



Technical FAQ

FAS2600

Chris Lueth, NetApp

May 2017

Version 1.6

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1 FAS2600 Overview

The FAS26000 is part of the new midrange family of NetApp® storage controllers that can also be used in traditional entry-level deployments. With this new offering, NetApp has dramatically enhanced the capabilities of our lowest end midrange family with onboard NVMe M.2 Flash Cache™, higher performance with Broadwell-DE processors, and enhanced onboard I/O connectivity. The FAS2600 includes the latest in SAS connectivity, the SAS 3.0 standard with 12Gb speeds. Besides onboard 10GbE ports, the FAS2600 also continues with the most versatile I/O interface available, the UTA2 connections that support 10GbE and 16Gb FC and can be easily changed between these two protocols in the field.

What is the FAS2600 series platform?

Answer: The FAS2600 series is NetApp's next-generation low-end member of our midrange platform family.

What are the FAS2600 models?

Answer: The FAS2620 and FAS2650.

What are some of the new features in the FAS2600 family?

Answer:

- The FAS2620 and FAS2650 feature Broadwell-DE architecture
- Onboard NVMe M.2 Flash Cache
- PCIe Gen 3 architecture
- High-speed DDR4-2133 memory
- Onboard 10GbE, 16Gb FC or 10GbE UTA2, and SAS 3.0 12Gb ports
- External USB port can be used to recover boot media or install ONTAP® image
- Modern micro-USB serial console port connects at 115,200 baud rate

Does the FAS2600 come with protocols included?

Answer: The base bundle for the FAS2600 includes all protocols.

What are the new FAS2600 model transitions?

Answer:

- The FAS2620 is a 12-drive enclosure that replaces the FAS2554 and supports SATA and hybrid SSD storage with Flash Pool™.
- The FAS2650 is a 24-drive enclosure that replaces the FAS2552 and supports SAS, SSDs, and hybrid storage with Flash Pool.

2 FAS2600 Controller and Chassis

Which components make up the FAS2600?

Answer: The FAS2600 components are the controller module, chassis, power supplies, internal disk drives, and possibly SFP+ modules.

What is the rack unit for the FAS2600 components?

Answer: The FAS2600 chassis is 2U high.

What are the FAS2600 model numbers?

Answer: The FAS2600 comes in two models: the FAS2620 and FAS2650.

Which model string extensions denote HA?

Answer:

- The FAS2600 single-controller model strings are the FAS2620 and FAS2650.
- The FAS2600 dual-controller model strings are the FAS2620A and FAS2650A.

Are the FAS2600 controllers hot swappable?

Answer: The FAS2600 controller is hot swappable and, it is important to note, does not require your turning off either power supply (PSU).

3 FAS2600 HA and Standalone Configurations

Which standalone and HA configurations are supported on the FAS2600?

Answer: Table 1 lists the configurations supported on the FAS2600.

Table 1) Supported FAS2600 configurations.

	FAS2620	FAS2650
Single-chassis controller with blank	Yes	
Single-chassis HA dual controllers	Yes	

What is the naming convention for the FAS2600 configurations?

Answer: The FAS2620 and FAS2650 are known as single-chassis standalone configurations. The FAS2620A and FAS2650A are single-chassis HA configurations.

Are dual-chassis HA configurations possible on the FAS2600 series?

Answer: No, the FAS2600 cannot span its chassis.

Is MetroCluster available on the FAS2600 series?

Answer: No. MetroCluster™ software is not available on the FAS2600 series.

What is the rack unit for FAS2600 configurations?

Answer: Both FAS2600 chassis are 2U each.

Which field upgrades are available with the FAS2600?

Answer: All FAS2600 standalone controllers can have a second controller of the same model added to become HA.

Does hardware-assisted takeover work on the FAS2600?

Answer: Yes. Hardware-assisted takeover on the FAS2600 uses the SP, and the hardware-assisted takeover functionality is similar to that of the SP in the FAS2200, FAS2500, and FAS8000 controller families. There is more information about the SP in section 4.

What is the NVMEM interconnect in FAS2600 series HA configurations?

Answer: Instead of an Infiniband interface, the FAS2600 NVMEM uses nontransparent bridging (NTB) for the HA interconnect over the backplane. But the NVMEM driver functionality works the same as in earlier platforms and handles the RDMA activity to keep NVMEM synchronized between the HA controllers.

Are there any single points of failure in the FAS2600?

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 FAS2600 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 (various disk shelves, the FAS200 series, FAS2000, FAS3100, FAS/V3200, and some FAS/V6200 and FAS8000 models) that demonstrate very high reliability of the chassis backplane.

Does the FAS2600 series support FlexArray?

