

Best Practices

for

FlashNAS ZFS **Redundant NAS Systems**

Abstract:

These application notes offer a convenient step-by-step deployment guideline for making the most of the high availability and reliability delivered by Winchester Systems FlashNAS ZFS redundant NAS storage systems.

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FlashNAS ZFS Series

FlashNAS ZFS series systems deliver truly consolidated storage systems for application server and file server deployment. They are available in a wide variety of hardware configurations, including high availability active/active dual controllers for assured redundancy and fast failover. Power supplies are also redundant and energy-efficient. In all situations, FlashNAS ZFS products protect your data and continued ability to work and provide services to your customers. Additionally, controllers, power supplies, and cooling modules use a modular cable-free design that makes installation, maintenance, and upgrades simple and quick.

FlashNAS is enhanced by the ZFS file system, which has sophisticated data corruption prevention and healing capabilities built in. You gain access to features such as unlimited snapshot, remote replication, and pool mirror. Powerful computing components and up to 1.5 PB in storage via JBOD make FlashNAS ZFS series systems highly scalable and capable solutions for every enterprise and organization.

Active/Active Dual Redundant Controllers

Select FlashNAS ZFS series models provide active/active dual controller architecture instead of an active/standby design. Having both controllers remain active concurrently translates into twice the system performance and much better high availability protection with significantly more rapid failover. If one controller requires maintenance or otherwise stops working, its twin immediately takes over to ensure continuity. In an active/standby design, there is a much longer delay before the second controller kicks in.

User-Friendly and Detailed Interface

The comprehensive GUI helps customers manage FlashNAS ZFS systems with ease, providing clear information and intuitive management for all configurations.

Best practices for FlashNAS ZFS redundant NAS systems

System / Compon	ents / Peripheral De	vices Status				
the model name,	version information,	and profiles of hardware com	iponents.			
Device Informatio Model Name Software Ve	e: Flas	hNAS 3000				
Service ID:		7975				
Service ID.	040	1915				
CPU :						
Controller	CPU ID CPU 0	Manufacturer	Speed	Fam		
B	CPU 0	Intel(R) Corporation	3300MH 3300MH		(R) Core(TM) i3-2120 (R) Core(TM) i3-2120	
					(1) 000(111) 10 2 120	
Memory :						
Controller	м	emory ID	Туре	Location	1	Size
А	М	em O	DDR3	ChannelA	-DIMM0	8192MB
A	М	em 1	DDR3	ChannelA	A-DIMM1	8192MB
A	М	em 2	DDR3	ChannelE	B-DIMM0	8192MB
A	М	em 3	DDR3	ChannelE	B-DIMM1	8192MB
В	М	em O	DDR3	ChannelA	-DIMM0	8192MB
В	М	em 1	DDR3	ChannelA	-DIMM1	8192MB
В	М	em 2	DDR3	ChannelE	3-DIMM0	8192MB
В	М	em 3	DDR3	ChannelE	B-DIMM1	8192MB
Network						
Interface	IP Addres	s ry) 192.168.150.95		Subnet Mask 255.255.255.0		MAC Address 00:21:3a:11:84:27
Mgmt1	(B - Secon	idary) 192.168.150.96		255.255.255.0		00:21:3a:19:84:27
CH0	(A) 0.0.0.0 (B) 0.0.0.0			255.0.0.0 255.0.0.0		00:21:3a:51:84:27 00:21:3a:59:84:27
CH1	(A) 0.0.0.0 (B) 0.0.0.0			255.0.0.0 255.0.0.0		00:21:3a:61:84:27 00:21:3a:69:84:27
CH2	(A) 192.16	8.150.80		255.255.255.0		00:21:3a:71:84:27
	(B) 192.16 (A) 192.16			255.255.255.0 255.255.255.0		00:21:3a:79:84:27 00:21:3a:81:84:27
СНЗ	(B) 192.16			255.255.255.0		00:21:3a:89:84:27
pard						
rare Status Ir the usage of hardwa	re components: CPU, ne	twork bandwidth, internal memory	and disk drives.			
		СРИ		100%	Networ	
	✓ Contr		3%			work (A): 0% Network (B): 0.01%
	⊮ Contr	oller B		man	Controller B	
		Memory		100%	Disk	
	🖉 Contr	roller A Total (A): 93.0% OS (A			Controller A Disl	c (A): 16.0% Disk (B): 0.0%
		oller B			Controller B	and the hereit and the second
are Status]	WW. A	MA ATT ATT ATT AND AND AN ANTAS N
	services: number of cor	nnections, number of users, and th	e amount of transactions.	k.		
	a Contr	CIFS	Cife (R): 0 connection	100	NFS Controller A	A): 0 connections IV4 (A): 0 connections
	⊮ Contr ⊮ Contr		cons (b), o connections			A): 0 connections V4 (A): 0 connections B): 0 connections V4 (B): 0 connections
	Conti					
		NDMP		100	FTP	
	G Contr	oller A Revert (A): 0 MB Back				(A): 0 users FTP (B): 0 users
		Revert (B): 0 MB Backi				
	⊮ Contr	oller B			Controller B	
		oller B		100	Volume	9
	⊮ Contr	oller B		100	Volume	e (A): 0 KB Write (B): 0 KB

