



Technical FAQ

FAS8000 Technical FAQ

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With Coverage of FAS8060 with IOXM

TABLE OF CONTENTS

1	FAS8000 Overview	7
	What is the FAS8000 series platform?	7
	What are the FAS8000 models by release date?	7
	What are some of the new features in the FAS8000 family?	7
	Will IBM be releasing an OEM version of the FAS8000 series platforms?	7
	What is the OS pricing model for the new FAS8000 models?	7
	Does the FAS8000 come with one free protocol?	8
	What are the new FAS8000 model transitions?	8
2	FAS8000 Controller and Chassis	8
	Which components make up the FAS8000?	8
	What is the rack unit for the FAS8000 components?	8
	Does the FAS8000 support an I/O expansion module?	8
	What are the FAS8000 model numbers?	8
	Which model string extensions denote HA?	8
	Are the FAS8000 controllers hot swappable?	8
3	FAS8000 HA and Standalone Configurations	9
	Which standalone and HA configurations are supported on the FAS8000?	9
	What is the naming convention for the FAS8000 configurations?	9
	Are dual-chassis HA configurations possible on the FAS8000 series?	9
	Is it possible to do a NDO conversion with MCC to use an IOXM on FAS8060 in Data ONTAP 8.3.1?	9
	Is MetroCluster available on the FAS8000 series?	9
	What is the rack unit for FAS8000 configurations?	9
	Which field upgrades are available with the FAS8000?	10
	What parts are required to add an IOXM to the FAS8060?	10
	Are there settings that tell a controller and chassis if they are standalone or HA when converting from A to AE configurations?	10
	Does hardware-assisted takeover work on the FAS8000?	10
	What is the NVRAM interconnect in FAS8000 series HA configurations?	10
	Is the NVRAM integrated on the motherboard or a slot-based adapter?	10
	Are there any single points of failure in the FAS8000?	11
	Is the FAS8000 series also available as V-Series systems?	11
	Why aren't there V8020, V8040, V8060, and V8080 EX models?	11
	Is a FlexCache version of the FAS8000 available?	11
	Is FlexCache software supported on the FAS8000?	11
	Does the FAS8000 support SnapLock?	11
4	FAS8000 System Features	12
	How much memory and NVRAM does the FAS8000 have?	12
	Does the FAS8000 use all of the memory and NVRAM?	12
	Which type of processors and how many processing cores does the FAS8000 have?	12
	How many of the FAS8060 and FAS8080 EX cores does Data ONTAP utilize?	12
	Which Data ONTAP release is required for the FAS8000?	12
	Which Data ONTAP build does the FAS8000 use?	12
	Which type of NVRAM does the FAS8000 have?	13
	What is the persistent write log feature on the FAS8000 NVRAM?	13
	How does NVRAM9 use its battery?	13

How many destages does the NVRAM9 battery support?.....	13
How long does it take for the FAS8000 NVRAM9 battery to charge?	13
Does the FAS8000 have an LCD display?	13
Can I make an LED blink on the FAS8000 to identify it in a data center?	13
Does the FAS8000 series support remote management?	13
What are some of the new service processor management features?	13
Is the SP connected to both the Ethernet and the serial console?	14
Is the SP an FRU like the RLM?	14
Is there a new command to administer the SP?	14
What are the recommended SP firmware levels?.....	14
What are the recommended BIOS levels on the FAS8000?.....	14
There is no NMI button on the FAS8000. How do I generate a core?	14
What are the system diagnostics in the FAS8000?	15
What is the boot medium in the FAS8000?	15
5 FAS8000 I/O	15
What are the recommended cluster interconnect ports for clustered Data ONTAP 8.2.x on the FAS8000?	15
What are the recommended cluster interconnect ports for clustered Data ONTAP 8.3.x on the FAS8000?	15
¹ FAS8080 requires X1117A-R6 in slot 12 to implement 6 cluster interconnects.	15
Why has the cluster interconnect recommendation increased to four on FAS8040, FAS8060, and FAS8080 EX?	16
What are the cluster interconnect recommendations for two node switchless cluster (TNSC) on FAS8040, FAS8060, and FAS8080 EX?	16
Does NetApp support using only two cluster interconnect ports on FAS8040, FAS8060, and FAS8080 EX?	16
How do I configure four cluster interconnect ports during initial setup on FAS8040, FAS8060, and FAS8080 EX?	16
How do I configure additional cluster interconnect ports after initial setup on FAS8040, FAS8060, and FAS8080 EX?	16
Where can I learn more about deciding how many cluster interconnect ports to use on FAS8040, FAS8060, and FAS8080 EX?	16
Which PCIe architecture does the FAS8000 use?.....	16
What onboard I/O ports and expansion slots does the FAS8000 have?	17
Which ports are used on the FAS8060AE and FAS8080AE EX to connect the NVRAMs together for synchronization?	17
What are the supported HA cables for FAS8060AE and FAS8080AE EX?	17
What are Unified Target Adapter 2 ports?	18
Does the FAS8000 have onboard UTA2 ports?	18
Does the FAS8000 support the X1143A-R6 UTA2 adapter?.....	18
What are the configuration rules for UTA2 ports?.....	18
What are the UTA2 port pairs?	18
Can UTA2 ports be set to the 16Gb FC or 10GbE personality in the field?.....	18
Can UTA2 ports set to the 10GbE personality be mixed with 10GbE ports in a VIF?	18
What causes frame length errors on UTA2 ports in tagged VLANs?	18
What are the supported SFP+ and copper cables with onboard and adapter-based UTA2 ports?	19
Which protocols are supported on UTA2 ports?	19
Can the UTA2 port personalities be set from maintenance mode?	19
Can the UTA2 ports be used for cluster interconnect with clustered Data ONTAP?	19
Are UTA2 ports configured when ordering FAS8000?.....	19
How does the X1143A-R6 ship when ordered as an add-on?.....	19

Can UTA2 ports be used in target or initiator mode when set to the FC personality?	19
Do the UTA2 ports autorange?	19
Do the onboard UTA2 ports provide fault tolerance?	19
Can UTA2 ports in the FC personality be used with DS14MK2/MK4 shelves or tape devices?	20
Are UTA2 ports supported with MetroCluster?	20
Do the onboard 10GbE ports support FC over Ethernet (FCoE)?	20
Can the onboard 10GbE ports be used with stateless offload in VIFs?	20
Do the onboard 10GbE ports provide fault tolerance?	20
Are there special 10GbE requirements for clustered Data ONTAP on the FAS8000?	20
Can all four onboard FAS8000 10GbE ports be used for host connectivity with 7-Mode?	20
Do the onboard FAS8000 10GbE or UTA2 ports autorange down to GbE?	20
What are the supported twinax copper cables for onboard 10GbE ports?	20
What are the supported twinax copper cables for onboard UTA2 ports set to the 10GbE personality?	21
What are the mode and reach for the onboard GbE and 10GbE ports?	21
Do the ports on the X1117A-R6 10GbE adapter require a special SFP+?	21
Which management interfaces does the FAS8000 have?	21
Do the e0M and SP ports support IPv6?	21
What is the SAS ACP port?	21
Is the external USB port supported?	21
6 FAS8000 Storage	22
What are the maximum SAS-based spindle counts and capacities supported on the FAS8000 series?	22
What are the maximum SSD counts supported on the FAS8000 series?	22
What are the supported Flash Cache™ and Flash Pool™ limits on the FAS8000 in Data ONTAP 8.2.x?	22
What are the supported Flash Cache and Flash Pool limits on the FAS8000 in Data ONTAP 8.3?	23
What are the maximum aggregate and volume sizes on the FAS8000 series?	23
What is the maximum number of volumes on the FAS8000?	23
Which X2065A-R6 SAS adapter versions are supported in FAS8000?	23
2) Why are older versions of X2065A-R6 not supported in FAS8000?	23
3) How can I tell which version of the X2065A-R6 is installed?	24
Which shelves and shelf modules are supported on the FAS8000 series?	24
Which hard disk drives (HDDs) are supported in the FAS8000?	24
Are all-SSD configurations supported in the FAS8000?	24
Are there special requirements for all-SSD configurations supported on the FAS8000?	24
What is the maximum shelf depth for stacks with SSDs?	24
Can all-SSD storage be used with MetroCluster deployments?	25
Can Flash Pool be used with MetroCluster deployments?	25
7 FAS8000 Chassis Power Supplies, Weight, and Thermals	25
What are the FAS8020 chassis dimensions?	25
What is the weight of supported FAS8020 configurations?	25
What are the FAS8040, FAS8060, and FAS8080 EX chassis dimensions?	25
What is the weight of supported FAS8040, FAS8060, and FAS8080 EX configurations?	26
What are the FAS8000 wattage and BTU ratings?	26
Does the FAS8000 support both 110V and 220V power?	26
What happens if a FAS8060 is connected to 110V power?	27
Are the FAS8000 power supplies assigned to a particular controller?	27
Which rail kit does the FAS8000 use for mounting in third-party cabinets?	27
How many fans does the FAS8000 chassis have?	27

