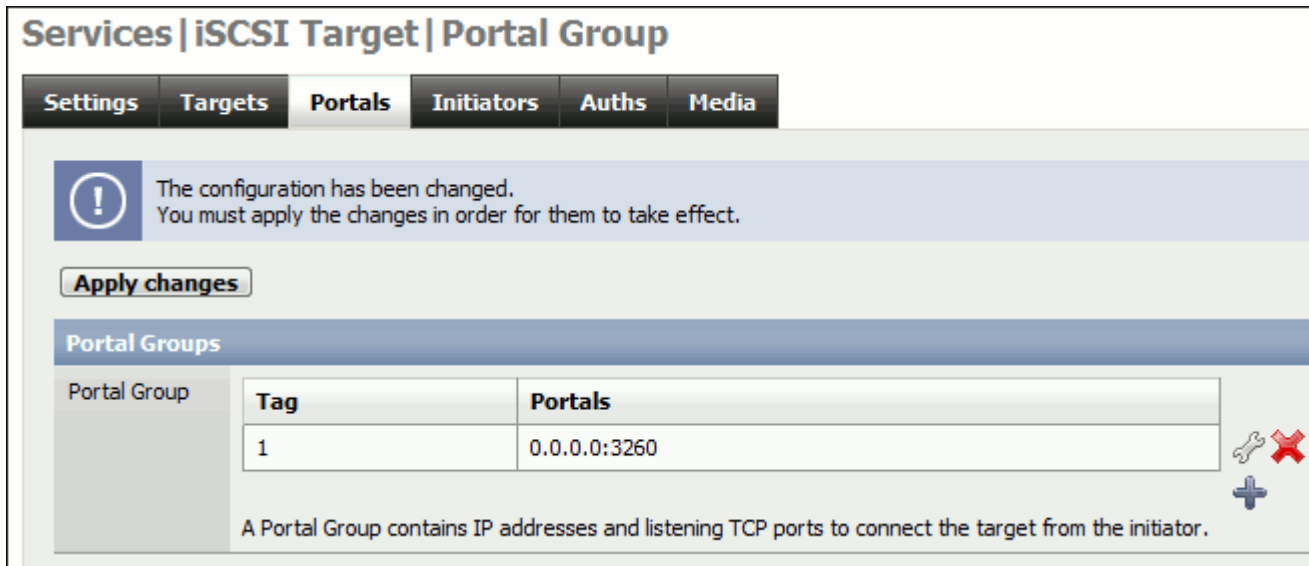


1 - Click the .

2 - For the benefit of this document I left it at its default which is to allow it to be accessed VIA any IP address that the NAS4Free server is configured with.



3 - Click the “**ADD**” Button.

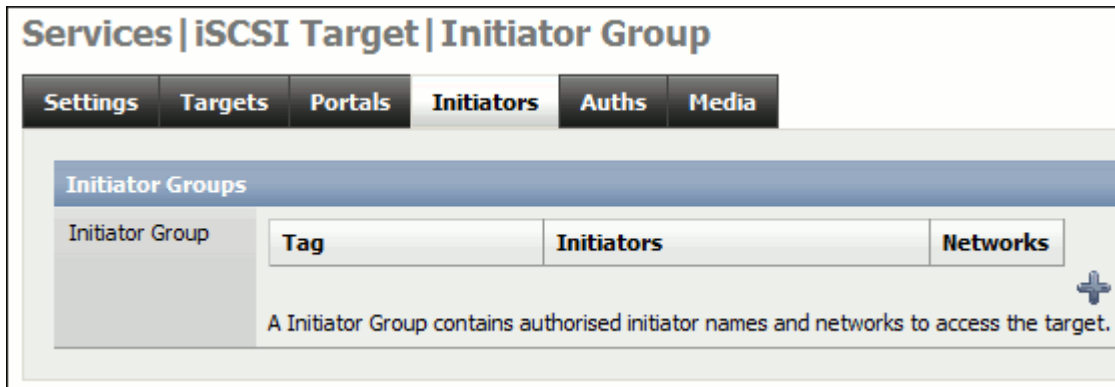


4 - Click the “**Apply Changes**” Button in the Portal Group Page.