Deployment

For customers who need large capacity more than premium performance, we recommend deployment cases 1 and 2. Deployment case 3 has been designed for customers who place an emphasis on high speed performance over capacity. The flexibility of FlashNAS ZFS series solutions allows them to cater to nearly every scenario along these lines.

Deployment Case 1: 16 HDD Deployment with two pools



Figure 1: Intelligent Wizard Allocation

Follow the steps below to create a typical setup that uses all available drives in a redundant NAS configuration. For the purposes of this example, we use 16 NL-SAS 4TB HDDs to create two pools which are assigned to controller A and controller B, respectively. The **Intelligent Setup Wizard** helps us complete configuration with minimal effort. Choose RAID 6, and the wizard will group the HDDs into two pools automatically as shown. This configuration offers active/active controller redundancy and also leverages the computing power of both controllers to increase overall NAS performance.

Step 1:	enter and	confirm	your	password
---------	-----------	---------	------	----------

System	> System			
Network	System Settings			
Storage	Configure the device name, time	zone, and administrator password.		
Users	Host Name (Controller A)	FlashNAS_A		
	Host Name (Controller B)	FlashNAS_B		
Shares	Timezone	[GMT-05:00]Eastern/New York	v	
Summary	Password			
	Confirm Password	••••• I		
				Next

Step 2: click Next

Network	View the network interface status a	nd specify the IP address.			
Storage					
Users	Interface	IP Address	Netmask	Gateway	Link
Shares	Mgmt0 (Primary)	O DHCP	255.255.0.0		•
Shares	CH0 (Controller A)	• DHCP 0 10.0.0.3	255.255.255.0		•
Summary	CH1 (Controller A)	• DHCP 0 10.0.0.4	255.255.255.0		•
	CH2 (Controller A)	• DHCP 0 10.0.0.5	255.255.255.0		•
	CH3 (Controller A)	• DHCP 0 10.0.0.6	255.255.255.0		•
	Mgmt0 (Slave)	• DHCP 0 10.0.0.7	255.255.255.0		•
	CH0 (Controller B)	• DHCP 0 10.0.0.8	255.255.255.0		•
	CH1 (Controller B)	• DHCP 0 10.0.0.9	255.255.255.0		
	CH2 (Controller B)	• DHCP 0 10.0.0.10	255.255.255.0		
	CH3 (Controller B)	• DHCP 0 10.0.0.11	255.255.255.0		•
	CH2 (Controller B)	• DHCP 0 10.0.0.10	255.255.255.0		

Step 3: use default RAID 6 settings for pool 1

~	System		Storage
~	Network		Storage Pool (For Controller A)
	Storage 🕨	-	Enter the pool name and choose the data protection level.
	Users	1	Pool Name: [Pool-1
	Shares	1	Data Protection Level:
	Summary	1	RAID 1: Provides best protection. Your data will be mirrored.
			V RAID 6: Provides protection against two simultaneous drive failures.
			RAID 5: Provides protection against one drive failure.
			🔞 🔿 RAID 0: Provides no protection but offers maximum capacity.
			🔯 🔿 Configuring storage after system initialized.
			Number of Drives: 8
			Usable Capacity: 21.83 TB
			Back Next