Are the FAS8040, FAS8060, and FAS8080 EX fans assigned to a particular chassis bay?	27
How are the FAS8000 fan speeds set?	27
Which type of fan and power supply failures can the FAS8000 withstand?	27
How long will a FAS8000 run if a power supply or fan FRU is removed?.....	27
Can DC power still be ordered with FAS8000?	27
Is the FAS8000 Climate Savers compliant?	27
Is the FAS8000 Energy Star compliant, and at what level?	28
8 FRU List	29
Appendix	32
Chassis Reliability	32
ASIC Reliability.....	33
9 Revision History	34

LIST OF TABLES

Table 1) Supported FAS8000 configurations.	9
Table 2) System memory for HA configurations.....	12
Table 3) Processing cores for HA configurations.	12
Table 4) Recommended SP firmware levels by Data ONTAP release.	14
Table 5) Recommended BIOS levels by Data ONTAP release.	14
Table 6) Onboard I/O ports with Data ONTAP 8.2.x.	15
Table 7) Onboard I/O ports with Data ONTAP 8.3.x.	15
Table 8) Onboard I/O ports for HA pair.	17
Table 9) Supported HA cables on the FAS8060AE and FAS8080AE EX.....	17
Table 10) Supported UTA2 connectivity options.	19
Table 11) Onboard management interfaces.....	21
Table 12) Maximum spindle counts and capacities.....	22
Table 13) Flash Cache and Flash Pool limits on the FAS8000 in Data ONTAP 8.2.x.	22
Table 14) Flash Cache and Flash Pool limits on the FAS8000 in Data ONTAP 8.3.	23
Table 15) Maximum aggregate and volume sizes.....	23
Table 16) Supported shelves and shelf modules.	24
Table 17) FAS8020 physical chassis dimensions.	25
Table 18) FAS8020 weights.	25
Table 19) FAS8040, FAS8060, and FAS8080 EX physical chassis dimensions.	25
Table 20) FAS8040, FAS8060, and FAS8080 EX weights.	26
Table 21) FAS8000 wattage and BTU ratings.....	26
Table 22) FRU list.	29

LIST OF FIGURES

Figure 1) FAS8080 EX IOXM with two HA interconnect ports in lower-right corner.....	17
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1 FAS8000 Overview

The FAS8000 is the new enterprise family of NetApp® storage controllers. With this new offering, NetApp has collapsed the FAS/V3200 midrange and FAS/V6200 high-end platform families into a single enterprise storage family. This change allows NetApp to reduce the number of specific platform models and provides sales teams with a simpler process to pick the right solution for a particular customer's needs. Simply put, with fewer platform models, there are fewer factors to sort through, resulting in reduced sales cycles and faster sales orders.

FlexArray software further collapses previous midrange and high-end platform offerings by unifying FAS and V-Series into the same controller. In addition, V-Series functionality on the FAS8000 becomes a license-based feature instead of a separate piece of hardware.

The FAS8000 features a multiprocessor Intel® chipset and leverages high-performance memory modules, NVRAM to accelerate and optimize writes, and an I/O-tuned PCIe Gen 3 architecture that maximizes application throughput. Building on a decade of multicore optimization, the Data ONTAP® operating system drives the latest cores and increased core counts to keep up with continuous growth in storage demands. The result is a flexible, efficient I/O design capable of supporting large numbers of high-speed network connections and massive capacity scaling.

By delivering more onboard ports to support drive, cluster, and host connectivity, the FAS8000 offers exceptional flexibility and expandability in an extremely dense package. Integrated unified target adapter (UTA) ports support 16Gb Fibre Channel, 10GbE, or FCoE, so your storage is ready on day one for whatever choices the future holds.

What is the FAS8000 series platform?

Answer: The FAS8000 series is NetApp's next-generation enterprise platform family. With the FAS8000, NetApp consolidates the FAS/V3200 and FAS/V6200 into a single storage family called enterprise storage.

What are the FAS8000 models by release date?

Answer: The FAS8020, FAS8040, and FAS8060 launched in February 2014, and the FAS8080 EX launched in June 2014. The FAS8060 with IOXM was launched in January 2015.

What are some of the new features in the FAS8000 family?

Answer:

- FAS8020, FAS8040, and FAS8060 feature the Sandy Bridge chipset
- FAS8080 EX uses the Ivy Bridge chipset
- PCIe Gen 3 architecture
- High-speed DDR3L memory
- Onboard 16Gb FC or 10GbE unified target adapter ports
- V-Series functionality becomes license-based feature on FAS8000 family
- Increased virtual storage tier (VST) limits

Will IBM be releasing an OEM version of the FAS8000 series platforms?

Answer: IBM currently has no plans to incorporate FAS8000 into its portfolio.

What is the OS pricing model for the new FAS8000 models?

Answer: FAS8000 uses the OS pricing model in which Data ONTAP is shown as a line-item cost in addition to controller and storage costs. This approach makes it more clear to customers what they are paying for and aligns our list pricing with industry practices.

Does the FAS8000 come with one free protocol?

Answer: The first protocol is not included with the base system purchase for FAS8000 platforms. This change does not affect the FAS32xx and FAS62xx platforms.

What are the new FAS8000 model transitions?

Answer:

- FAS8020 replaces FAS/V3220.
- FAS8040 replaces FAS/V3250.
- FAS8060 replaces FAS/V6220.
- FAS8080 EX replaces FAS/V6250 and FAS/V6290.

2 FAS8000 Controller and Chassis

Which components make up the FAS8000?

Answer: The FAS8000 components are the controller module, chassis, power supplies, possibly SFP+ modules, and adapters supported in the controller. The FAS8080 EX also features an I/O expansion module (IOXM) for added I/O expandability, and the IOXM is an optional feature on FAS8060 with Data ONTAP 8.2.3 and Data ONTAP 8.3.1. Please note that the IOXM is not supported on FAS8060 in Data ONTAP 8.3.

What is the rack unit for the FAS8000 components?

Answer: The FAS8020 chassis is 3U high, and the FAS8040, FAS8060, and FAS8080 chassis are 6U high. The FAS8060AE and FAS8080AE EX with the IOXM are dual-chassis configurations and 12U high.

Does the FAS8000 support an I/O expansion module?

Answer: Yes. The IOXM is optional on FAS8060 and required on FAS8080 EX. The FAS8060 requires Data ONTAP 8.2.3 or Data ONTAP 8.3.1 in order to support the IOXM. The other FAS8000 models, with their increased mix of high-performance onboard ports and the flexibility offered by the new UTA2 ports, reduce the need for an IOXM to provide more slots.

What are the FAS8000 model numbers?

Answer: The FAS8000 comes in four models: the FAS8020, FAS8040, FAS8060, and FAS8080 EX.

Which model string extensions denote HA?

Answer:

- FAS8000 single-controller model strings are FAS8020, FAS8040, FAS8060, FAS8060E, and FAS8080E EX.
- FAS8000 dual-controller model strings are FAS8020A, FAS8040A, FAS8060A, FAS8060AE, and FAS8080AE EX.

Are the FAS8000 controllers hot swappable?

Answer: The FAS8000 controller is hot swappable and, it is important to note, does not require your turning off either power supply (PSU).

3 FAS8000 HA and Standalone Configurations

Which standalone and HA configurations are supported on the FAS8000?

Answer: Table 1 lists the configurations supported on the FAS8000.

Table 1) Supported FAS8000 configurations.

	FAS8020	FAS8040	FAS8060	FAS8080 EX
Single-chassis controller with blank	Yes			No
Single-chassis HA dual controllers	Yes			No
Single-chassis controller with IOXM	No		Yes ¹	
Dual-chassis controller with IOXM	No		Yes ¹	

¹ FAS8060 requires Data ONTAP 8.2.3 or Data ONTAP 8.3.1 to support IOXM

What is the naming convention for the FAS8000 configurations?

Answer: FAS8020, FAS8040, FAS8060, FAS8060E, and FAS8080E EX are known as single-chassis standalone configurations.

FAS8020A, FAS8040A, and FAS8060A are single-chassis HA configurations.

FAS8060AE and FAS8080AE EX are a dual-chassis HA configurations.

Are dual-chassis HA configurations possible on the FAS8000 series?

Answer: Yes, but dual-chassis HA configurations for FAS8020 and FAS8040 require using MetroCluster™ technology in 7-Mode with Data ONTAP 8.2.x or clustered Data ONTAP with Data ONTAP 8.3, including adding the FC-VI adapter in slot 1. In this configuration, NVRAM9 synchronization for the two controllers occurs through MetroCluster over the FC-VI adapter. The minimum requirement for support is to mirror the root aggregate across the two nodes. For more information on supported MetroCluster configurations, refer to the appropriate documentation.

