

Create a RAID 10 Array Using FreeNAS

Author: Date: Perry Whittle 25th February 2010

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UMENT

This document exprans now to create a RAID10 array using a FreeNAS Open source NAS\SAN box. This can be either a physical or virtual node. The example here utilises a VMWare ESX4i virtual machine. This array may then be presented over iSCSI transport to build a Windows 2003 or Windows 2008 cluster. For the purposes of this document the following apply

RAID	Redundant Array of Inexpensive Disks
OS	Operating System
Node	A host computer

1.1 AUDIENCE

The document is intended for engineers wishing to discover more about storage and RAID arrays. It is not expected that the reader is familiar with the FreeNAS OS or storage arrays but expects that FreeNAS is already installed and configured.

2 STORAGE ARRAY TYPES

RAID arrays are sets of redundant disks, hence the name RAID (Redundant Array of Inexpensive Disks). RAID comes in various forms which have expanded since the appearance of more intelligent disk controllers. Common arrays are;

RAID 0 striped

Data is striped across disks, no fault tolerance.

RAID 1 mirrored

Data on disk is mirrored to a second disk

RAID 4 Striping with parity

One disk is dedicated for the parity bits, data is striped data across the remaining disks in the array.

RAID 5 Striping with parity

Stripes data including the parity bits across all disks in the array (distributed parity)

RAID6 Striping with Parity (dual parity)

Extra parity redundancy over RAID5

RAID 0+1 Striping with mirror

Striped set which is then mirrored

RAID 1+0 Mirror with striping

Mirrored disks which are then striped



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Open the FreeNAS management page and go to Disk Management as shown below. We are going to be using the 4 disks 2GB in size.

reeNAS refree network attached storage	
ystem Network Disks	Services Access Status Diagnostics Advanced Help
Disks Management	Disk Add
Management S.M.A.R.T.	iSCSI Initiator
Disk	da3: 2048MB (VMware Virtual disk 1.0)
Description	da0: 2048/MB (VMware Virtual disk 1.0) da2: 40960/MB (VMware Virtual disk 1.0) da3: 2048/MB (VMware Virtual disk 1.0) da4: 2048/MB (VMware Virtual disk 1.0)
Transfer mode	da5: 2048MB (VMware Virtual disk 1.0) da6: 2048MB (VMware Virtual disk 1.0) acd0: NA (VMware Virtual IDE CDROM Drive/000000001) ves.
Hard disk standby time	Always on v Puts the hard disk into standby mode when the selected amount of time after the las
Advanced Power Management	Disabled This allows you to lower the power consumption of the drive, at the expense of perf
Acoustic level	Disabled 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	Unformated Unformated This allows you to set the file system for preformatted hard disks containing data. Le

Add each disk in turn and be sure to click the drop down list box % Reformatted file system+and select Software RAID+as the format type. Click % pply changes+

	manag	ement					
Manage	ment 5.	4.A.R.T. iSESI Initiator					
landge		in a second and a second					
	The config	uration has been changed.					
\odot	You must a	pply the changes in order for them to take	effect.				
App	ly changes	■ ←────					
-							
Dick	Gino	Description	Covial	Standbu	File	Status	
Disk	Size	Description	Serial number	Standby time	File system	Status	
Disk da1	Size 40960MB	Description VMware Virtual disk 1.0	Serial number n/a	Standby time	File system ZFS storage pool device	Status ONLINE	4 🗙
Disk da1 da3	Size 40960MB 2048MB	Description VMware Virtual disk 1.0 VMware Virtual disk 1.0	Serial number n/a n/a	Standby time Always on Always on	File system ZFS storage pool device SoftRaid	Status ONLINE Initializing	4 🗙 4 💥
Disk da1 da3 da4	Size 40960MB 2048MB 2048MB	Description VMware Virtual disk 1.0 VMware Virtual disk 1.0 VMware Virtual disk 1.0	Serial number n/a n/a n/a	Standby time Always on Always on Always on	File system ZFS storage pool device SoftRaid SoftRaid	Status ONLINE Initializing Initializing	+ ¥ + ¥ + ¥
Disk da1 da3 da4 da5	Size 40960MB 2048MB 2048MB 2048MB	Description VMware Virtual disk 1.0	Serial number n/a n/a n/a n/a	Standby time Always on Always on Always on Always on	File system ZFS storage pool device SoftRaid SoftRaid SoftRaid	Status ONLINE Initializing Initializing Initializing	4 × 4 × 4 ×



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ed, create the 2 RAID1 arrays (remember RAID10 triped). Shown below is the first RAID1 array, alize the array+ Click % pply changes+before continuing.