Answer: No, the FAS2600 does not support FlexArray® licensing to virtualize storage arrays.

Is a FlexCache version of the FAS2600 available?

Answer: No. The FAS2600 does not offer a FlexCache® model.

Does the FAS2600 support SnapLock?

Answer: SnapLock® software is supported in ONTAP 9 and later and can be used on the FAS2600 at release.

Where is the upgrade procedure to replace existing controllers with FAS2600?

Answer: Here is a link to the [Controller Upgrade Express Guide](#).

4 FAS2600 System Features

How many nodes does the FAS2600 support?

Answer: The FAS2600 supports up to 8 nodes for both NAS and SAN deployments.

Does the FAS2600 have onboard flash?

Answer: Yes, the FAS2600 features onboard NVMe M.2 Flash Cache.

How much onboard flash does the FAS2600 have?

Answer: The FAS2600 has 512GiB of flash per node and 1024GiB for an HA pair.

How much memory and NVMEM does the FAS2600 have?

Answer: Table 2 shows system memory.

Table 2) System memory for HA configurations.

HA Pairs	Physical Memory	Total NVMEM
FAS2620A	64GB	8GB
FAS2650A		

Does the FAS2600 use all of the memory and NVMEM?

Answer: Yes. All FAS2600 models fully utilize the available memory and NVMEM at launch.

Which type of processors and how many processing cores does the FAS2600 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
FAS2620A	Broadwell-DE	2 x 64-bit hexa-core	12	1.9GHz	D-1528
FAS2650A					

Which ONTAP release is required for the FAS2600?

Answer: The FAS2650 is supported starting in the ONTAP 9.1 RC1 release. The FAS2620 is supported in ONTAP 9.1 RC2.

Which ONTAP build does the FAS2600 use?

Answer: The FAS2600 uses the x86_64 build. This same build supports both AMD and the latest platforms based on Intel.

Does the FAS2600 destage NVMEM contents to flash?

Answer: Yes. In the event of unexpected loss of power, the FAS2600 will destage NVMEM contents to flash for a permanent, persistent write log of data not committed to disk when power was lost.

```
*****
* Pending cached data is detected *
* Starting the process to save to *
* media...                        *
*****

Destage is in progress, please wait
.....

Destage is completed successfully
Powering off from the backup power source
```

Does the FAS2600 encrypt NVLOG data before destaging NVMEM contents to flash?

Answer: Yes, all data in NVMEM is encrypted prior to being stored in flash.

What is the persistent write log feature on the FAS2600 NVMEM?

Answer: The persistent write log feature on the FAS2600 destages NVMEM contents to flash memory in the event of an unexpected loss of power. 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 the FAS2600 use its NVMEM battery?

Answer: In the event of a dirty shutdown, NVMEM uses its battery to keep the NVLOG DIMMs refreshed during the reboot process. In this event the NVMEM contents are not destaged to flash. In the event of unexpected loss of power, the NVMEM battery keeps the motherboard powered up while the contents of NVMEM are destaged to flash.

How many destages does the NVMEM battery support?

Answer: A fully charged NVMEM battery can handle about 25 destage events.

How long does it take to restage NVMEM data?

Answer: It takes about 20 seconds to restage the NVMEM contents from flash.

```
Wed Aug 10 13:09:03 2016 [nv2flash.restage.progress:NOTICE]: ReStage is going
to restore non-volatile data from flash in approximately 21 seconds.
```

```
.....
```

```
Wed Aug 10 13:09:22 2016 [nv2flash.copy2NVMEM.succeed:INFO]: Copying
nonvolatile data from the flash device to NVMEM succeeded in 19 seconds.
```

How long does it take for the FAS2600 NVMEM battery to charge?

Answer: Given the new NVMEM architecture where the entire motherboard is kept powered, during the destage process significant battery charge is consumed for a destage event. But because a fully charged battery provides enough power for 25 destage events, and the battery isn't used to keep the NVMEM contents refreshed for 72 hours, ONTAP should boot up normally after a destage with no pause to charge the battery.

Where are the NVRAM battery material safety data sheets (MSDS)?

Answer: Here are links to the Lithium Ion MSDS on the Field Portal:

[LG Lithium Ion MSDS](#)

[Sony Lithium Ion MSDS](#)

How does NetApp design their NVMEM batteries to avoid potential lithium-ion fires?

Answer: Here are some of the design considerations for NetApp NVMEM lithium-ion batteries and why NetApp has not had fire issues.

- NetApp does not use any rapid charge modes and does not allow the battery to be charged to an excessively high voltage.
- When the battery is charged to the correct voltage level, the charger is turned off until it requires a recharge.
- When the battery is in use, it is not in a high current discharge mode.
- The battery has protection circuitry that prevents high discharge currents.