The FAS8060AE and FAS8080AE EX does support dual-chassis HA and has ports on the IOXM to synchronize NVRAM.

Is it possible to do a NDO conversion with MCC to use an IOXM on FAS8060 in Data ONTAP 8.3.1?

Answer: Yes, you can add the IOXM to a four node FAS8060 MCC deployment. The procedure is to convert one site at a time by doing a negotiated switch-over (NSO). Once converted to include IOXM perform a switch-back (SB) and repeat to convert second site.

Is MetroCluster available on the FAS8000 series?

Answer: Yes. MetroCluster software is available on the FAS8000 series in several configuration options. MetroCluster can be used with all of the configurations covered in Table 1.

What is the rack unit for FAS8000 configurations?

Answer: FAS8020 chassis are 3U each. The FAS8040 and FAS8060 chassis are 6U each. The FAS8060E and FAS8080E EX standalone is 6U, and the FAS8060 AE and FAS8080AE EX are 12U.

Which field upgrades are available with the FAS8000?

Answer: All FAS8000 standalone controllers can have a second controller of the same model added to become HA. Starting with Data ONTAP 8.2.3 a FAS8060 can have an IOXM added to a single controller or a FAS8060A can be converted to a FAS8060AE by added a second chassis and two IOXMs.

What parts are required to add an IOXM to the FAS8060?

Answer: The table below shows the parts required for adding the IOXM to various FAS8060 configurations options.

Conversion	Description	Part Number	Quantity
FAS8060 to FAS8060E	IOXM	X80X0-EXP-R6	1
FAS8060A to FAS8060AE	IOXM	X80X0-EXP-R6	2
	Chassis	X6232-R6	1
	Bezel	X80083-R6	1
	Power supply	X763-R6	2
	Fan	X8537A-R6	6
	HA cables	X66201A-R6 or X66202A-R6 or X66210A-R6 or X66230A-R6	2

Are there settings that tell a controller and chassis if they are standalone or HA when converting from A to AE configurations?

Answer: Yes, there is a boot time variable named `psm-cc-config` and a Maintenance Mode variable named `ha-config`. The variables are automatically updated when a second controller is added to a chassis but need to be manually set when changing to a standalone or dual-chassis HA. For more information on this see [Adding a second chassis to an existing HA system in 7-Mode](#) or [Adding a second chassis to an existing HA system in cDOT](#) on the NetApp Support site (search for the document name in case the link is no longer active).

Does hardware-assisted takeover work on the FAS8000?

Answer: Yes. Hardware-assisted takeover on the FAS8000 uses the SP, and the hardware-assisted takeover functionality is similar to that of the SP in FAS2200, FAS/V3200, and FAS/V6200 controller families. There is more information about the SP in section 4.

What is the NVRAM interconnect in FAS8000 series HA configurations?

Answer: The FAS8000 NVRAM uses InfiniBand for the HA interconnect. In a single-chassis HA configuration, the HA interconnect runs over the backplane. Dual-chassis FAS8020 and FAS8040 HA require MetroCluster because there are no external ports for the NVRAM9. The FAS8060AE and FAS8080AE EX has two ports on the IOXM for HA interconnect between chassis.

Is the NVRAM integrated on the motherboard or a slot-based adapter?

Answer: The NVRAM9 is integrated on the motherboard and does not take a slot.

Are there any single points of failure in the FAS8000?

Answer: Although the chassis backplane is not fault tolerant, there are no active components on the backplane on which controllers rely to remain in a running state. This passive backplane is a highly reliable component that is very unlikely to cause an outage on a FAS8000 series system. Reliable passive backplanes are used in almost all modular storage systems with two controllers in a single chassis as well as network switches. Also, NetApp has been shipping systems and subsystems with shared backplanes for quite some time (DS14-class disk shelves, the FAS200 series, FAS2000, FAS3100, FAS/V3200, and some FAS/V6200 models) that demonstrate very high reliability of the chassis backplane.

Is the FAS8000 series also available as V-Series systems?

Answer: No. V-Series becomes a license-based feature on the FAS8000 family called FlexArray and no longer requires a separate model string.

Why aren't there V8020, V8040, V8060, and V8080 EX models?

Answer: V-Series becomes a license-based feature on the FAS8000 family called FlexArray and no longer requires a separate model string.

Is a FlexCache version of the FAS8000 available?

Answer: No. The FAS8000 does not offer a FlexCache® model.

Is FlexCache software supported on the FAS8000?

Answer: Yes. FlexCache software is supported on the FAS8000 and included in the base software.

Does the FAS8000 support SnapLock?

Answer: SnapLock® software is supported in Data ONTAP 8.1 and later and can be used on the FAS8000 at release.

4 FAS8000 System Features

How much memory and NVRAM does the FAS8000 have?

Answer: Table 2 shows system memory.

Table 2) System memory for HA configurations.

HA Pairs	Physical Memory	Total NVRAM
FAS8020A	48GB	8GB
FAS8040A	64GB	16GB
FAS8060A / AE	128GB	
FAS8080AE EX	256GB	32GB

Does the FAS8000 use all of the memory and NVRAM?

Answer: Yes. All FAS8000 models fully utilize the available memory and NVRAM starting with Data ONTAP 8.2.1 RC2, as does the FAS8080 EX with Data ONTAP 8.2.2 RC1.

Which type of processors and how many processing cores does the FAS8000 have?

Answer: Table 3 gives processing core information.

Table 3) Processing cores for HA configurations.

HA Pairs	Architecture	Processors	Processing Cores	Processor Speed	Processor Model
FAS8020A	Intel Sandy Bridge	2 x 64-bit hexa-core	12	2.0 GHz	E5-2620
FAS8040A		2 x 64-bit octo-core	16	2.1 GHz	E5-2658
FAS8060A / AE		4 x 64-bit octo-core	32	2.1 GHz	E5-2658
FAS8080AE EX	Intel Ivy Bridge	4 x 64-bit deca-core	40	2.8 GHz	E5-2680 v2

How many of the FAS8060 and FAS8080 EX cores does Data ONTAP utilize?

Answer: Data ONTAP CPU utilization on the FAS8060 reaches 1,560%, meaning that all 16 cores actively service the workload (100% equals one core). Data ONTAP also takes advantage of all 20 cores in the FAS8080 EX at launch.

Which Data ONTAP release is required for the FAS8000?

Answer: The FAS8020, FAS8040, and FAS8060 are supported starting in the Data ONTAP 8.2.1 RC2 release. The FAS8080 EX is supported in Data ONTAP 8.2.2 RC1. The FAS8060AE with IOXM is supported in Data ONTAP 8.2.3 and Data ONTAP 8.3.1.

Which Data ONTAP build does the FAS8000 use?

Answer: The FAS8000 uses the x86_64 build. This same build supports both AMD and the latest platforms based on Intel.

Which type of NVRAM does the FAS8000 have?

Answer: The FAS8000 NVRAM9 uses the same NVRAM8 architecture used on FAS/V6200, with the exception of its being integrated on the motherboard versus adapter based. NVRAM8 and NVRAM9 offer the same protection as their predecessors plus a new persistent write log capability that is outlined in the following questions.

What is the persistent write log feature on the FAS8000 NVRAM?

Answer: The persistent write log feature on the FAS8000 destages NVRAM contents to flash memory in the event of a dirty shutdown. Because the NVLOG contents are stored in flash memory, they are protected permanently regardless of how long the power outage lasts. During initial bootup after power is restored, the destaged NVLOG is replayed, enabling the file system contents to include any acknowledged writes since the last consistency checkpoint (CP) to disk.

How does NVRAM9 use its battery?

Answer: In the event of a dirty shutdown, NVRAM9 uses its battery to keep the NVLOG DIMMs refreshed while it destages their contents to flash memory. The operation takes about a minute, and afterward the NVRAM9 subsystem turns itself off.

How many destages does the NVRAM9 battery support?

Answer: A fully charged NVRAM9 battery can handle 50+ destage events.

How long does it take for the FAS8000 NVRAM9 battery to charge?

Answer: Given the NVRAM9 architecture, in which only a small amount of battery capacity is consumed during destaging and turning itself off after destaging, we don't expect the FAS8000 bootup to be interrupted waiting for the battery to reach sufficient charge before continuing the boot process. A completely discharged battery should reach sufficient charge to continue the boot process within an hour.

Does the FAS8000 have an LCD display?

Answer: No. The FAS8000 does not have an LCD display. However, LEDs are provided on the chassis front to help determine the state of the controller. Remote management has proven to be the primary source for monitoring system information versus LCDs. Also, with the SP, the state of LEDs can be determined remotely.

