

Software RAID

If your hardware has enough ram to use ZFS, then you should be using ZFS, and not any other form of software or hardware RAID. Software and hardware RAID DO NOT provide the kind of robust data protection that ZFS redundancy and checksums provide. ZFS checksums are done at the block level and can detect and repair bitrot transparently. Software and hardware RAID DO NOT provide these block-level protections. Software and hardware RAID will ignorantly pass corrupted data to the system AND there is no mechanism for the system to respond with, "This data is corrupt. Please consult some other part of the RAID."

You can use software or hardware RAID if you want. But, you have been warned.

XigmaNAS supports Software JBOD, RAID 0, 1 and 5 configurations as well as Hardware RAID. This section describes configuring Software RAID 5. The process is virtually identical for all the others with the exception of using geom. Vinum (unstable).

Here is the FreeBSD module name and equivalent:

- JBOD: Geom concat
- RAID 0: Geom stripe
- RAID 1: Geom mirror
- RAID 5: Geom RAID5 (Thanks to Arne for developing this non-official FreeBSD module!!)

All disks must be the same size for all RAID types with the exception of JBOD and Geom RAID5 (it will be based on the smallest disk).

Important - RAID does not equal backup. Even if you create a RAID array you must still keep another copy of your data in a different location.

The XigmaNAS team recommends configuring each of the RAID Disks as standalone Storage Disks first to ensure they are fully functional and supported under XigmaNAS. Once confirmed, remove any of the mount points and Disks for the RAID drives to ensure a clean start. The following description assumes that the drives have been confirmed as functional.

The High-Level process flow for configuring a simple RAID array is:









1. Add Disks
2. Format Disks for "Software RAID"
3. Create the RAID array using the previously formatted for "Software RAID"
4. Format the newly created RAID array in UFS filesystem
5. Add Mount Point
6. Enable Services (CIFS, FTP, etc.)
7. For CIFS you have to create *share*.


To remove a RAID array, remove the mount point first and delete the RAID.

Add the Disks

Follow the Add Disk process as described above to add each of the Disks to be used in a RAID array. In the example below, I have added 4 identically sized hard drives.

Disks | Management

Management	S.M.A.R.T.	iSCSI Initiator						
Disk	Size	Description	Device model	Serial number	Standby time	File system	Status	
ada1	953870MB	Schijf 1	WDC WD10EADS-00L5B1	WD-WCAU4C611299	Always on	SoftRaid	ONLINE	 
ada2	953870MB	Schijf 2	WDC WD10EADS-00L5B1	WD-WCAU4C444927	Always on	SoftRaid	ONLINE	 
ada3	953870MB	Schijf 3	WDC WD10EADS-00L5B1	WD-WCAU4C444919	Always on	SoftRaid	ONLINE	 
ada4	953870MB	Schijf 4	WDC WD10EADS-00L5B1	WD-WCAU4C311324	Always on	SoftRaid	ONLINE	 



[Rescan disks](#)

Ensure the drives are in an ONLINE status.

You cannot use the 2nd partition of a XigmanAS boot drive as a part of a RAID array. Only whole disks can be used to form a RAID array.

Prepare (format) the disks

Open the *Disk:Format* TAB, select each of the Disks in turn and ensure the *File system* is changed to *Software RAID*, click the *Format Disk* button and confirm your action.

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!

Repeat for all Disks to be used in the RAID array.

The result should be for example:

```
Erasing MBR and all partitions:  
Creating one partition:  
***** Working on device /dev/ad1 *****  
Initializing partition:  
Destroying old GMIRROR information:  
Done!
```

Create the Software RAID array

Open the *Disks/Software RAID* page and choose your Software RAID type.

For our example, we select 'Geom RAID5':


Disks|Software RAID|RAID5|Management

JBOD RAID 0 RAID 1 **RAID 5** RAID 0/1/5

Management Tools Information

Volume Name	Type	Size	Status
+			

Info:
GEOM Raid5 is used to create RAID5 volumes.

Click the  icon on the right-hand side to Add a new RAID 5.

Enter a RAID name for the RAID.

Click and select each of the drives to be used in this RAID array.

Disks: RAID: Add

Raid name	<input type="text" value="BigDisk"/>
Type	RAID 5 (rotated block-interleaved parity)
Members of this volume	<input checked="" type="checkbox"/> ad1 (512000MB, VMware Virtual IDE Hard Drive/00000001) <input checked="" type="checkbox"/> ad2 (512000MB, VMware Virtual IDE Hard Drive/00000001) <input checked="" type="checkbox"/> ad3 (512000MB, VMware Virtual IDE Hard Drive/00000001)

Add


Drives will not appear here unless they have previously been formatted as Software RAID

Click the *Add* button and when prompted, click the Apply Changes button.