Does the FAS2600 have an LCD display?

Answer: No. The FAS2600 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 FAS2600 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 FAS2600 series support remote management?

Answer: The FAS2600 uses the service processor (SP) used on FAS2200, FAS2500, and FAS8000 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 in to the serial console, you can toggle to 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 ONTAP and is always available.

What are the recommended FAS2600 SP firmware levels?

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

Table 4) Recommended SP firmware levels by ONTAP release.

	SP Firmware Level
ONTAP 9.1 RC1	5.0

What are the recommended BIOS levels on the FAS2600?

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

Table 5) Recommended BIOS levels by ONTAP release.

	BIOS Level
ONTAP 9.1 RC1	11.0

There is no NMI button on the FAS2600. How do I generate a core?

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

What are the system diagnostics in the FAS2600?

Answer: The FAS2600 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 FAS2600?

Answer: The FAS2600 uses a mSATA USB flash in place of CompactFlash.

Is NetApp Volume Encryption (NVE) supported on FAS2600?

Answer: Yes, NVE is supported on FAS2600.

Are FlexGroups supported on FAS2600

Answer: Yes, FlexGroups are supported on FAS2600.

Does the FAS2600 have a Trusted Platform Module (TPM)

Answer: Yes, FAS2600 has onboard TPM.

Does ONTAP or onboard key manager (OKM) use the TPM?

Answer: No, not at this time.

5 FAS2600 I/O

What are the recommended and supported cluster interconnect ports for ONTAP 9.1 on the FAS2600?

Answer: Refer to Table 6 for cluster interconnect port requirements and recommendations.

Table 6) Onboard I/O ports with ONTAP 9.1.

Default/Recommended	Supported
e0a, e0b 10GbE ports	e0e, e0f UTA2 ports

How can you determine cluster interconnect traffic?

Answer: Use the command `statistics lif show` to determine the amount of traffic on the cluster interconnects. If you set an interval it'll spit out how much has been received/sent during that time.

What are the onboard FAS2600 ports?

Answer: Refer to Table 7 for cluster interconnect port requirements and recommendations.

Table 7) Onboard I/O ports with ONTAP 8.2.x.

Port Type/Number per PCM	Label
Mini-SAS3 (2)	0a, 0b
10GbE (2)	e0a, e0b
UTA2 (4)	e0c/0c, e0d/0d, e0e/0e, e0f/0f
GbE e0M/SP	Wrench
Serial console (micro-USB)	IOIOI
Serial console (RJ45)	IOIOI
USB 2.0	

Which PCIe architecture does the FAS2600 use?

Answer: The FAS2600 uses the PCIe Gen 3 architecture for motherboard connectivity to onboard ports and slots.

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 FAS2600 have onboard UTA2 ports?

Answer: Yes. The FAS2600 has four onboard UTA2 ports.

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 FAS2620 are e0c/0c and e0d/0d, and the second port pair is e0e/0e and e0f/0f.

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 [FAS2600 SE Presentation](#) for more details about 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 such as NFS, CIFS, iSCSI, and FCoE use Ethernet II frame formatting and are not affected by this issue.

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

Answer: See Table 8 for supported UTA2 connectivity options.

Table 8) Supported UTA2 connectivity options.

	Onboard UTA2 Ports		
	16Gb FC	10GbE	1GbE
SFP+	X6596-R6	X6589A-R6	X6567-R6 (optical) X6568-R6 (RJ-45)
Cables	See Hardware Universe (HWU)		

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.

The GbE SFP transceivers support NFS, CIFS, and iSCSI.

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 interconnects with ONTAP on the FAS2600?

Answer: Yes. The UTA2 ports are supported for cluster interconnects.

Are UTA2 ports configured when ordering the FAS2600?

Answer: Yes. When quoting FAS2600 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+.

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 16/8/4Gbps speeds but do not work with 1Gb or 2Gb FC speeds. UTA2 ports set to the 10GbE personality will not autorange down to GbE speeds but do support GbE speeds with the SFPs shown in Table 8.

Can I use 1GbE and 10GbE on the same port pair?

Answer: Yes, when the port pair is set to Ethernet, you can use 1GbE and 10GbE connections on the same UTA2 ASIC.

Do the onboard UTA2 ports provide fault tolerance?

Answer: The FAS2600 has two UTA2 ASICs, and port pairs are e0c/0c and e0d/0d sharing an ASIC, while port pairs e0e/0e and e0f/0f share the second ASIC.

Can UTA2 ports in the FC personality be used with tape devices?

Answer: Direct connection to tape drives with UTA2 ports is supported on HP, Quantum, and Tandberg tape devices. IBM tape devices require an FC switch between the UTA2 port and tape drive.