Step 4: use default RAID 6 settings for pool 2

System	Storage
Vetwork	Storage Pool (For Controller B)
Storage	Enter the pool name and choose the data protection level.
Users	Pool Name (Pool-2
Shares	Data Protection Level:
Summary	RAID 1: Provides best protection. Your data will be mirrored.
	 RAID 6. Provides protection against two simultaneous drive failures. RAID 5. Provides protection against one drive failure. RAID 0. Provides no protection but offers maximum capacity. Configuring storage after system initialized.
	Number of Drives: 8
	Usable Capacity: 21.83 TB
	Back Next

Step 5: select Next in all following steps

Y System	Users New User			
Vetwork	Add user accounts. Create the home dire	ectory if necessary.		
V Storage	_			
Users 🕨	Name	Password	Confirm Password	Home Directory
Shares	guest	••••	•••••	
Summary				
Summary				
				Back
				Back

🥜 System	Shares Shared Folder		
Network			
Storage	Create folders to be shared and configure access rights.		
Vsers	Folder	Access Rights	
Shares >	EonShare	Full Control	O Read Only
snares 🕨		O Full Control	O Read Only
Summary		O Full Control	O Read Only

Step 6: You will see the 16 drives equally divided into two pools and assigned to their respective controllers

										-
Storage Pool					_			_	Welcome admin	😓 Logout 🔹 Link
Configuration	Pool									1
Storage	Virtual Store	ge Pools								
Pool			ols. Virtual storage pools al	low you to consolidate st	orage beyond the p	hysical limitations of indi-	idual disk drives. Pool capacity of	can be expanded wh	en necessary by addir	ng more drives without
		manage virtual storage po or repartitioning.	ols. Virtual storage pools al	low you to consolidate st	orage beyond the p	hysical limitations of indi-	idual disk drives. Pool capacity o	can be expanded wh	en necessary by addi	ng more drives without
Pool Volume Disk			ols. Virtual storage pools al Free Space	low you to consolidate st Utilization	orage beyond the p Status	hysical limitations of inde Media Scan	idual disk drives. Pool capacity o Deduplication Ratio		en necessary by addir signed Owner (Curr	
Pool Volume Disk SSD	reformatting	or repartitioning.							signed Owner (Curr	
Pool Volume Disk	reformating Name	or repartitioning. Used Space	Free Space	Utilization	Status	Media Scan	Deduplication Ratio	As	signed Owner (Curr	

Deployment case 2: 16 HDD deployment with one pool

In the event that customers prefer to create just one pool, the controllers are placed in active/standby mode. Although performance and failover are not as fast in this configuration as in deployment case 1, high availability is still offered with one controller backing up the other. The advantage of having one pool is more consolidated large storage capacity, as all drives are pooled together.



Figure 2: high capacity with high availability protection

Step 1: select Storage -> Pool -> Create

WINCHESTERSYSTEMS Purpose-Built Storage	2**					Alert	Shortcut	Explorer	di Home
Storage Pool		_					Welcom	e admin 🛛 🕹 Logout	📑 Links 🔻
Status Configuration Storage Pool Volume		nanage virtual storage po	ols. Virtual storage pools is without reformatting or i		e storage beyond ti	he physical limitations of indi	vidual disk drives. F	'ool capacity can be exp	? panded
Disk SSD SSD	Name	Used Space	Free Space	Utilization	Status	Media Scan	Assigned Own	ner (Current)	
 ↔ Folder ↔ Galaria ↔ Galaria ↔ Galaria ↔ Maintenance 			Create	Expand	Edit	Delete Details	Import	Export	Assign