Disks: Geom Raid5: RAID

Geom Mirror Geom Concat Geom Stripe **Geom Raid5** Geom Vinum(unstable)

Manage RAID Tools Information

 The changes have been applied successfully.

Volume Name	Type	Size	Status
BigDisk	5	1000	REBUILDING

Note:
Optional configuration step: Configuring a virtual RAID disk using your [previously configured disk](#). Wait for the 'up' status before format and mount it!

Creating a RAID 5 array can take a long time:

But you can use your raid during the building process! (even if it's in 'REBUILDING state).

The status field will not immediately update.

Format the software RAID array

When the Status is up or rebuilding, then the RAID array must be formatted.

Open the *Disk:Format* menu and choose the newly created RAID array:

Disks: Format

Disk	BigDisk: (Software graid5 RAID 5) ▼
File system	UFS (GPT and Soft Updates) ▼
Minimum free space	5 ▼ 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

Leave the Type as UFS (GPT and Soft Update), click the Format Disk button and confirm.


A display similar to this should be output (example when the RAID 5 was in state 'rebuilding'):

Disk initialization details:

```
Erasing MBR and all partitions.
Destroying old GPT information:
Creating GPT partition:
/dev/raid5/BigDiskp1 added
Creating filesystem with 'Soft Updates':
/dev/raid5/BigDiskp1: 199.7MB (409020 sectors) block size 16384, fragment size 2048
    using 4 cylinder groups of 49.94MB, 3196 blks, 6400 inodes.
    with soft updates
super-block backups (for fsck -b #) at:
 160, 102432, 204704, 306976
Done!
```

(You should have lot's of more line as this example! On this example the drive was a small 200MB)

Create the mount point

Once the RAID array is formatted, all that is left is to mount the array. Open the Disk/Mount Point page and click the  icon on the right-hand side.

Disks: Mount Point: Add

Disk	BigDisk: (Software graid5 RAID 5) ▼
Partition	EFI GPT ▼ <small>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/graid5/gvinum for volume created with old FreeNAS release</small>
File system	UFS ▼
Share Name	big_share
Description	RAID 5 Share

Add

From the *Disk* drop-down, select the RAID disk. The *RAID name* you previously configured is visible.


Change the *Partition* to *EFI - GPT*

Enter a useful *Share name* and click the Add button.




The *Status* should display as *configuring*, and then click the *Apply Changes* button and the *Status* should update to *UP*.

Disks: Mount Point

Manage **Tools** **Fsck**

 The changes have been applied successfully.

Disk	Partition	File system	Share Name	Description	Status
/dev/raid5/BigDisk	p1	ufs	big_share	RAID 5 Share	OK

Your Geom RAID5 array is now ready for use. If you have already enabled CIFS, FTP or NFS, then the array, with the defined Share name, will be visible across your network.

Software RAID array status

You can verify the status of your RAID array from:

- *Status/Disks* page and select the *Information* Tab
- *Disks/Software RAID/geom used* page and select the *Information* Tab.

A healthy RAID array will show all the State: values as UP or COMPLETE.

RAID 1 and RAID 5 arrays may take some time to synchronize completely, be patient and monitor the status of the RAID synchronization by continuing to refresh the Information page.

Replacing a failed hard drive on a gmirror array

Note - Supplemental step by step instructions for removing / replacing failed drives in SoftRAID1 and SoftRAID 5 arrays are available in FAQs:

- [How do I remove / replace a disk in a SoftRAID1 array ?](#)
- [How do I remove / replace a disk in a SoftRAID5 array ?](#)

In the case of a failure on one hard drive, your RAID array is in the 'DEGRADED' state:

Here is an example with the RAID 1 array named "mirroire" in "DEGRADED" state with a missing hard drive:

Disks: Geom Mirror: RAID

Volume Name	Type	Size	Status
mirroire	1	102M	DEGRADED

And we can check that the disk is missing in the Disk/Management page:

Disks: Management

Disk	Size	Description	Standby time	File system	Status
ad0	102MB	VMware Virtual IDE Hard Drive/00000001	Always on	UFS	ONLINE
da0	102MB	VMware, VMware Virtual S 1.0	Always on	SoftRaid	ONLINE
da1	204MB	VMware, VMware Virtual S 1.0	Always on	SoftRaid	MISSING

We can see that in our example, the disk da1 is missing.