System Network Disks	Services Access	Status Diagnostic	s Advanced	Help
Disks Software RAI	D RAID1 Add RAID 5 RAID 0/1/5 mation			
Raid name	DataR1			
Туре	RAID 1 (mirroring)			
Balance algorithm	Round-robin read	e algorithm.		
Provider	da3 (2048MB, VMware da4 (2048MB, VMware da5 (2048MB, VMware da6 (2048MB, VMware	e Virtual disk 1.0) e Virtual disk 1.0) e Virtual disk 1.0) e Virtual disk 1.0)		
	Note: Ctrl-click (or com	mand-click on the Mac) to sel	ect multiple entries.	
Initialize	Create and initializ	e RAID. on the selected disks! Do no	t use this option if you	u want to add an already existing RAID again.
Add Cancel				

RAID1 arrays created! Both arrays should show the COMPLETE+status.

Managem	ient Tools Informa	tion			
Volume	Name	Туре	Size	Status	
DataR1		1	2048MB	COMPLETE	4 🎾
DataR2		1	2048MB	COMPLETE	d 2



Format them as Software RAID+as shown below.

System	Network	Disks	Services	Access	Status	Diagnostics	Advanced	Help
Disk	s Forma	t						
Di	sk		DataR	: 2048MB (Sc	ftware gmirro	r RAID 1) 💌		
Fil	e system	Software RAID						
Do	n't Erase MBR		Dor	n't erase the M	1BR (useful fo	r some RAID control	ler cards)	
F	ormat disk							
UFS	is the NATIVE file edictable results	e format for , file corrup!	FreeBSD (the ur tion, and loss of	iderlying OS c data!	f FreeNAS). A	Attempting to use ot	her file formats su	ch as FAT, FAT32, EXT2, EXT3, or NTFS can result in

Now go to **@**isks+then **%**oftware RAID+from the menu and select **%**AID0+as shown below. You will see the two RAID1 arrays previously created. Now we need to create a stripe across these arrays.

em Network C)isks Services	Access Stat	us Diagnostics	Advanced	Help
isks Software	e RAID RAID	0 Add			
BOD RAIDO RA	AID 1 RAID 5 R	AID 0/1/5			
Management Tools	5 Information				
Raid name	DataR	10			
Туре	RAID 0	(striping)			
Provider	DataR	1 (, Software gmirror R 2 (, Software gmirror R	AID 1)	_	
	Note: C	trl-click (or command-c	ick on the Mac) to select	multiple entries.	
Initialize	Cri This will	eate and initialize RAID erase ALL data on the	selected disks! Do not u	se this option if you	u want to add an already existing RAID agair



Now format your new array with the appropriate file system (UFS or ZFS). Add this as an iSCSI target and present to your cluster node!

System	Network	Disks	Services	Access	Status	Diagnostics	Advanced	Help
Disk	s Forma	t						
Dis	k		DataR	10: 4096MB (S	ioftware gstri	ipe RAID 0) 💌		
File	system		ZFS st	orage pool de	vice 💽			
Don	't Erase MBR		FAT32 EXT2	PT and Soft U	pdates)	or some RAID control	ler cards)	
Fo	ormat disk		Softwa ZFS sto	re RAID prage pool dev	rice			
Warr UFS is	ning: s the NATIVE file	e format for file corrup	FreeBSD (the u	nderlying OS o	of FreeNAS). /	Attempting to use ot	ner file formats su	ch as FAT, FAT32, EXT2, EXT3, or NTF5 can result in