Step 2: select 16 HDDs with RAID 6 to create pool 1 and assign it to controller A

eate Pool				
Select Pool Elements				
Pool Name				
Pool-1				
RAID Level				
RAID 6	~			
Owner	21			
Controller A	~			
Available Disk				
Disk List				Select All
Disk		Size		
Slot 1		3.63TB		~
Slot 2		3.63TB		
Slot 3		3.63TB		
Slot 4		3.63TB		
Slot 5		3.63TB		
Slot 6		3.63TB		
Slot 7		3.63TB		
Slot 8		3.63TB		
Slot 9		3.63TB		
Slot 10		3.63TB		
Slot 11		3.63TB		
			Next	Consul
			Next	Cancel

Step 3: click OK to finish creating pool 1

immary		
Pool Name : Pool-1		
Member Drives : 16 drives		
RAID Level : RAID 6		
Available Size : 50.94 TB		
ZIL : no drive		
L2ARC : no drive		
Spare Drives : no drive		

Step 4: view pool 1 configuration

Purpose-Built Storage							Alert	Shortcut	Explorer	Home
Storage Pool								Welcome	admin 👍 Logou	t 📑 Links
+ 🥥 Status ∋ 💮 Configuration ≘ 🔄 Storage	Pool Vitual Store	ge Pools	_	_	_	_		_		2
	Create and a	manage virtual storage po	ols. Virtual storage pools a	low you to consolidate st	ware beyond the n	hysical limitations of inde	idual disk drives. Pool capacity ca	n he expanded when nec	ressary by adding more d	thread the second
Pool	reformatting	or repartitioning.				Š			1992	arres monda
			Free Space 49.62TB	Utilization 0.00%	Status Online	Media Scan None	Deduplication Ratio		d Owner (Current)	arres monda

Deployment case 3: 12 HDD + four SSD deployment (two pools)



Figure 3: high performance deployment

This is a very high performance deployment scenario, leveraging SSDs via ZIL and L2ARC. This setup makes full use of the computing power, speed, and redundancy of the FlashNAS ZFS series dual controllers, and is the most desirable configuration whenever possible.

Step 1: select Storage -> Pool -> Create

WINCHESTERSYSTEMS Purpose-Built Storage	ur					Alert	Shortcut	Explorer	fi Home
Storage Pool		_					Welcome	admin 🛛 🕹 Logout	📑 Links 🔻
Status Configuration Storage Pool		nanage virtual storage po	ools. Virtual storage pools es without reformatting or		e storage beyond th	e physical limitations of indi	ividual disk drives. Pr	ool capacity can be ex	panded
Volume Disk SSD	Name	Used Space	Free Space	Utilization	Status	Media Scan	Assigned Own	er (Current)	
 ↔ Folder ↔ Folder ↔ Count ↔ Backup ↔ Maintenance 			Create	Expand	Edit	Delete Details	Import	Export	Assign

Pool Name		
Pool-1		
RAID Level		
RAID 5		
Owner		
Controller A		
Available Disk		
Disk List		🔲 Select /
Disk	Size	
Slot 1	3.63TB	
Slot 2	3.63TB	
Slot 3	3.63TB	
Slot 4	3.63TB	
Slot 5	3.63TB	
Slot 6	3.63TB	
Slot 7	3.63TB	
Slot 8	3.63TB	
Slot 9	3.63TB	
Slot 10	3.63TB	
Slot 11	3.63TB	

Step 2: select six HDDs with RAID 5 to create pool 1 and assign it to controller A

Step 3: select two SSDs using ZFS Intent Log (ZIL) with mirror to enhance data protection

Available Disk		
Disk	Size	
Slot 13	745.21GB	
Slot 14	745.21GB	
Slot 15	745.21GB	
Slot 16	745.21GB	

Step 4: select the same two SSDs as Second Level ARC (L2ARC) to enhance read performance

figure Second Level ARC (L2ARC)	
Available Disk	
Disk	Size
Slot 13	745.21GB
Slot 14	745.21GB
Slot 15	745.21GB
Slot 16	745.21GB

Step 5: click OK to finish creating pool 1

mmary		
Pool Name : Pool-1		
Member Drives : 6 drives		
RAID Level : RAID 5		
Available Size : 18.19 TB		
ZIL : 2 drives with data protection		
L2ARC : 2 drives		
Spare Drives : no drive		