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

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

Do the onboard 10GbE ports on the FAS2600 use an ASIC?

Answer: No, the onboard 10GbE ports connect to interfaces on the Broadwell-DE processor.

Do the onboard FAS2600 10GbE ports autorange down to GbE?

Answer: No. The onboard 10GbE ports do not autorange but can be set to GbE speed by using the SFP options shown in Table 8.

What are the supported cables for onboard 10GbE for onboard FAS2600 ports?

Answer: For the latest on supported FAS2600s, refer to the [Hardware Universe \(HWU\)](#).

Which management interfaces does the FAS2600 have?

Answer: See Table 9 for FAS2600 management interfaces.

Table 9) Onboard management interfaces.

Active-Active	Micro-USB Serial Console	RJ-45 Serial Console	Management SP/e0M (Wrench)
All models	2 (115K baud)	2 (115K baud)	2 x GbE (e0M) 2 x 10/100Mb SP ¹

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.

At what speed does the FAS2600 serial console port run?

Answer: The FAS2600 serial console ports run at 115,200 baud rate.

Is the external USB 2.0 port supported?

Answer: Yes, the external USB port can be used to boot ONTAP if the onboard boot media has failed, to install a particular release of ONTAP, or to install a firmware service image. The external USB port is only enabled during these activities, and its activation is based on specific commands.

What is the USB device formatted for use with the FAS2600?

Answer: The USB device needs to have FAT32 formatting to use on the external USB port.

What are the allowed use cases with the FAS2600 external USB port?

Answer: Table 10 shows use cases where the external USB port can be used.

Table 10) External USB port use case scenarios.

Scenario	Prerequisites	Command
Perform boot device recovery from loader prompt	- USB 2.0 device formatted to FAT32 with correct ONTAP netboot.tgz and image.tgz image - Not hot pluggable, need to boot to loader prompt after USB device is inserted into external USB port	- boot_recovery using the netboot image at the loader prompt - Select appropriate ONTAP image at the boot menu
Fetch ONTAP software for installation	- USB 2.0 device formatted to FAT32 with correct ONTAP image	- system node image update/get - Command has an additional option to fetch ONTAP from USB device
Fetch service image for firmware update	- USB 2.0 device formatted to FAT32 with correct service image	- system node firmware download - Command has an additional option to fetch ONTAP from USB device

6 FAS2600 Storage

Does FAS2600 support Advanced Drive Partitioning (ADP)?

Answer: Yes, FAS2600 supports ADP.

What version of ADP is supported on FAS2600?

Answer: FAS2600 uses ADPv1.0 to partition drives, and the same approach used on entry level systems starting in Data ONTAP 8.3.

What are the maximum spindle counts and capacities supported on the FAS2600 series?

Answer: Table 11 shows maximum spindle counts and capacities.

Table 11) Maximum spindle counts and capacities.

Standalone and HA	Maximum Spindles SAS/SATA	Maximum SSDs	Maximum SSD + SAS and/or SATA
FAS2620	144	136 ¹	144
FAS2650	144	144	144

¹⁾ Maximum 136 SSDs allowed as FAS2620 has 8 internal SATA disks.

What are the supported internal disks on the FAS2600 series?

Answer: Table 12 shows supported internal disks on the FAS2600.

Table 12) Supported internal disks on FAS2600.

	SAS	SATA	SSDs	NSE
FAS2620	N/A	4TB, 8TB, 10TB	960GB, 3.84TB	800GB SSD, 3.8TB SSD, 6TB at 7.2K RPM AES-256, FIPS 140-2 compliant
FAS2650	900GB, 1.2TB, 1.8TB	N/A	960GB, 3.84TB, 15.3TB	800GB SSD, 3.8TB SSD, 1.8TB 10K RPM AES-256, FIPS 140-2 compliant

What are the supported flash limits on the FAS2600?

Answer: Table 13 shows these limits.

Table 13) Flash limits on the FAS2600 HA pairs in ONTAP.

	Flash Cache per Controller
Minimum/maximum onboard flash (512GB per node)	1024GiB
Maximum onboard flash + Flash Pool cache (HA and standalone)	24TiB

What is the maximum number of volumes on the FAS2600?

Answer: The FAS2600 supports up to 1,000 volumes.

Is there a demo video on how RAID-TEC works?

Answer: Yes, here is a link to the YouTube video that can be shared with customers:

[RAID-TEC Demonstration](#)

What are the maximum aggregate and volume sizes on the FAS2600 series?

Answer: Table 14 shows the maximum aggregate and volume sizes.

Table 14) Maximum aggregate and volume sizes.