Can I make an LED blink on the FAS8000 to identify it in a data center?

Answer: From the SP you can use the command `sp identify led 60` to have the fault LED on the controller rear blink for 60 seconds or toggle it on or off with `sp identify led on` and `sp identify led off`.

Does the FAS8000 series support remote management?

Answer: The FAS8000 uses the service processor (SP) used on FAS2200, FAS/V3200, and FAS/V6200 systems. The SP has all the features of RLM and BMC along with new ones that improve RASM capabilities. The new features are covered in the next few questions.

What are some of the new service processor management features?

Answer: The SP performs FRU reporting and tracking, monitors and reports on internal sensors, reports on and can set LED states, and actively manages fan speed.

Besides the Ethernet management port interface (the external management port is shared by SP and e0M), the SP can also be accessed from the serial console by toggling with Ctrl-G. Use Ctrl-D to get back to the serial console.

Is the SP connected to both the Ethernet and the serial console?

Answer: The SP is always connected to the Ethernet and the serial console and can be accessed from either. If the SP is accessed over the Ethernet, you can toggle to the serial console with Ctrl-D. If logged into the serial console, you can toggle into the SP using Ctrl-G. To get back to the serial console, toggle with Ctrl-D.

Is the SP an FRU like the RLM?

Answer: No. The SP is integrated on the motherboard but runs its own kernel outside Data ONTAP and is always available.

Is there a new command to administer the SP?

Answer: Yes. Data ONTAP has added a new command to administer the SP. The new command is `sp`. The setup command also prompts for the TCP/IP information needed to use the SP using Ethernet.

What are the recommended SP firmware levels?

Answer: Table 4 lists the SP firmware levels, which depend on the Data ONTAP release used.

Table 4) Recommended SP firmware levels by Data ONTAP release.

	SP Firmware Level
Data ONTAP 8.2.1	3.0
Data ONTAP 8.2.2	3.0.1
Data ONTAP 8.2.3	3.0.2
Data ONTAP 8.3	3.1
Data ONTAP 8.3.1	3.1.1
Data ONTAP 8.3.2	3.1.2

What are the recommended BIOS levels on the FAS8000?

Answer: Table 5 lists the BIOS levels, which depend on the Data ONTAP release used.

Table 5) Recommended BIOS levels by Data ONTAP release.

	BIOS Level
Data ONTAP 8.2.1	9.0
Data ONTAP 8.2.2 Data ONTAP 8.3	9.1.1
Data ONTAP 8.2.3 Data ONTAP 8.3.1	9.3

There is no NMI button on the FAS8000. How do I generate a core?

Answer: The SP is required to generate a core file. After you are logged into the SP, run the command `system core`.

What are the system diagnostics in the FAS8000?

Answer: The FAS8000 uses system-level diagnostics, or SLDIAG, in place of the older SYSDIAG on most platforms. SLDIAG is accessed using maintenance mode during bootup. If sysdiag is entered at the loader prompt, the system will boot into maintenance mode.

What is the boot medium in the FAS8000?

Answer: The FAS8000 uses a USB flash in place of CompactFlash. The USB flash, which is an FRU item, offers the same reliability as CompactFlash.

The FAS2200, FAS/V3200, and FAS/V6200 also use a USB flash for boot media.

5 FAS8000 I/O

What are the recommended cluster interconnect ports for clustered Data ONTAP 8.2.x on the FAS8000?

Answer: Refer to Table 6 for cluster interconnect port requirements and recommendations. Running clustered Data ONTAP on the FAS8000 requires using two of the onboard 10GbE ports.

Table 6) Onboard I/O ports with Data ONTAP 8.2.x.

Model	Required / Default	Two node switchless cluster (TNSC)	Recommended Switched	Maximum Switched
FAS8020	e0a, e0b			
FAS8040 FAS8060	e0a, e0c		e0a, e0b, e0c, e0d	e0a, e0b, e0c, e0d
FAS8080 EX	e0a, e0c		e0a, e0b, e0c, e0d	e0a, e0b, e0c, e0d e12a, e12b ¹

¹ FAS8080 requires X1117A-R6 in slot 12 to implement 6 cluster interconnects.

What are the recommended cluster interconnect ports for clustered Data ONTAP 8.3.x on the FAS8000?

Answer: Refer to Table 7 for cluster interconnect port requirements and recommendations. Running clustered Data ONTAP on the FAS8000 requires using two of the onboard 10GbE ports.

Table 7) Onboard I/O ports with Data ONTAP 8.3.x.

Model	Required	Recommended / Default Switched / TNSC	Maximum Switched / TNSC
FAS8020	e0a, e0b		
FAS8040 FAS8060	e0a, e0c	e0a, e0b, e0c, e0d	e0a, e0b, e0c, e0d
FAS8080 EX	e0a, e0c	e0a, e0b, e0c, e0d	e0a, e0b, e0c, e0d e12a, e12b ¹

¹ FAS8080 requires X1117A-R6 in slot 12 to implement 6 cluster interconnects.

Why has the cluster interconnect recommendation increased to four on FAS8040, FAS8060, and FAS8080 EX?

Answer: In Data ONTAP 8.2.1, performance improvements were implemented for large sequential remote reads, and reaching peak performance requires more than two cluster interconnects on FAS8040, FAS8060, and FAS8080 EX. NetApp expects additional performance tuning that will increase performance for other workloads. Deploying FAS8040, FAS8060, and FAS8080 EX with four cluster interconnects helps enable future-ready deployments to take advantage of potential performance increases.

What are the cluster interconnect recommendations for two node switchless cluster (TNSC) on FAS8040, FAS8060, and FAS8080 EX?

Answer: With Data ONTAP 8.2.x NetApp supports two cluster interconnects with TNSC. Starting in Data ONTAP 8.3.0 and later NetApp recommends using four cluster interconnects with TNSC.

Does NetApp support using only two cluster interconnect ports on FAS8040, FAS8060, and FAS8080 EX?

Answer: Yes. Even though we recommend using four cluster interconnects on FAS8040, FAS8060, and FAS8080 EX, using only two cluster interconnects is still supported.

How do I configure four cluster interconnect ports during initial setup on FAS8040, FAS8060, and FAS8080 EX?

Answer: During initial setup in the clustered Data ONTAP wizard, enter all four onboard 10GbE port names (e0a, e0b, e0c, e0d). Data ONTAP automatically assigns IP addresses to the ports using this approach.

Remember to also account for additional cables to connect the extra two cluster interconnect ports.

How do I configure additional cluster interconnect ports after initial setup on FAS8040, FAS8060, and FAS8080 EX?

Answer: If LIFs already exist on the ports, they first need to be migrated to other 10GbE ports. The next steps are modifying the role and MTU size for the new cluster interconnect ports with the command `net port modify local -port e0b,e0d -role cluster -mtu 9000`, followed by creating the interface with the `net int create` command. Using this approach, you also need to enter the various TCP/IP settings, including address and netmask.

Where can I learn more about deciding how many cluster interconnect ports to use on FAS8040, FAS8060, and FAS8080 EX?

Answer: See the [FAS8000 SE Presentation](#) for a guided decision tree process on using the correct number of cluster interconnects.

Which PCIe architecture does the FAS8000 use?

Answer: The FAS8000 uses the PCIe Gen 3 architecture for motherboard connectivity to onboard ports and slots.

What onboard I/O ports and expansion slots does the FAS8000 have?

Answer: The FAS8000 onboard ports are shown in Table 8.

Table 8) Onboard I/O ports for HA pair.

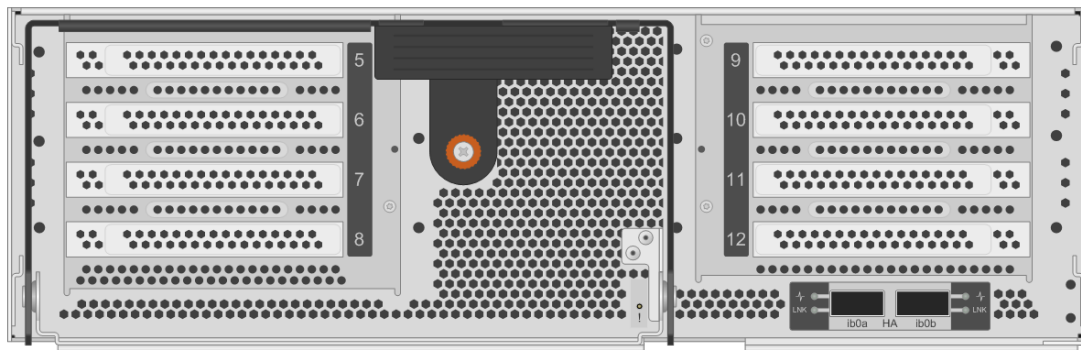
Active-Active	10GbE	16Gb FC ¹	GbE	6Gb SAS	Slots
FAS8020A	4–8	0–4	4	4	4
FAS8040A FAS8060A	8–16	0–8	8	8	8
FAS8060AE	8–16	0–8	8	8	24
FAS8080AE EX	8–16	0–8	8	8	24

¹16Gb FC is the Unified Target Adapter 2 (UTA2) port and can be configured as 16Gb FC or 10GbE.