Step 6: select Storage -> Pool -> Create

WINCHESTERSYSTEMS	5"								Jert	Shortcut		plorer	Home
Storage Pool										Welco	ome admin	b Logout	Link
± 🤪 Status	Pool												
± 💮 Configuration	Virtual Storag	ge Peols											
Storage	Create and n	manage virtual storage poo	is. Virtual storage pools allo	w you to consolidate stora	pe beyond the phy	sical limitations	of individual dis	k drives. Pool c	apacity can be exp	anded when nec	essary by addin	a more drives with	out :
		or repartitioning.											
Pool													
Pool Volume	Name	Used Space	Free Space	Utilization	Status	Media 1	ican	Deduplicat	ion Ratio	A51	signed Owner (C	(urrent)	
			Free Space 17.771B	Utilization 0.00%	Status Online	Media 1 None	ican	Deduplicat	ion Ratio	Asi A (A		Current)	
U Volume	Name	Used Space		100404		None		0%		A (A	N.		Assign
Volume Disk	Name	Used Space		100404			ican Expand		ion Ratio			Export	Assign
Volume Disk SSD Folder	Name	Used Space		100404		None		0%		A (A	N.		Assign
Volume Disk SSD Folder	Name	Used Space		100404		None		0%		A (A	N.		Assign

Step 7: select six HDDs with RAID 5 to create pool 2 and assign it to controller B

lect Pool Elements		
Pool Name		
Pool-2		
RAID Level		
RAID 5		
Owner		
Controller B		
Available Disk		
DiskList		📄 Select Al
Disk	Size	
Slot 7	3.63TB	
Slot 8	3.63TB	
Slot 9	3.63TB	
Slot 10	3.63TB	
Slot 11	3.63TB	
Slot 12	3.63TB	
Slot 15	745.21GB	
Slot 16	745.21GB	

Step 8: select two SSDs as ZFS Intent Log (ZIL) with mirror to enhance data protection

Available Disk		
Disk	Size	
Slot 15	745.21GB	
Slot 16	745.21GB	

Step 9: select the same two SSDs as Second Level ARC (L2ARC) to enhance read performance

figure Second Level ARC (L2ARC)		
Available Disk		
Disk	Size	
Slot 15	745.21GB	

Step 10: click OK to finish creating pool 2

Create Pool	×
Summary	
Pool Name : Pool-2	
Member Drives : 6 drives	
RAID Level : RAID 5	
Available Size : 18.19 TB	
ZIL : 2 drives with data protection	
L2ARC : 2 drives	
Spare Drives : no drive	
	Back OK Cancel

Step 11: check both pools to make sure they are assigned to their respective controllers

WINCHESTERSYSTEMS	5						Alert	Shortcut Explorer	Home
Storage Pool								Welcome admin 🛛 👆 Log	out 📑 Links 1
± 🤪 Status	Pool								2
± (⊙) Configuration ⊒ □] Storage	Virtual Storage Pools								
Pool		nanage virtual storage poo or repartitioning	is. Virtual storage pools allo	w you to consolidate store	age beyond the phys	ical limitations of individual	disk drives. Pool capacity can be en	panded when necessary by adding more driv	s without
Volume Disk	Name	Used Space	Free Space	Utilization	Status	Media Scan	Deduplication Ratio	Assigned Owner (Current)	
SSD SSD	Pool-1	08	17,77TB	0.00%	Online	None	0%	A (A)	
🗄 🥪 Folder	Pool-2	08	17.77TB	0.00%	Online	None	0%	B (B)	
 Backup Maintenance 					[Create Expand	Edit Delete	Details Import Expo	t Assign

Conclusion

This quick guide shows the ease with which redundant dual controller FlashNAS ZFS series systems can be setup in several very unique ways. Their adaptability means they can be effortlessly configured for high speed performance and maximum capacity utilization, all with high availability. You can use these typical configurations as excellent starting points for your own solution, and benefit from the advanced data protection and reliability they offer, especially with SSD employment of powerful ZIL and L2ARC to ensure better performance and tighter data integrity protection.

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