Adding an Initiator

Initiators are systems that can access an iSCSI target (in this case the ZFS storage we created above) here you can specify which machines via IP can initiate a communication with the iSCSI target.

1 - Click on the “**Initiators**” Tab.



2 - Click the **+**.

Services | iSCSI Target | Initiator Group | Add

Settings | **Targets** | **Portals** | **Initiators** | **Auths** | **Media**

Tag number
Numeric identifier of the group.

Initiators
Initiator authorised to access to the iSCSI target. It takes a name or 'ALL' for any initiators.


Authorised network
Network authorised to access to the iSCSI target. It takes IP or CIDR addresses or 'ALL' for any IPs.

Comment
You may enter a description here for your reference.

3 - Here again I left all settings at their defaults and clicked the “**ADD**” Button. (Anything can access it).




Services | iSCSI Target | Initiator Group

Settings | **Targets** | **Portals** | **Initiators** | **Auths** | **Media**

 The configuration has been changed.
You must apply the changes in order for them to take effect.

Initiator Groups

Initiator Group	Tag	Initiators	Networks
	1	ALL	ALL

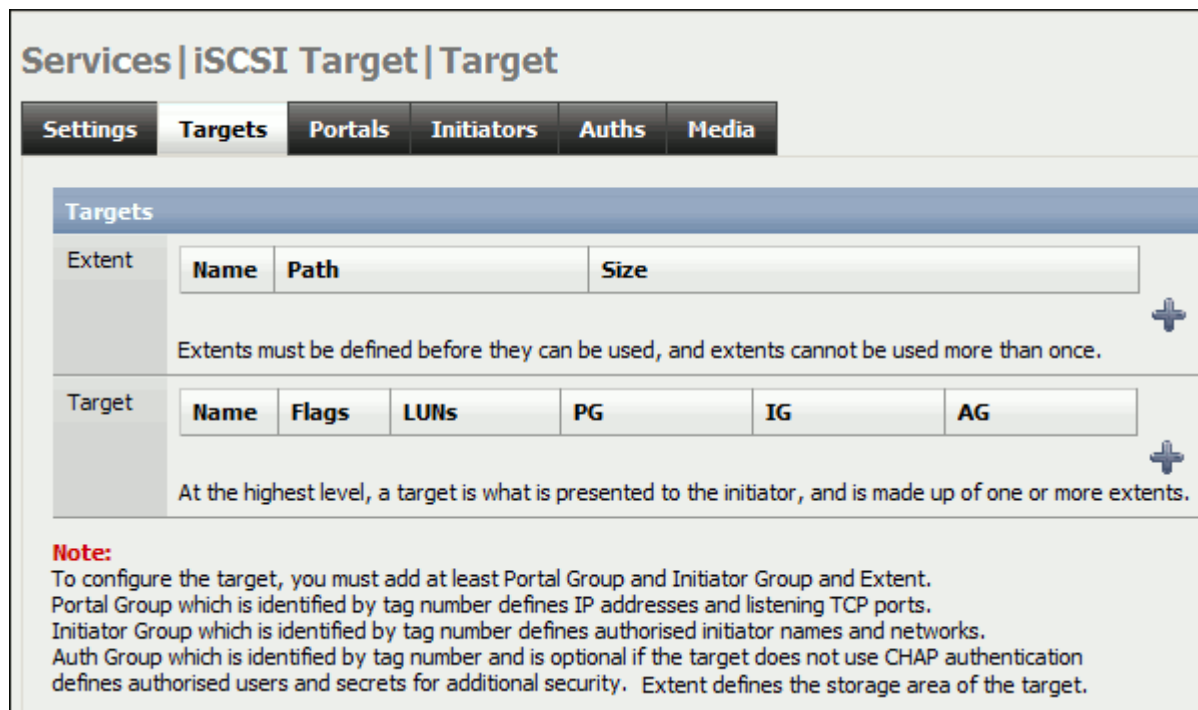
A Initiator Group contains authorised initiator names and networks to access the target.

4 - Click the “**Apply Changes**” Button.