Which ports are used on the FAS8060AE and FAS8080AE EX to connect the NVRAMs together for synchronization?

Answer: There are two InfiniBand ports, ib0a and ib0b, on the lower-right corner of the IOXM, as shown in Figure 1.

Figure 1) FAS8060E and FAS8080 EX IOXM with two HA interconnect ports in lower-right corner.



What are the supported HA cables for FAS8060AE and FAS8080AE EX?

Answer: Table 9 shows the supported HA cables on the FAS8060AE and FAS8080AE EX.

Table 9) Supported HA cables on the FAS8060AE and FAS8080AE EX.

	Description	Part Number
Copper	R7,CBL,56G,QSFP-QSFP,CU,100 OHM,1.0M	X66201A-R6
	R7,CBL,56G,QSFP-QSFP,CU,100 OHM,2.0M	X66202A-R6
Optical	R7,CBL,SAS,QSFP-QSFP,ACTIVE,OPT,5M	X66210A-R6
	R7,CBL,SAS,QSFP-QSFP,ACTIVE,OPT,30M	X66230A-R6

What are Unified Target Adapter 2 ports?

Answer: Unified Target Adapter 2 (UTA2) ports can be configured as 16Gb FC or 10GbE and, in the case of 10GbE, support FCoE, iSCSI, NFS, and CIFS. The previous generation of UTA ports supported only the 10GbE personality. With the addition of FC capabilities, UTA2 becomes the second generation of NetApp UTA ports.

Does the FAS8000 have onboard UTA2 ports?

Answer: Yes. The FAS8000 has onboard UTA2 ports. The FAS8020 has two UTA2 ports per controller, while the FAS8040, FAS8060, and FAS8080 EX have four onboard UTA2 ports per controller.

Does the FAS8000 support the X1143A-R6 UTA2 adapter?

Answer: Yes. All FAS8000 models support the X1143A-R6 UTA2 adapter.

What are the configuration rules for UTA2 ports?

Answer: UTA2 ports are based on dual-port ASICs, and both ports have to be set to either 16Gb FC or 10GbE. Both ports on the X1143A-R6 share the same ASIC and have to be set to the same type: 10GbE or 16Gb FC.

When UTA2 ports are set to the FC personality, individual ports on the ASIC can be set to either target or initiator mode.

What are the UTA2 port pairs?

Answer: UTA2 port pairs on the FAS8020 are e0c/0c and e0d/0d. Port pairs on the FAS8040, FAS8060, and FAS8080 EX are first pair e0e/e0 and e0f/0f and second pair e0g/0g and e0h/0h. Both ports on the X1143A-R6 are considered port pairs, and additional X1143A-R6 adapters in other slots are their own port pair.

Can UTA2 ports be set to the 16Gb FC or 10GbE personality in the field?

Answer: Yes. The UTA2 port personality can be changed in the field using the `ucadmin` command.

See the [FAS8000 SE Presentation](#) for more details on configuring UTA2 ports in the field, including using the `ucadmin` command.

Can UTA2 ports set to the 10GbE personality be mixed with 10GbE ports in a VIF?

Answer: Yes. Both ports can be mixed in the same 10GbE VIF.

What causes frame length errors on UTA2 ports in tagged VLANs?

Answer: This is an issue in the UTA2 ASIC and only affects CGMP, STP, DDP, and SNA protocols. Other more common UTA2 protocols like NFS, CIFS, iSCSI, and FCoE use Ethernet II frame formatting and are not affected by this issue. For more information see the FAS8000 SE Presentation.

What are the supported SFP+ and copper cables with onboard and adapter-based UTA2 ports?

Answer: See Table 10 for supported UTA2 connectivity options.

Table 10) Supported UTA2 connectivity options.

	Onboard UTA2 Ports		X1143A Adapter-Based UTA2 Ports	
	16Gb FC	10GbE	16Gb FC	10GbE
SFP+	X6596-R6	X6599A-R6	X6602A-R6	X6600-R6
Twinax	Cisco® twinax copper cables			

Which protocols are supported on UTA2 ports?

Answer: The onboard and adapter-based UTA2 ports support FC and, when set to the 10GbE personality, FCoE, iSCSI, NFS, and CIFS.

Can the UTA2 port personalities be set from maintenance mode?

Answer: Yes. You can set the port personalities in maintenance mode.

Can the UTA2 ports be used for cluster interconnect with clustered Data ONTAP?

Answer: No. The UTA2 ports are not supported for the cluster interconnect.

Are UTA2 ports configured when ordering FAS8000?

Answer: Yes. When quoting FAS8000 systems, you will be asked for onboard and adapter-based UTA2 port personality and, in the case of Ethernet, if you need SFP+ or twinax copper cables. Manufacturing will then set the port personality and will insert the correct SFP+.

How does the X1143A-R6 ship when ordered as an add-on?

Answer: When ordered as an add-on, the X1143A-R6 will ship as FC target without SFP+. You need to order the SFP+ and cabling and set the personality using the `ucadmin` command.

Can UTA2 ports be used in target or initiator mode when set to the FC personality?

Answer: Yes. Onboard and adapter-based UTA2 ports can be configured as target or initiator.

Do the UTA2 ports autorange?

Answer: UTA2 ports set to FC personality ports autorange across 16/8/4Gb/sec speeds but do not work with 1Gb or 2Gb speeds. UTA2 ports set to the 10GbE personality will not autorange down to GbE speeds, however.

Do the onboard UTA2 ports provide fault tolerance?

Answer: The FAS8020 has a single ASIC for onboard UTA2 ports, and fault tolerance across ASICs requires adding the X1143A-R6. The FAS8040, FAS8060, and FAS8080 EX have two UTA2 ASICs, and port pairs are e0e/0e and e0f/0f sharing an ASIC, while port pairs e0g/0g and e0h/0h share the second ASIC.

Can UTA2 ports in the FC personality be used with DS14MK2/MK4 shelves or tape devices?

Answer: UTA2 ports are not supported with older DS14 FC shelves. To connect to DS14 shelves or for a more flexible option with FC tape, order X1132A-R6 or X2054A-R6.

Direct connection to tape drives with UTA2 ports are supported on HP, Quantum, and Tandberg tape devices. IBM tape devices requires a FC switch between the UTA2 port and tape drive.

Are UTA2 ports supported with MetroCluster?

Answer: Yes. UTA2 ports are supported for backend storage with fabric and stretch MetroCluster technology and with ATTO bridges in PtP mode.

Do the onboard 10GbE ports support FC over Ethernet (FCoE)?

Answer: No. Onboard 10GbE ports do not work for FCoE types of uses.

Can the onboard 10GbE ports be used with stateless offload in VIFs?

Answer: Yes. The onboard 10GbE ports can be used with stateless offload in VIFs, with a couple of conditions. First, all of the VIF links must be 10GbE, because mixed physical link speeds in the same VIF will not work. Second, all ports in the 10GbE VIF need to support stateless offload. Otherwise, stateless offload must be supported for all the 10GbE ports in the VIF, or the onboard 10GbE ports will be automatically disabled.

Do the onboard 10GbE ports provide fault tolerance?

Answer: The FAS8020 has a single ASIC for onboard 10GbE ports, and fault tolerance across ASICs requires adding an adapter. The FAS8040, FAS8060, and FAS8080 EX have two 10GbE ASICs, and port pairs are e0a and e0b sharing an ASIC, while port pairs e0c and e0d share the second ASIC.

Are there special 10GbE requirements for clustered Data ONTAP on the FAS8000?

Answer: See Table 8 for required and recommended cluster interconnect ports.

Can all four onboard FAS8000 10GbE ports be used for host connectivity with 7-Mode?

Answer: Yes. You can use all onboard 10GbE ports for data access when using Data ONTAP in 7-Mode.

Do the onboard FAS8000 10GbE or UTA2 ports autorange down to GbE?

Answer: No. The onboard 10GbE ports run only at 10Gb speeds and do not autorange to GbE or slower.

What are the supported twinax copper cables for onboard 10GbE ports?