	FAS2600
Maximum number of volumes	1000
Maximum aggregate size	400TB
Maximum volume size	100TB
Minimum root volume size	350GB

Which shelves and shelf modules are supported on the FAS2600 series?

Answer: Table 15 shows the supported shelves and shelf modules.

Table 15) Supported shelves and shelf modules.

Shelf	Shelf Module
DS224C (new orders)	IOM12
DS212C (new orders)	IOM12
DS2246 (migrated shelves)	IOM6 IOM12
DS4246 (migrated shelves)	IOM6 IOM12
DS460C	IOM12

Can IOM6 and IOM12 be used as external storage?

Answer: Yes, either IOM6 or IOM12 based shelves can be used externally but cannot be mixed on the external stack. All external shelves will be either IOM6 or IOM12 based.

Which hard disk drives (HDDs) are supported in the FAS2600?

Answer: Any disk supported in the shelves listed in Table 15 in ONTAP 9.x is supported on the FAS2600 series. For the latest about supported drive options on the FAS2600, see the [Hardware Universe \(HWU\)](#).

Are all-SSD configurations supported on the FAS2650?

Answer: Yes, all-SSD configurations are supported on the FAS2650.

Are all-SSD configurations supported on the FAS2620?

Answer: No, all-SSD configurations are not supported on the FAS2620; only hybrid SSD for Flash Pool is supported on the FAS2620.

What is the maximum shelf depth for stacks with SSDs?

Answer: The maximum shelf depth for stacks containing SSDs is five with 24 internal SSDs and six with no internal SSDs. This applies to pure SSD stacks and Flash Pool stacks with SSDs and HDDs.

Does the FAS2600 use ACP cabling for out-of-band management?

Answer: No, there is no locked wrench port on the FAS2600 for traditional ACP cabling.

How is SAS storage management handled on the FAS2600?

Answer: Starting in ONTAP 9, SAS storage management is handled in band over the SAS cables.

Is connecting the SAS ports on FAS2600 with no external storage considered a best practice?

Answer: Yes, connecting the SAS ports with no external storage provides MP-HA to internal disks and is considered a best practice. FAS2600 ship with two 0.5 meter SAS cables for this purpose.

What SAS cable lengths are supported on FAS2600?

Answer: Only copper SAS cables 2 meters and under are supported with the onboard FAS2600 SAS ports. For longer SAS cables use optical.

Can the FAS2620 and FAS2650 be converted to a storage shelf?

Answer: Yes, the FAS2620 and FAS2650 can be converted to a storage shelf by changing the PCM with the IOM12 shelf module.

7 FAS2600 Chassis Power Supplies, Weight, and Thermals

What are the FAS2600 chassis dimensions?

Answer: Table 16 shows the chassis dimensions.

Table 16) FAS2600 physical chassis dimensions.

	FAS2650		FAS2620	
	Metric	English		
Height	2U		2U	
Height (measured)	8.5cm	3.3"	8.7cm	3.4"
Width	44.7cm	17.6" (fits 19" rack)	44.7cm	17.6"
Chassis depth	48.3cm	19"	50.8cm	20"
With cable management	61.3cm	24.1"	63.8cm	25.1"

What are the FAS2600 environmental?

Answer: For the most comprehensive information about FAS2600 environmental details, refer to the [Hardware Universe \(HWU\)](#).

Table 17) FAS2600 environmental.

	Operational	Storage	Transit
Temperature Range	From 41°F up to 113°F (5°C up to 45°C)	From -40°F up to 158°F (-40°C up to 70°C)	From -40°F up to 158°F (-40°C up to 70°C)
Relative Humidity	From 8% up to 90%	From 10% up to 95%	From 10% up to 95%
Altitude	Up to 10000ft (3048m)	Up to 40000ft (12192m)	Up to 40000ft (12192m)

What are the FAS2600 weights?

Answer: For the most comprehensive weight information about the FAS2600 across various configuration options, refer to the [Hardware Universe \(HWU\)](#).

The FAS2620 standalone is 56.66 pounds (25.7kg), and HA is 61.95 pounds (28.1kg).

The FAS2650 standalone is 55.56 pounds (25.2kg), and HA is 60.85 pounds (27.6kg).

What are the wattage and BTU ratings for the standalone FAS2650?

Answer: For the most comprehensive information about FAS2650 wattage and BTU ratings across various configuration options, refer to the [Hardware Universe \(HWU\)](#).

Table 18) Standalone FAS2650 watts and BTU ratings.

	110V		220V	
	Worst Case	Typical	Worst Case	Typical
Amps (A)	5.39	3.95	2.65	1.94
Watts (W)	528	387	518	380
BTU	1,803	1,321	1,768	1,297

What are the wattage and BTU ratings for FAS2620 HA pairs?