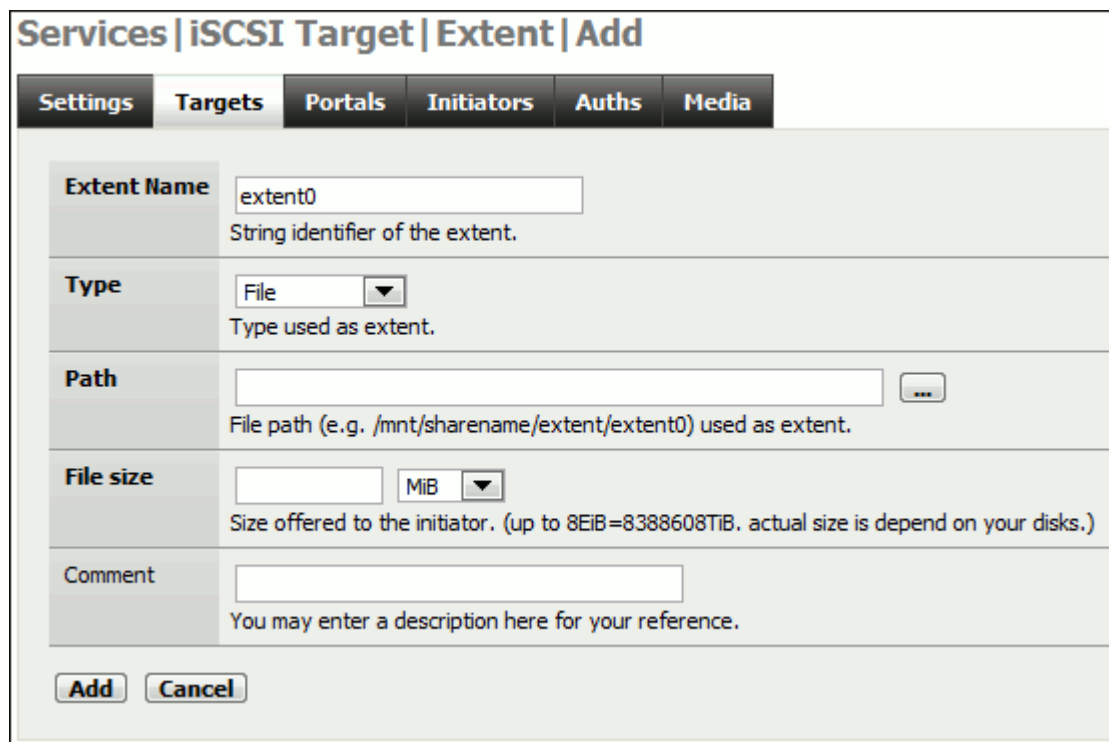
Create an Extent

To create an iSCSI Target you must create an Extent first.

1 - Go to the "Targets" Tab.




2 - Click the + for creating an Extent.

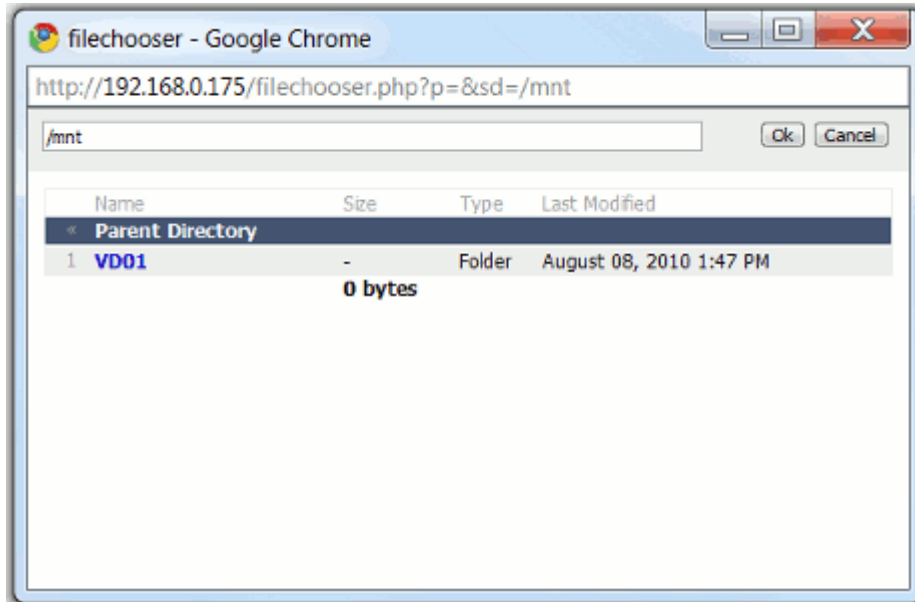


3 - Give the Extent a name I left mine as "extent0".