Answer: The following Cisco twinax copper cables can also be used for onboard 10GbE and UTA ports set to the 10GbE personality:

- X-SFP-H10GB-CU1M-R6: cable, Cisco, twinax 10GbE copper SFP+ 1m
- X-SFP-H10GB-CU3M-R6: cable, Cisco, twinax 10GbE copper SFP+ 3m
- X-SFP-H10GB-CU5M-R6: cable, Cisco, twinax 10GbE copper SFP+ 5m
- X6566-05-R6: cable, twinax copper SFP+ 10G - 0.5m
- X6566-2-R6: cable, twinax copper SFP+ 10G - 2m
- X6566-3-R6: Cable, twinax copper SFP+ 10G - 3m
- X6566-5-R6: cable, twinax copper SFP+ 10G - 5m

What are the supported twinax copper cables for onboard UTA2 ports set to the 10GbE personality?

Answer: Cisco branded twinax cables are supported for onboard UTA2 ports set to the 10GbE personality at launch on Data ONTAP 8.2.1. NetApp branded twinax cables are not supported for onboard UTA2 ports set to 10GbE at launch, but support is planned in Data ONTAP 8.2.2, with Quote Tool availability to be determined later.

What are the mode and reach for the onboard GbE and 10GbE ports?

Answer: The onboard GbE and 10GbE ports are short-reach multimode ports.

Do the ports on the X1117A-R6 10GbE adapter require a special SFP+?

Answer: Yes. The X1117A-R6 10GbE ports require a special SFP+ that is not interchangeable with other SFP+ modules. The required SFP+ is model X6569-R6.

Which management interfaces does the FAS8000 have?

Answer: See Table 11 for FAS8000 management interfaces.

Table 11) Onboard management interfaces.

Active-Active	Serial Console	Management SP/e0M (Wrench)	Private Management SAS ACP (Wrench with Lock)
All models	2	2 x GbE (e0M) 2 x 10/100Mb SP ¹	2 x 10/100

¹ SP port links to external switch at GbE speed, but internal path is limited to 10/100Mb.

Do the e0M and SP ports support IPv6?

Answer: Yes. Both e0M and SP support IPv6.

What is the SAS ACP port?

Answer: The private management provides out-of-band management to the SAS DS2246 and DS4243 shelves. For more information on the ACP port, review the [Storage Subsystem Technical FAQ](#).

Is the external USB port supported?

Answer: No. The external USB port is not used at this time. There are plans to use it in the future for recoverability purposes.

6 FAS8000 Storage

What are the maximum SAS-based spindle counts and capacities supported on the FAS8000 series?

Answer: Table 12 shows maximum spindle counts and capacities.

Table 12) Maximum spindle counts and capacities.

Standalone and HA	Maximum Spindles	Maximum Capacity (Based on 8TB Disks)
FAS8020	480	3840TB
FAS8040	720	5760TB
FAS8060	1,200	9600TB
FAS8080 EX	1,440	11520TB

What are the maximum SSD counts supported on the FAS8000 series?

Answer: FAS8000 models support up to 240 100GB, 200GB, 400GB, 800GB, 1.6TB, and 3.84TB SSDs.

What are the supported Flash Cache™ and Flash Pool™ limits on the FAS8000 in Data ONTAP 8.2.x?

Answer: Table 13 shows these limits.

Table 13) Flash Cache and Flash Pool limits on the FAS8000 in Data ONTAP 8.2.x.

Platform	Flash Cache per Controller	Flash Cache per HA Pair	Flash Pool per Controller	Combined per Controller
FAS8020	1.5TB	3TB	6TB	6TB
FAS8040	2TB	4TB	12TB	12TB
FAS8060	4TB	8TB	18TB	18TB
FAS8080 EX	8TB	16TB	36TB	36TB

What are the supported Flash Cache and Flash Pool limits on the FAS8000 in Data ONTAP 8.3?

Answer: Table 14 shows these limits.

Table 14) Flash Cache and Flash Pool limits on the FAS8000 in Data ONTAP 8.3.

Platform	Flash Cache per Controller	Flash Cache per HA Pair	Flash Pool per Controller	Combined per Controller
FAS8020	1.5TB	3TB	24TB	24TB
FAS8040	2TB	4TB	48TB	48TB
FAS8060	4TB	8TB	72TB	72TB
FAS8080 EX	12TB	24TB	144TB	144TB

What are the maximum aggregate and volume sizes on the FAS8000 series?

Answer: Table 15 shows the maximum aggregate and volume sizes.

Table 15) Maximum aggregate and volume sizes.

	Maximum Aggregate Size 8.2.1 RC2	Maximum Aggregate Size 8.2.1 GA	Maximum Aggregate Size 8.2.2 +	Maximum Volume Size	Minimum Root Volume
FAS8020	150TB	324TB		70TB	8.2.x: 250GB 8.3.x: 350GB
FAS8040	180TB	324TB		100TB	
FAS8060	324TB	400TB			
FAS8080 EX	N/A		400TB		

What is the maximum number of volumes on the FAS8000?

Answer: Clustered Data ONTAP 8.2 supports up to 1,000 volumes. Data ONTAP 8.2 7-Mode supports 500 volumes, as do all previous Data ONTAP releases.

Which X2065A-R6 SAS adapter versions are supported in FAS8000?

Answer: X2065A-R6 adapter versions 111-00341+D1 and later are supported in FAS8000 systems.

X2065A-R6 adapter versions 111-00341+A0 through 111-00341+D0 are not supported in FAS8000s.

2) Why are older versions of X2065A-R6 not supported in FAS8000?

Answer: Older SAS X2065A-R6 adapters have firmware compatibility issues with the PCI Gen3 architecture in FAS8000s. These adapters increase the likelihood of seeing PCI errors and in some cases can cause a panic from uncorrectable PCI errors.

3) How can I tell which version of the X2065A-R6 is installed?

Answer: If you've recently upgraded to a FAS8000 and migrated a X2065A-R6 SAS adapter to the FAS8000, verify in sysconfig –a output from the controller ASUP information that the version of X2065A-R6 SAS HBA is 111-00341 is version +D1 and higher (example follows in blue).

```
slot 1: SAS Host Adapter 1a (PMC-Sierra PM8001 rev. C, SAS, <UP>)  
      MFG Part Number:    USI 6086-000010-00 rev. MP V4.1  
      Part number:        111-00341+D1  
      Serial number:      ST078A6D05E  
      Date Code:          20100613  
      Firmware rev: 01.11.07.00
```

FAS8000 with older SAS X2065A-R6 versions 111-00341+Ax through 111-00341+D0 should be replaced with newer SAS HBAs.

Which shelves and shelf modules are supported on the FAS8000 series?

Answer: Table 16 shows the supported shelves and shelf modules.

Table 16) Supported shelves and shelf modules.

Shelf	Shelf Module
DS2246	IOM6
DS4243	IOM3
DS4246	IOM6
DS4486	IOM6
DS14mk4 ^{1 2}	ESH4
DS14mk2-AT ²	AT-FCX

¹ Data ONTAP 8.2.x supports 15K FC disks that are 144GB in size and larger, 10K FC disks that are 300GB in size and larger, and SATA disks that are 500GB and larger. FC disks 72GB and smaller are not supported in Data ONTAP 8.2.x.

² Use of DS14 shelves requires the X2054A-R6 FC adapter as the FC initiator.

Which hard disk drives (HDDs) are supported in the FAS8000?

Answer: Any disk supported in the shelves listed in Table 12 in Data ONTAP 8.1.x and Data ONTAP 8.2.x is supported on the FAS8000 series. Review the Table 12 footnotes for information on supported disks and shelf changes with Data ONTAP 8.2.

Are all-SSD configurations supported in the FAS8000?

Answer: Yes. All-SSD configurations are supported on the FAS8000 at launch.

Are there special requirements for all-SSD configurations supported on the FAS8000?

Answer: Yes. All-SSD configurations on a FAS8000 require 200GB and larger SSDs.

What is the maximum shelf depth for stacks with SSDs?

Answer: The maximum shelf depth for stacks containing SSDs is four. This applies to pure SSD stacks and Flash Pool stacks with SSD and HDD disks.

Can all-SSD storage be used with MetroCluster deployments?

Answer: See [MetroCluster Frequently Asked Questions](#) for the latest on MetroCluster SSD support.

Can Flash Pool be used with MetroCluster deployments?

Answer: See the [Flash Pool Technical FAQ](#) for the latest on Flash Pool support with MetroCluster.

7 FAS8000 Chassis Power Supplies, Weight, and Thermals

What are the FAS8020 chassis dimensions?

Answer: Table 17 shows the chassis dimensions.

Table 17) FAS8020 physical chassis dimensions.

	Metric	English
Height	3U	
Height (measured)	13.0 cm	5.12"
Width	44.7 cm	17.6"
Chassis depth	60.75 cm	23.92"
Cable management	6.55 cm	2.58"

What is the weight of supported FAS8020 configurations?

Answer: Table 18 lists supported weights.

Table 18) FAS8020 weights.