Answer: For the most comprehensive information about FAS2620 wattage and BTU ratings across various configuration options, refer to the [Hardware Universe \(HWU\)](#).

Table 19) FAS2620 HA watts and BTU ratings.

	110V		220V	
	Worst Case	Typical	Worst Case	Typical
Amps (A)	5.58	4.15	2.74	2.04
Watts (W)	546	406	536	398
BTU	1,864	1,386	1,830	1,359

Does the FAS2600 support both 110V and 220V power?

Answer: Yes. Both voltage levels are supported on the FAS2600.

Are the FAS2600 power supplies assigned to a particular controller?

Answer: No. The two power supplies are assigned to the FAS2600 chassis.

What is the Energy Star rating for FAS9000?

Answer: Previously we designed to 80+ Gold but our older storage shelves and integrated entry level systems came in at 80+ Silver. With our new hardware released late last year we designed to and tested against 80+ Platinum standards. However, while we design and test to these standards we haven't gone through the formal certification.

8 FRU List

For the latest information about FAS2600 FRUs, refer to the [Hardware Universe \(HWU\)](#).

Battery	X1847-R6	Lithium System Battery CR2032, R6
	X3152A	R7, ASSY, BATT, 2CELL, HLDR, NV
Bezel	PH-FAS2600_Bezel	PH-FAS2600 - R6, SUB ASSY, BEZEL, FAS2600
Blank	X5055-R6	BLANK, CHASSIS FILLER, REAR, DS2246, R6
Cable management	X3322A	SUB ASSY, SM, BKT, CBL MGMNT SET
Chassis	X5721A	DS224C Chassis w/PSUs
Memory module	X3222A	R7, IC, SODIMM, 16GB, x8, ECC, REG
	X3310A	NVME, FLASH, 512GB
mSATA	X3320A	R7, DRIVE, SSD, 128GB, mSATA
Power supply unit	X5726A	PSU, 913W
Processor controller module (PCM)	PH-FAS2600_PCM_wM	PH-FAS2600-SUB ASSY, CONTROLLER, MEM, FAS2600
	X3173A	R7, SUB ASSY, CONTROLLER, NO MEM
PSU	X5726A	PWR SPLY, 913W, AC, PLATINUM
Rail kit	X5526A-R6	Kit, 4-Post, Square-Hole, 24"-32" Rail
	X5527A-R6	Kit, 2-Post, Round-Hole
	X5529A-R6	Kit, 4-Post, Swift, Square-Hole, 24"-32" Rail
	X877B-R6	Rail Kit II, NetApp Cabinet, R6
	X8783A-R6	Rail Kit III, NetApp Cabinet, R6
Transceiver	X6567-R6	SFP Optical 1GB Shortwave Multimode
	X6568-R6	SFP Copper 1GB RJ-45
	X6589-R6	XCVR, SFP+, Optical, 10GbE, Shortwave
	X6596-R6	XCVR, SFP+, Optical, 16Gb, FC, Shortwave