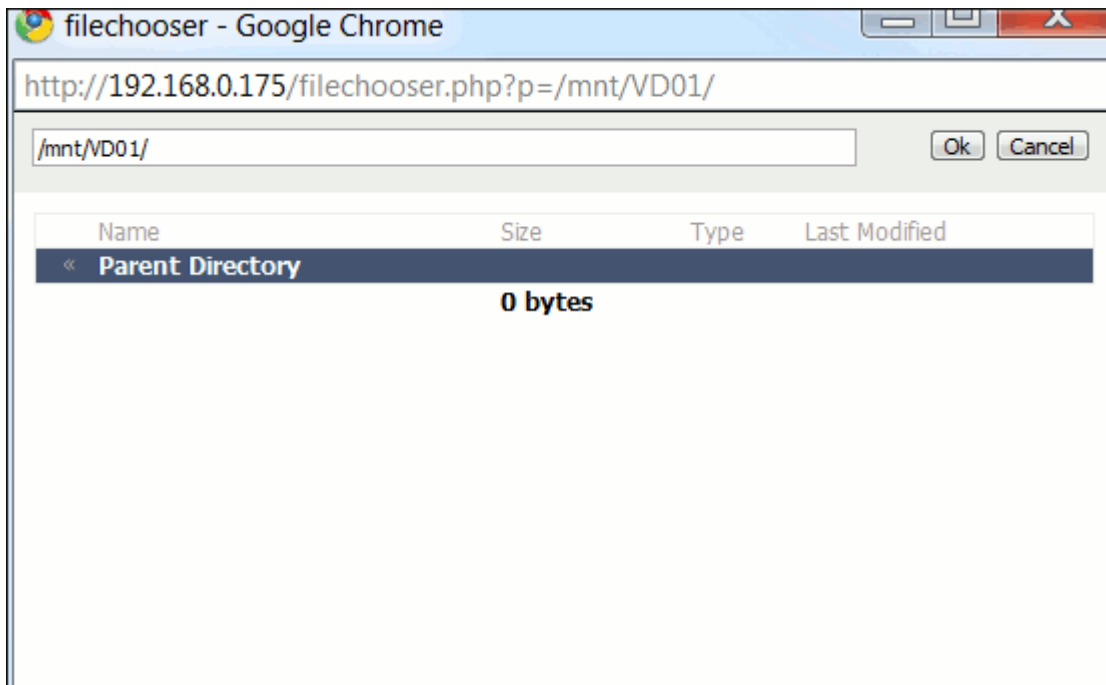
4 - In 0.7.2 of NAS4Free with ZFS the "TYPE", "ZFS Volume" option in the Drop-down Menu did not

work for me! SO KEEP IT AS "File".

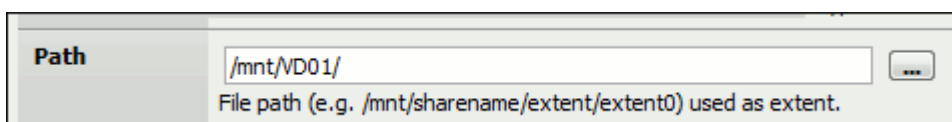
5 - Click on the  Button at the end of the Path text box. This will bring up a simple file system browser. Since we cannot use the ZFS volume, we have to point to the correct directory and create a file which will essentially be the drive you will be writing to.



6 - Earlier we created a device called VD01 which is presented here as a folder. Select VD01 or the name of your Virtual Device.

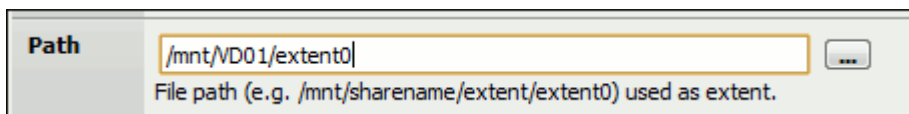


7 - This will change the path from /mnt/ to /mnt/VD01/ in the address bar at the top. Click the "OK" Button once you have selected the path.