	Metric	English
Chassis with single controller	28.6 kg	63.05 lbs
Chassis with two controllers	33.6 kg	74.08 lbs

What are the FAS8040, FAS8060, and FAS8080 EX chassis dimensions?

Answer: Table 19 shows the chassis dimensions.

Table 19) FAS8040, FAS8060, and FAS8080 EX physical chassis dimensions.

	Metric	English
Height	6U	
Height (measured)	25.9 cm	10.2"
Width	44.7 cm	17.6"
Chassis depth	61.7 cm	24.3"
Cable management	11.68 cm	4.6"

What is the weight of supported FAS8040, FAS8060, and FAS8080 EX configurations?

Answer: Table 20 lists supported weights with PC cards installed.

Table 20) FAS8040, FAS8060, and FAS8080 EX weights.

		Metric	English
FAS8040	Chassis with single controller	45.8 kg	100.97 lbs
	Chassis with two controllers	54.2 kg	119.49 lbs
FAS8060	Chassis with single controller	46.3 kg	102.07 lbs
	Chassis with single controller and IOXM	52.2 kg	115.08 lbs
	Chassis with two controllers	55.1 kg	121.47 lbs
FAS8080 EX	Chassis with single controller and IOXM	52.2 kg	115.08 lbs

What are the FAS8000 wattage and BTU ratings?

Answer: Table 21 shows the wattage and BTU ratings.

Table 21) FAS8000 wattage and BTU ratings.

	100V Wattage Typical Wattage	100V Wattage Worst Case	200V Wattage Typical Wattage	200V Wattage Worst Case
FAS8020 standalone	278 W 948 BTU	384 W 1,309 BTU	276 W 941 BTU	374 W 1,275 BTU
FAS8020A	444 W 1,514 BTU	596 W 2,032 BTU	432 W 1473 BTU	583 W 1,988 BTU
FAS8040 standalone	335 W 1,142 BTU	442 W 1,507 BTU	334 W 1,139 BTU	434 W 1,480 BTU
FAS8040A	605 W 2,063 BTU	876 W 2,987 BTU	596 W 2,032 BTU	855 W 2,916 BTU
FAS8060 standalone (includes with IOXM)	400 W 1,364 BTU	507 W 1,729 BTU	397 W 1,354 BTU	502 W 1,708 BTU
FAS8060A*	---	---	752 W 2,564 BTU	1007 W 2,564 BTU
FAS8080E EX standalone	856 W 2,921 BTU	981 W 3,348 BTU	844 W 2,880 BTU	953 W 3,252 BTU
FAS8080AE EX	1,727 W 5,842 BTU	1,962 W 6,696 BTU	1,688 W 5,760 BTU	1,906 W 6,504 BTU

*The FAS8060A requires 220V, and the bottom controller will not power up if 110V is detected.

Does the FAS8000 support both 110V and 220V power?

Answer: Yes. Both voltage levels are supported on the FAS8000, with the exception that the FAS8060A does not support 110V in single-chassis HA configurations.

What happens if a FAS8060 is connected to 110V power?

Answer: The FAS8060 can run on 110V power with a standalone controller in the chassis with or without an IOXM. If a second FAS8060 controller is added to a chassis connected to a 110V chassis, the bottom controller will not power up. If a FAS8060A is rebooted, the top controller boots normally, while the bottom controller remains powered off.

Are the FAS8000 power supplies assigned to a particular controller?

Answer: No. The two power supplies are assigned to the FAS8000 chassis.

Which rail kit does the FAS8000 use for mounting in third-party cabinets?

Answer: At launch the FAS8000 uses the X5526A-R6 rail kit for mounting in third-party cabinets. Later the default mounting kit will become the X5529A-R6 swift rail kit.

How many fans does the FAS8000 chassis have?

Answer: There are three fans in the FAS8020 chassis and six fans in the FAS8040 and FAS8060 chassis.

Are the FAS8040, FAS8060, and FAS8080 EX fans assigned to a particular chassis bay?

Answer: Yes, the top three fans provide cooling to the top bay (A), and the bottom three fans provide it to the bottom bay (B).

How are the FAS8000 fan speeds set?

Answer: The SP on each controller sets the fan speed based on temperatures on the controller. In the case of an SP malfunction, the processor complex sets the fan speed.

Which type of fan and power supply failures can the FAS8000 withstand?

Answer: The FAS8000 can run indefinitely with a failed fan per chassis bay or failed power supply per chassis.

Note that each fan FRU contains two fans. A failed fan FRU counts as two failed fans in a controller bay and would initiate a shutdown.

How long will a FAS8000 run if a power supply or fan FRU is removed?

Answer: The FAS8000 will initiate a shutdown if a fan FRU is removed for more than two minutes.

The FAS8000 will run indefinitely if a power supply is removed.

Can DC power still be ordered with FAS8000?

Answer: No. As of April 2012, DC power can no longer be ordered for any NetApp controller or shelf. For more information, review the [EOA DC Power Product Bulletin](#).

Is the FAS8000 Climate Savers compliant?

Answer: Yes, FAS8000s meet the requirements of Climate Savers PSUs. Climate Savers is a green grid initiative that requires PSUs to be 80 PLUS. FAS8000 PSUs are 80 PLUS (Gold).

Is the FAS8000 Energy Star compliant, and at what level?

Answer: Yes, FAS8000s have met Energy Star 80 Plus Gold standards. ENERGY STAR is a superset of Climate Savers, with the following requirements:

- 80 PLUS (Silver) PSUs
- Public reporting of results against a performance benchmark (Emerald) that reports IOPS/watt
- Ability to monitor and report input power

NetApp has a leadership position in this initiative with the largest number of certified configurations. The current version of the specification is targeted at entry systems; these have been certified. The FAS8000 series is hardware compliant, although these systems have not been certified because they are out of scope.

See here for more info on the specifics:

<https://fieldportal.netapp.com/Modules/FieldPortal/Binders/Content.aspx?contentID=204672>.

8 FRU List

Table 22) FRU list.

Model Number	Part Number	Description
FAS8020	X3567-R6	Processor controller module (PCM) (w/o DIMMs and w/o NVRAM9 battery)
	X80084-R6	Bezel
	X8535-R6	Fan
	X6231-R6	Chassis FRU (w/o fans and w/o PSUs)
	X6596-R6	4/8/16 SFP
	X6599A-R6	10G SFP
	X1426A-R6	USB flash model 8GB
	X1839-R6	NVRAM battery
	X1847-R6	Coin cell battery
	X763-R6	Power supply units
	X3212-R6	4GB memory DIMM (NVRAM for 8020 only)
	X3213-R6	8GB memory DIMM: - NVRAM for 8040 and 8060 - Main memory for 8020, 8040, 8060
	X80084-R6	Bezel
	X3118A-R6	Blanking panel, System controller
FAS8040	X3568-R6	Processor controller module (PCM) (w/o DIMMs and w/o NVRAM9 battery)
	X80083-R6	Bezel
	X8537A-R6	Fan
	X6232-R6	Chassis FRU (w/o fans and w/o PSUs)
	X6596-R6	4/8/16 SFP
	X6599A-R6	10G SFP
	X1426A-R6	USB flash model 8GB

	X1834-R6	NVRAM battery
	X1847-R6	Coin cell battery
	X763-R6	Power supply units
	X3213-R6	8GB memory DIMM: - NVRAM for 8040 and 8060 - Main memory for 8020, 8040, 8060
	X80083-R6	Bezel
	X3105A-R6	Blanking panel, System controller
	X3106A-R6	Blanking panel, fan assembly
FAS8060	X3569-R6	Processor controller module (PCM) (w/o DIMMs and w/o NVRAM9 battery)
	X80083-R6	Bezel
	X8537A-R6	Fan
	X6232-R6	Chassis FRU (w/o fans and w/o PSUs)
	X6596-R6	4/8/16 SFP
	X6599A-R6	10G SFP
	X1426A-R6	USB flash model 8GB
	X1834-R6	NVRAM battery
	X1847-R6	Coin cell battery
	X763-R6	Power supply units
	X3213-R6	8GB memory DIMM: - NVRAM for 8040 and 8060 - Main memory for 8020, 8040, 8060
	X80X0-EXP-R6	IOXM
	X3105A-R6	Blanking panel, System controller
	X3106A-R6	Blanking panel, fan assembly
FAS8080 EX	X3570-R6	Processor controller module (PCM) (w/o DIMMs and w/o NVRAM9 battery)
	X80083-R6	Bezel
	X8537A-R6	Fan
	X6232-R6	Chassis FRU (w/o fans and w/o PSUs)

	X6596-R6	4/8/16 SFP
	X6599A-R6	10G SFP
	X1426A-R6	USB flash model 8GB
	X1834-R6	NVRAM battery
	X1847-R6	Coin cell battery
	X763-R6	Power supply units
	X3214-R6	16GB DIMM: • NVRAM for FAS8080 EX • Main memory for FAS8080 EX
	X80X0-EXP-R6	IOXM
Blanks	X3106A-R6	Blanking panel, System controller
	X3105A-R6	Blanking panel, fan assembly

Appendix

Chassis Reliability

This section addresses concerns about the chassis being a single point of failure (SPOF) with single-chassis HA solutions.