First Step

For replacing this disk: Stop XigmaNAS and replace this disk with a new one (in the same place on the ATA or SCSI channel). And restart XigmaNAS.

After restarting XigmaNAS, the Disk/Management should display it back (ONLINE if it's the same, or CHANGED if it's a different disk).

The Software RAID 1 status is still 'DEGRADED', we must add this new disk:

Second Step

Open the *Disk/Software RAID/Geom mirror/Tools* page and select your DEGRADED RAID array and action "forget" (The Disk field is not used on this first action).

Disks: Geom Mirror: Edit

Geom Mirror	Geom Concat	Geom Stripe	Geom Raid5	Geom Vinum(unstable)
Manage RAID	Tools	Information		
Volume Name	mirroire <input type="button" value="v"/>			
Disk	/dev/da0 <input type="button" value="v"/>			
Command	forget <input type="button" value="v"/>			
<input type="button" value="Send Command!"/>				

Third Step

Still on this *Disk/Software RAID/Geom mirror/Tools* page, re-select your DEGRADED RAID array, the select the newly replaced Disk, and choose action "insert":

Disks: Geom Mirror: Edit

Geom Mirror	Geom Concat	Geom Stripe	Geom Raid5	Geom Vinum(unstable)
Manage RAID	Tools	Information		
Volume Name	mirroire <input type="button" value="v"/>			
Disk	/dev/da1 <input type="button" value="v"/>			
Command	insert <input type="button" value="v"/>			
<input type="button" value="Send Command!"/>				

You can now check your RAID status (Disk/Software RAID/Geom mirror): It should be 'REBUILDING" or "COMPLETE" (the time needed for rebuilding depend of your disk size).

Disks: Geom Mirror: RAID

Geom Mirror	Geom Concat	Geom Stripe	Geom Raid5	Geom Vinum(unstable)
Manage RAID	Tools	Information		
Volume Name	Type	Size	Status	
mirroire	1	102M	COMPLETE	<input type="button" value="e"/> <input type="button" value="x"/> <input type="button" value="+"/>

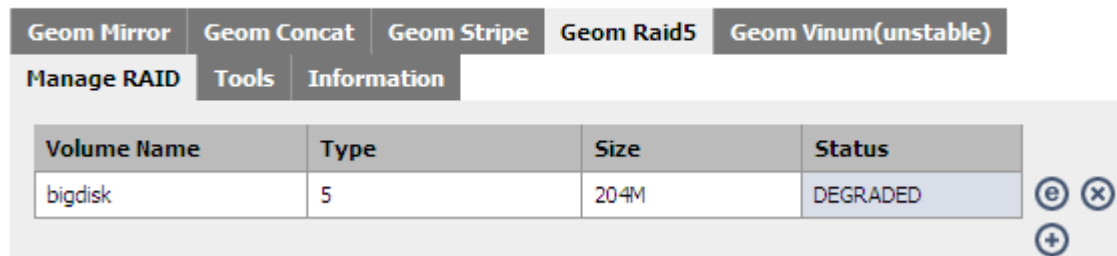
You should check the Disk/Mount Status too, as sometimes needs a remount.

Replacing a failed hard drive on a RAID5 array

In the case of a failure on one hard drive, your RAID array is in the 'DEGRADED' state.

Here is an example with the RAID 5 array "bigdisk" with a missing hard drive:

Disks: Geom Raid5: RAID



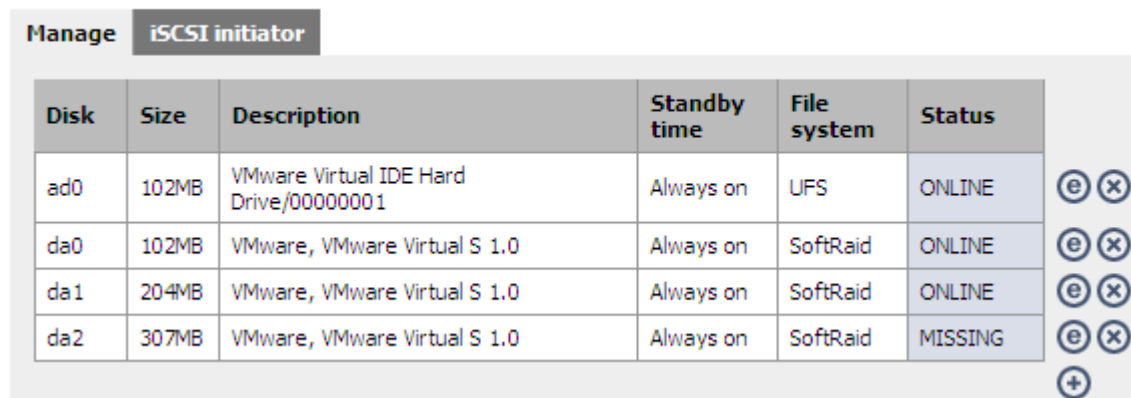
The screenshot shows a web interface for RAID management. At the top, there are tabs for 'Geom Mirror', 'Geom Concat', 'Geom Stripe', 'Geom Raid5', and 'Geom Vinum(unstable)'. Below these are sub-tabs for 'Manage RAID', 'Tools', and 'Information'. The main content is a table with the following data:

Volume Name	Type	Size	Status
bigdisk	5	204M	DEGRADED

On the right side of the table, there are three circular icons: a plus sign (+), a minus sign (-), and a refresh icon (e).

And the disk is missing:

Disks: Management



The screenshot shows a web interface for disk management. At the top, there are tabs for 'Manage' and 'iSCSI initiator'. The main content is a table with the following data:

Disk	Size	Description	Standby time	File system	Status
ad0	102MB	VMware Virtual IDE Hard Drive/00000001	Always on	UFS	ONLINE
da0	102MB	VMware, VMware Virtual S 1.0	Always on	SoftRaid	ONLINE
da1	204MB	VMware, VMware Virtual S 1.0	Always on	SoftRaid	ONLINE
da2	307MB	VMware, VMware Virtual S 1.0	Always on	SoftRaid	MISSING

On the right side of the table, there are three circular icons: a plus sign (+), a minus sign (-), and a refresh icon (e).

First Step

For replacing this disk: Stop XigmaNAS and replace this disk with a new one (in the same place on the ATA or SCSI channel). And restart XigmaNAS.

After restarting XigmaNAS, the Disk/Management should display it back (ONLINE if it's the same, or CHANGED if it's a different disk).

The Software RAID 5 status is still 'DEGRADED', we must add this new disk:

Second Step

Open the Disk/Software RAID/Geom Raid5/Tools page and select your DEGRADED RAID array, the replaced Disk name and action "insert".

Disks: Geom Raid5: Edit

Geom Mirror	Geom Concat	Geom Stripe	Geom Raid5	Geom Vinum(unstable)
Manage RAID	Tools	Information		
Volume Name	bigdisk ▼			
Disk	/dev/da2 ▼			
Command	insert ▼			
Send Command!				

You can now check your RAID status (Disk/Software RAID/Geom raid5): It should be 'REBUILDING" or "COMPLETE" (the time needed for rebuilding depends on your disk size).

Disks: Geom Raid5: RAID

Geom Mirror	Geom Concat	Geom Stripe	Geom Raid5	Geom Vinum(unstable)
Manage RAID	Tools	Information		
Volume Name	Type	Size	Status	
bigdisk	5	204M	COMPLETE	⊕ ⊗ ⊕

You should check the Disk/Mount Status too, as sometimes needs a remount.

Software RAID configuration with geom vinum

Geom Vinum is all in one module permits you to create a software RAID 0,1 and 5 arrays. But, for the moment the XigmaNAS team doesn't recommend you to use it because too many users have met with problems using the RAID 5 option of this tool.

Complex Software RAID combinations (RAID 1+0, 5+0, etc..)

XigmaNAS permits you to create advanced Software RAID combinations, for example:

- RAID 1+0: Permits you to create a RAID 0 array using RAID 1 arrays
- RAID 5+0: Permits you to create a RAID 0 array using RAID 5 arrays
- RAID X + Y: Permits you to create a RAID Y array using RAID X arrays

The High-Level process flow for configuring a complex RAID X + Y array is:

1. Add the Disks (4 disks minimum for a RAID 1+0, 6 disks for a RAID 5+0)
2. Format Disks for "Software RAID"
3. Create the RAID X arrays using the previously formatted for "Software RAID"
4. Format the newly created RAID X arrays for "Software RAID"
5. Create the RAID Y array using the previously RAID X arrays formatted for "Software RAID"

6. Add Mount Point
7. Enable Services (CIFS, FTP, etc.)

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