This will appear in the Target Add page.

8 - Add to the path field "extent0"



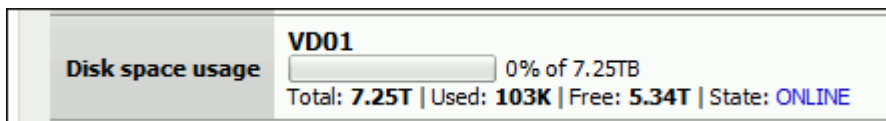
9 - File Size: Here is the big problem DO NOT USE AUTO it does not work with ZFS. You will get an:

Error: The changes could not be applied (error code 1).

message later on when trying to "Apply Changes" and in the logs (Top Pull Down Menu Diagnostics > Logs) you will get messages such as:

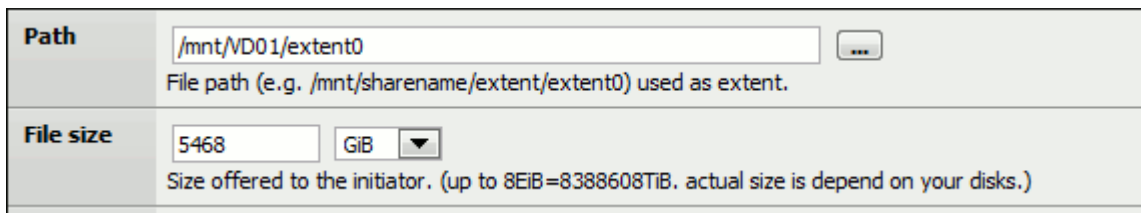
```
Apr 4 15:13:37 nas4free root: Failed to restart service iscsi_target
Apr 4 15:13:37 nas4free istgt[19293]: istgt.c:1618:main: ***ERROR***
istgt_lu_init() failed
Apr 4 15:13:37 nas4free istgt[19293]: istgt_lu.c:1863:istgt_lu_init:
***ERROR*** lu_add_unit() failed
Apr 4 15:13:37 nas4free istgt[19293]: istgt_lu.c:1604:istgt_lu_add_unit:
***ERROR*** LU1: LUN0: Auto size error (/mnt/VD01/extent0)
Apr 4 15:13:37 nas4free istgt[19293]: istgt version xxxxxxxxxxxx (xxxxxxxxx)
Apr 4 15:13:37 nas4free istgt[19165]: istgt version xxxxxxxxxxxx) exiting
```

You must put in an approximate size. So do you remember earlier, when I asked you to note down the free space in the Status System Page?



Here I have 5.34T which is 5.34 TB of free space, this is what we will present to the iSCSI Initiators as free space.

10- In "File Size" as it only accepts whole numbers and no Decimal points, enter the value as a whole number with the correct units attached. I cannot add 5.34TB so I added 5468GB (5.34 x 1024(number of GB in a TB), I might lose a tiny bit of space but for this document I will allow it.



11- Add a comment, then click the "Save" Button

12- Click "Apply Changes" on the **Services| iSCSI Target | Target** page.

Services | iSCSI Target | Target

Settings Targets Portals Initiators Auths Media

 The changes have been applied successfully.

Targets

Extent	Name	Path	Size
	extent0	/mnt/VD01/extent0	5468GIB

Extents musxtents cannot be used more than once.

Target	Name	Flags	LUNs	PG	IG	AG
--------	------	-------	------	----	----	----

At the highest level, a target is what is presented to the initiator, and is made up of one or more extents.

Note:
To configure the target, you must add at least Portal Group and Initiator Group and Extent. Portal Group which is identified by tag number defines IP addresses and listening TCP ports. Initiator Group which is identified by tag number defines authorised initiator names and networks. Auth Group which is identified by tag number and is optional if the target does not use CHAP authentication defines authorised users and secrets for additional security. Extent defines the storage area of the target.

Adding a Target

All that is left is to add a target.

Services | iSCSI Target | Target

Settings Targets Portals Initiators Auths Media

Targets

Extent	Name	Path	Size
--------	------	------	------

Extents must be defined before they can be used, and extents cannot be used more than once.