Background

The NetApp chassis has no active components on the chassis backplane required to keep the controllers running. The passive chassis backplane is a highly reliable component that has shown very high resiliency across platform and storage families on which is it used. These include:

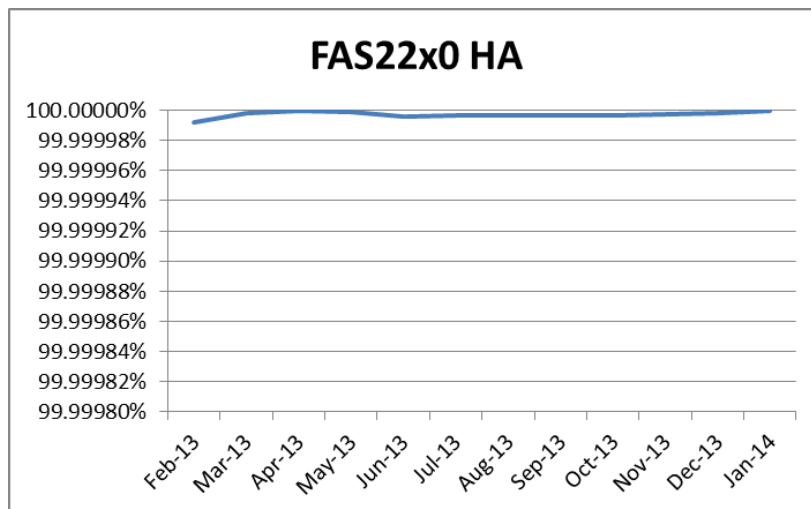
- Platforms: FAS200, FAS2000, FAS2200, FAS3100, FAS3200, FAS6200
- Shelves: DS14 shelves, DS2246 shelves, DS424x shelves, DS4486 shelves

More so, all storage vendor modular-based architectures share a common backplane. Outside of high-end very costly frame array types of storage systems, modular-based architectures are the norm.

Reliability Metrics

Based on deployed NetApp storage systems, our chassis have measured from 9M hours to 19M hours before being replaced. This is called the mean time before replacement (MTBR), and to put those hours into perspective, they represent from 1,026 to 2,167 years. Another important reliability metric is measured uptime data, which captures any unplanned downtime. Our FAS2200 single-chassis HA systems have measured over 99.99998% uptime without any unplanned downtime (see Figure 1). This equates to from 3 to 6 seconds of unplanned FAS2200 downtime, indicating chassis failure is a very uncommon occurrence.

Figure 2) FAS22x0 measured availability.



ASIC Reliability

This section addresses concerns about ASICs being a single point of failure (SPOF).

Background

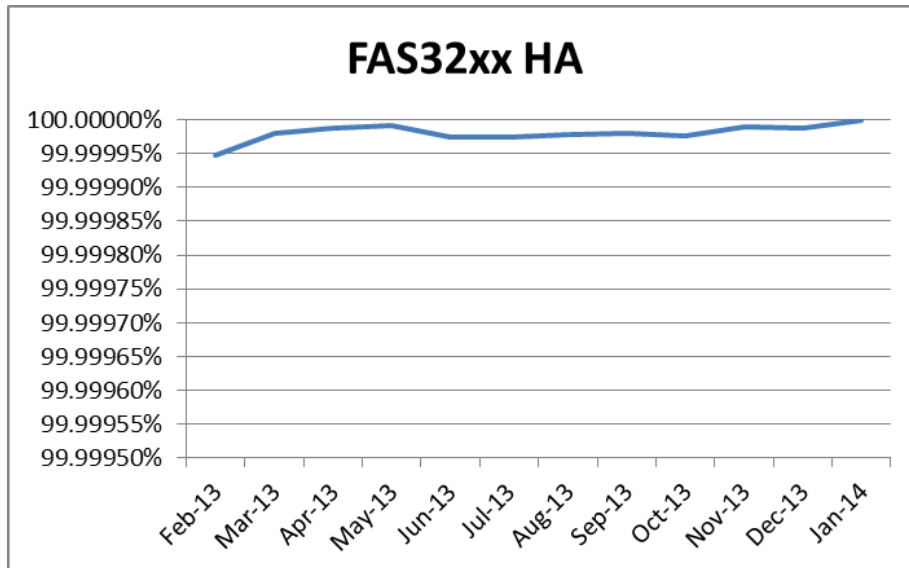
ASICs used in NetApp designs are evaluated on many characteristics, and one of the most important considerations is expected reliability. Much like NetApp disk vendors, ASIC vendors calculate and maintain their component's mean time before failure (MTBF). ASIC vendors used in NetApp storage systems have reported from 10M to 100M hours before failure, which represents from 1,140 to 11,000 years.

Reliability Metrics

NetApp motherboards incorporate many ASICs, and this makes it hard to measure an individual motherboard ASIC's reliability over time. NetApp tracks ASIC reliability at the field-replaceable unit (FRU) layer, and the motherboard FRU represents the consolidated reliability of all the onboard ASICs. Over time, with one exception NetApp motherboards have shown 1M to almost 7M hours MTBF results; in terms of years, that is 114 to 798 years.

The best way to mitigate possible ASIC failures is to deploy HA pairs. In the event of ASIC failure, the partner can automatically take over for the affected system without interruption to data access. The FAS8020 is too new to have measured uptime results, but we can leverage availability results for the FAS3200. FAS3200 HA systems, which include single-chassis and dual-chassis HA configurations, have shown over 99.99995% uptime availability (see Figure 3). This equates to from 15 seconds or less of unplanned downtime for a midrange-class HA pair.

Figure 3) FAS32x0 HA measured availability.



9 Revision History

Revision	Date	Comment
1.0	January 2014	Initial release
1.1	February 2014	Fixed minor typos Changed the answer for FAS8000 free protocol in section 1
1.2	February 2014	Cleared up disagreement for twinax support at launch on page 15 Added minimum root volume size to Table 11 Added question about 2 x cluster interconnects being supported on page 13 Corrected SSD limits on page 18 Added more details about e0M and SP port speeds in Table 8
1.3	February 2014	Changed Data ONTAP release for full memory and NVRAM support to 8.2.1 RC2 on page 10 Added 7-Mode requirement for MetroCluster on page 8 Added IPv6 support for e0M and SP on page 17 Added FlexCache software support on page 9 Added maintenance mode support for setting UTA2 ports on page 15 Added support for mixed 10GbE and UTA2 ports on page 14 Added new aggregate sizes supported in Data ONTAP 8.2.1 GA on page 18
1.4	March 2014	Flattened UTA2 supported connectivity options into a table in section 5 Added MetroCluster support with UTA2 ports in section 5
1.5	May 2014	Added support for FAS8080 EX Added question in section 4 on turning LED on and off to easily identify a controller Added question on IBM OEM plans with FAS8000 in section 1 Updated FAS8020, FAS8040, and FAS8060 power consumption details (previously didn't include any load on PCIe slots)
1.6	June 2014	Added UTA2 support with non-IBM tape drives in section 5 Corrected maximum Flash Cache on FAS8080 EX in section 6 Added NetApp branded twinax cables in table 9
1.7	June 2014	Removed support for NetApp branded cables in table 9; support comes later
1.8	August 2014	Fixed aggregate sizes in table 14 Added blank part numbers in table 21 Added compliance information in section 7 about Energy Star and Climate Savers Added processor model strings
2.0	September 2014	Increased max capacity in Table 11 with 6TB disks Consolidated Table 13 and Table 14 into one Table 19: highlighted weights shown include adapter cards Added Table 13 to show increased Flash Pool and Flash Cache with Data ONTAP 8.3 Added appendix with chassis and ASIC reliability coverage
2.1	December 2014	Added details about supported SAS HBA versions on pages 21 and 22 Updated UTA2 support with direct connections to tape devices on page 17 Updated weights in section 7 to match HWU
2.2	January 2015	Added details throughout for FAS8060 with IOXM
2.3	March 2015	Added question about frame length errors on UTA2 ports Added controller blanks to FRU table Added question about NDO process to add IOXM to MCC in Data ONTAP 8.3.1
2.4	April 2015	Added details about IOXM support on FAS8060 in Data ONTAP 8.3.1
2.5	May 2015	Fixed table 1 showing FAS8060 dual chassis HA being supported with IOXM
2.6	December 2015	Added bezel to parts list in section 3. Clarified cluster interconnect requirements in section 5. Updated max capacity and max SSD size in section 6.

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