9 Sysconfig Output

```
> sysconfig -a
NetApp Release ONTAP 9.1: 0200: Thu Jul 21 02:59:10 PDT 2016

System ID: 0537004118 (); partner ID: 0000000000 ()

System Serial Number: 621699999991 ()

System Rev: A1

System Storage Configuration: Single-Path HA
System ACP Connectivity: Inband Active

All-Flash Optimized: false

Backplane Part Number: DS22412

Backplane Rev:

Backplane Serial Number: 021616080443

slot 0: System Board 1.9 GHz (System Board XXII A1)

    Model Name:          FAS2600
    Part Number:         111-02505
    Revision:            A1
    Serial Number:       021623022411
    BIOS version:        11.0X13
    Loader version:      6.0X19
    Processors:          6
    Processor ID:         0x50663
    Microcode Version:   0x700000b
    Processor type:      Intel(R) Xeon(R) CPU D-1528 @ 1.90GHz
    Memory Size:         32768 MB
    Memory Attributes:   Bank Interleaving
                        Hoisting
                        Rank Interleaving
                        Channel Interleaving

    Mezzanine Card:

        Part:            111-02732
        Version:         A0
        Serial:          021622036098
    NVMEM Size:         4094 MB of Main Memory Used
    Controller:         A
    PCIE Switch 1:      id 1 546 1.04
    TPM FW Version:     0005.0033

Service Processor      Status: Online
    Firmware Version:   5.0X23002
    Mgmt MAC Address:   00:A0:98:A5:CA:5B
    Ethernet Link:      down, 10Mb, half duplex
    Using DHCP:         yes
```

```

IPv4 configuration:
    IP Address:      unknown
    Netmask:         unknown
    Gateway:         unknown
IPv6 configuration:      Disabled
[Service Processor cached network information determined at Wed Aug 10 13:11:12 GMT 2016]
slot 0: Internal 10/100/1000 Ethernet Switch
    Firmware Version:  Version13 SB_XXII ETHSW RZM
    Wrench:            auto-10tx-hd-down
    Device Type:       88E6176
slot 0: Gigabit Ethernet I210
    e0M MAC Address:   00:a0:98:a5:ca:59 (auto-unknown-down)
    Device Type:       1533
    Firmware Version:  3.25-7.5 0x80000674
slot 0: 10 Gigabit Ethernet Controller IX5-SFP+
    e0a MAC Address:   00:a0:98:a5:ca:4b (auto-unknown-down)
    SFP Vendor:
    SFP Part Number:
    SFP Serial Number:
    e0b MAC Address:   00:a0:98:a5:ca:4c (auto-unknown-down)
    SFP Vendor:
    SFP Part Number:
    SFP Serial Number:
    Device Type:       X550EM
    Firmware Version:  0.86-7.1 (20150807-0701)
slot 0: 1G/10G Ethernet Controller CNA EP 8324
    (Multiple Dual-port, QLogic CNA 8324(8362) rev. 2)
    e0c MAC Address:   00:a0:98:a5:ca:4d (auto-unknown-down)
    e0d MAC Address:   00:a0:98:a5:ca:4e (auto-unknown-down)
    e0e MAC Address:   00:a0:98:a5:ca:4f (auto-unknown-down)
    e0f MAC Address:   00:a0:98:a5:ca:50 (auto-unknown-down)
    Device Type:       EP8324N
    NIC Firmware rev:  5.4.56.0
slot 0: PLX DMA Engine 2 (PLX87d0)
    State:             Inactive
slot 0: Interconnect HBA: Generic OFED Provider
    Port Name:         ib0a
    GID:               fe80:0000:0000:0000:0000:0000:0000:0104
    Base LID:          0x104
    Active MTU:        8192

```

```

slot 0: NTB Interconnect i0 (PLX87b0)
    Max HW Data Rate:  PCIe Gen 3 x 8
    HW Data Rate:      PCIe Gen 1 x 0
    SW Data Rate:      PCIe Gen 0 x 0
    Logical Link:       Down
    Port State:         Disabled

slot 0: SAS Host Adapter 0a (PMC-Sierra PM8070 rev. C, SAS, <OFFLINE (hard)>)
    Firmware rev:      03.08.09.00
    Base WWN:          5:00a098:0038a27:30
    Phy State:         [0] Disabled
                      [1] Disabled
                      [2] Disabled
                      [3] Disabled

    Mini-SAS HD Vendor:      not available
    Mini-SAS HD Part Number: not available
    Mini-SAS HD Type:        not available
    Mini-SAS HD Serial Number: not available

slot 0: SAS Host Adapter 0b (PMC-Sierra PM8070 rev. C, SAS, <UP>)
    Firmware rev:      03.08.09.00
    Base WWN:          5:00a098:0038a27:34
    Phy State:         [4] Enabled, 12.0 Gb/s
                      [5] Enabled, 12.0 Gb/s
                      [6] Enabled, 12.0 Gb/s
                      [7] Enabled, 12.0 Gb/s

```

(Note - disk information removed to save space)

```

Shelf 0: DS224-12  Firmware rev. IOM12E A: 0105  B: ----

slot 0: Fibre Channel Target Host Adapter 0c
    (QLogic CNA 8324 (8362) rev. 2, <LINK NOT CONNECTED>)
    Firmware rev:      8.5.1
    Flash rev:         7.0.3
    Host Port Addr:    000000
    FC Nodename:       50:0a:09:80:80:82:08:56 (500a098080820856)
    FC Portname:       50:0a:09:83:80:82:08:56 (500a098380820856)
    Connection:        No link
    Switch Port:       Unknown

slot 0: Fibre Channel Target Host Adapter 0d
    (QLogic CNA 8324 (8362) rev. 2, <LINK NOT CONNECTED>)
    Firmware rev:      8.5.1
    Flash rev:         7.0.3
    Host Port Addr:    000000