Target	Name	Flags	LUNs	PG	IG	AG
--------	------	-------	------	----	----	----

At the highest level, a target is what is presented to the initiator, and is made up of one or more extents.

Note:
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1. Click the  to add a target.

Services | iSCSI Target | Target | Add

Settings
Targets
Portals
Initiators
Auths
Media

iSCSI Target

Target Name	<input type="text" value="disk0"/> <small>Base Name will be appended automatically when starting without 'iqn.'</small>
Target Alias	<input type="text"/> <small>Optional user-friendly string of the target.</small>
Type	<input type="text" value="Disk"/> ▼ <small>Logical Unit Type mapped to LUN.</small>
Flags	<input type="text" value="Read/Write (rw)"/> ▼
Portal Group	<input type="text" value="Tag1"/> ▼ <small>The initiator can connect to the portals in specific Portal Group.</small>
Initiator Group	<input type="text" value="Tag1"/> ▼ <small>The initiator can access to the target via the portals by authorised initiator names and networks in specific Initiator Group.</small>
Comment	<input type="text"/> <small>You may enter a description here for your reference.</small>

LUN0

Storage	<input type="text" value="extent0 (/mnt/VD01/extent0)"/> ▼ <small>The storage area mapped to LUN0.</small>
----------------	--


Advanced settings

Auth Method	<input type="text" value="Auto"/> ▼ <small>The method can be accepted by the target. Auto means both none and authentication.</small>
Auth Group	<input type="text" value="None"/> ▼ <small>The initiator can access to the target with correct user and secret in specific Auth Group.</small>
Initial Digest	<input type="text" value="Auto"/> ▼ <small>The initial digest mode negotiated with the initiator.</small>
Queue Depth	<input type="text" value="0"/> <small>0=disabled, 1-255=enabled command queuing with specified depth. The recommended queue depth is 32.</small>
Inquiry Vendor	<input type="text"/> <small>You may specify as SCSI INQUIRY data. Empty as default. (up to 8 ASCII chars)</small>
Inquiry Product	<input type="text"/> <small>You may specify as SCSI INQUIRY data. Empty as default. (up to 16 ASCII chars)</small>
Inquiry Revision	<input type="text"/> <small>You may specify as SCSI INQUIRY data. Empty as default. (up to 4 ASCII chars)</small>
Inquiry Serial	<input type="text"/> <small>You may specify as SCSI INQUIRY data. Empty as default. (up to 16 ASCII chars)</small>
Logical Block Length	<input type="text" value="512B / block"/> ▼ <small>You may specify logical block length (512 by default). The recommended length for compatibility is 512</small>

1. Give it a Target Name if you want to, I called mime LUN0 or you can leave it as disk0.
2. Leave all settings at their defaults and click the “**ADD**” Button at the bottom.



Services | iSCSI Target | Target


- Settings
- Targets**
- Portals
- Initiators
- Auths
- Media

 The configuration has been changed. You must apply the changes in order for them to take effect.



Apply changes


Targets

Extent	Name	Path	Size	
	extent0	/mnt/VD01/extent0	5468GIB	 



Extents must be defined before they can be used, and extents cannot be used more than once.

Target	Name	Flags	LUNs	PG	IG	AG	
	iqn.2007-09.jp.ne.peach.istgt:LUN0	rw	LUN0=/mnt/VD01/extent0	1	1	none	 



At the highest level, a target is what is presented to the initiator, and is made up of one or more extents.

Note:
To configure the target, you must add at least Portal Group and Initiator Group and Extent.
Portal Group which is identified by tag number defines IP addresses and listening TCP ports.
Initiator Group which is identified by tag number defines authorised initiator names and networks.
Auth Group which is identified by tag number and is optional if the target does not use CHAP authentication defines authorised users and secrets for additional security. Extent defines the storage area of the target.

1. Click the “**Apply Changes**” Button.

That is it! All that is left is connecting to the iSCSI Target. There is a wealth of information on this, so I will leave you to Google that one.

Cheers again.

References

YouTube: [Preview of ZFS on FreeNAS 0.7 Server](#) : **Author** - learnfreenas (Gary Sims)

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