```

```

FC Nodename:      50:0a:09:80:80:82:08:56 (500a098080820856)
FC Portname:      50:0a:09:84:80:82:08:56 (500a098480820856)
Connection:       No link
Switch Port:      Unknown

slot 0: Fibre Channel Target Host Adapter 0e
(QLogic CNA 8324 (8362) rev. 2, <LINK NOT CONNECTED>)
Firmware rev:     8.5.1
Flash rev:        7.0.3
Host Port Addr:   000000
FC Nodename:      50:0a:09:80:80:82:08:56 (500a098080820856)
FC Portname:      50:0a:09:81:80:82:08:56 (500a098180820856)
Connection:       No link
Switch Port:      Unknown

slot 0: Fibre Channel Target Host Adapter 0f
(QLogic CNA 8324 (8362) rev. 2, <LINK NOT CONNECTED>)
Firmware rev:     8.5.1
Flash rev:        7.0.3
Host Port Addr:   000000
FC Nodename:      50:0a:09:80:80:82:08:56 (500a098080820856)
FC Portname:      50:0a:09:82:80:82:08:56 (500a098280820856)
Connection:       No link
Switch Port:      Unknown

slot 0: Intel BDW SATA Controller u0a (0x52711000)
boot0 Micron M600 MTFDDAT128MBF      MU05 122104MB 512B/sect
(161712A72CA4)

slot 0: Intel USB EHCI Adapter u0b (0x52712000)
slot 1: Flash Cache NVMe
Serial Number:    S2UVNAAH300135
Part Number:      110-00465
Hardware Revision: A0
Firmware Version: NA00
Model Name:       X3310A
Capacity:         512 GB
Vendor Name:      Samsung
State:            ok

```

10 System Validation / Quality Assurance

We stress test our subassemblies of the system individually, rather than the system as a whole. Our strategy is to place the greatest emphasis on the earlier steps of the assembly process. Our ICT (In-Circuit Test) coverage is typically in the high 90% range, which is not easy to do when a controller has more than 10K components. We also incorporate advanced technologies to validate all the high speed buses at ICT. At functional test, we validate each functional block of the design. When the subassemblies come together at system test, we have very high confidence in quality of each, and focus on testing the interconnects of those subassemblies. We believe this provides better overall test coverage of the system.

Here's a brief summary of the subassembly and system testing:

PCM's

- All external I/O ports are thoroughly tested as well as all the internal buses. PCIe buses are placed under heavy stress test as these are the back-bones of the controller architecture.
- Entire physical memory is tested using 2 advanced algorithms.
- Service processor functionality is heavily exercised during PCM testing.
- PCM functional testing ranges from 50-90min depending on platform as I/O and memory have impact on test time.

System Chassis

- Data paths between all controllers (and all internal drives if applicable) heavily exercised.
- Fan control is exercised.
- Chassis functional testing ranges from 25-40min depending on model.

OSSG Storage Shelves

- Full functionality of the controller is tested.
- All data paths to drives are exercised for 4hrs. The health of each drive is carefully examined at the end of the 4hr drive I/O test.
- Drives are shipped integrated in the storage chassis; exceptions are DS4486, DS460C.

HSG Storage Systems

- Full functionality of the controller is tested.
- All data paths to drives are exercised.
- Drives are exercised for 1hr in test fixture. The health of each drive is carefully examined at the end of the drive I/O test.
- Drives are shipped integrated in the storage chassis; exceptions are Wembley and Trafford based systems.

System Level Test

- Interfaces between PCM's and chassis are tested.
- Interfaces between PCM and storage shelves are tested.
- Basic functionality of system as configured is tested.

Revision History

Revision	Date	Comment
1.0	September 2016	Initial release
1.1	September 2016	Version from editorial review posted
1.2	September 2016	Added information about NVE in section 4 Updated table 11 with maximum FAS2620 SSD configurations
1.3	December 2016	Removed 1TB NVMe Flash Cache from FRU table Added FlexGroup and TPM support in section 4 Updated table 11 to show max 144 SSDs Added FAS2620 details to section 7 Clarified which shelves can be ordered with FAS2600 in table 15
1.4	February 2017	Added support info about mixing GbE and 10GbE SFP+ on UTA2 ports Added links to the NVMEM battery MSDS Added link to RAID-TEC demo video Added DS460C support Added more details about TPM and OKM Added link to the Controller Upgrade Express Guide Added best practice information to connect SAS ports if no external storage Added design considerations for lithium-ion batteries to prevent potential fire issues Added SAS cable length issues with copper cables
1.5	April 2017	Added question in section seven about Energy Star rating Added command to monitor cluster interconnect traffic in section five Added appendix on system validation and quality assurance Added information about external shelf supported configurations in section six Added conversion to shelf is supported on both FAS2620 and FAS2650 in section six Updated SFP+ information in appendix eight Updated max shelves in a stack in section six
1.6	May 2017	Added information about ADP in section six on storage

Refer to the [Interoperability Matrix Tool \(IMT\)](#) on the NetApp Support site to validate that the exact product and feature versions described in this document are supported for your specific environment. The NetApp IMT defines the product components and versions that can be used to construct configurations that are supported by NetApp. Specific results depend on each customer's installation in accordance with published specifications.

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