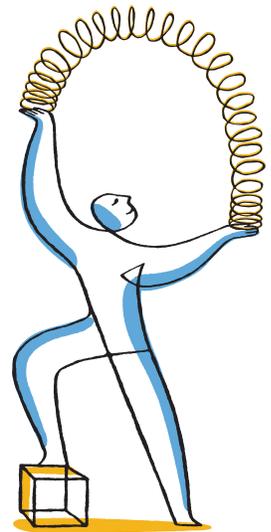




NetApp®

Datasheet

Disk Shelves, Storage Media, and Cabling for FAS and V-Series Systems



KEY FEATURES

High Availability and Resiliency

Full redundancy, multipath connections, out-of-band management, and advanced analytics are standard.

Integrated Flash SSD Support

Choose full solid-state disk (SSD) configurations or mix SSD and HDD to combine the performance of flash with the capacity of hard disks.

Industry-First Optical SAS Connectivity

Deliver high-performance, low-latency SAS connections across distances up to 500 meters for enhanced flexibility and resilience.

Flexibility to Optimize Storage for a Variety of Needs

NetApp® FAS disk shelves and storage media give you flexibility to optimize for high performance or high capacity or to strike a balance.

Greater Simplicity

The same media and disk shelves work for all NetApp FAS and V-Series systems so you can upgrade controllers and keep shelves and media in place.

The Challenge

Provide reliability and flexibility to support a broad set of application needs

Addressing the performance, capacity, and density needs of different applications can be a tricky balancing act, especially in shared virtual infrastructures in which the supported workloads can change quickly and without significant lead-time.

Storage administrators must constantly think ahead so that their architecture is highly available, contains the right mix of HDD and SSD storage, and delivers the necessary data security to address the changing requirements of modern IT deployments—including the cloud.

Acquiring and supporting separate storage systems for each workload can quickly exhaust your available budget, staff, and resources. Add to this the ever-present need to optimize power, cooling, and floor space utilization, and it's clear that storage hardware needs to be more flexible than ever.

The Solution

Leading flexibility, performance, connectivity, and cross-platform leverage from NetApp

Designed for the most demanding environments, the NetApp FAS architecture offers a high degree of flexibility and

choice in supported disk shelves and storage media. From high-capacity HDD to ultraperformance SSDs to self-encrypting drives, NetApp delivers the right drive technology to meet your specific capacity, density, performance, and security needs.

Our selection of disk shelves lets you optimize for capacity, performance density, or versatility. You can attach different types of disk shelves to a single storage system to satisfy diverse requirements without needing to deploy new storage systems, making your infrastructure more agile and more responsive to your business needs. Industry-first optical SAS delivers high-performance, low-latency connectivity—between controllers and shelves—across extended data center distances for enhanced flexibility and resilience.

NetApp is a proven leader in the use of flash technology to optimize storage cost and performance. NetApp Flash Pool™ intelligent caching technology combines HDD and SSD, caching “hot” data to SSDs in real time to accelerate performance. All-SSD shelves provide the highest performance for persistent storage.



Figure 1) The DS4243, DS4246, and DS4486 disk shelves.



Figure 2) The DS2246 disk shelf.

The NetApp family of disk shelves delivers the enterprise-class resiliency and availability that you expect from the NetApp Data ONTAP® operating system, the world's #1 storage operating system.¹

Plus, the same drives and shelves work across all FAS and V-Series platforms with nondisruptive controller upgrades for the utmost in flexibility. All shelves and media are supported in clustered Data ONTAP² configurations.

Highly Resilient and Available

NetApp disk shelves are deployed using multipath high availability with storage controller pairs to improve overall system availability.

- Full redundancy, including fans and power supplies, is standard in disk shelf designs.
- Alternate control path provides out-of-band management connections to each disk shelf.
- NetApp RAID-DP® technology offers superior data protection and performance over traditional RAID implementations.

- Maintenance Center performs proactive health monitoring of drives and distinguishes between transient events and real underlying issues based on drive diagnostics.

Industry-First Optical SAS Connectivity

Designed to streamline deployment and give you more freedom in where you place storage, NetApp is the first to deliver optical SAS connectivity for an easy-to-use, direct-connect solution capable of spanning distances up to 500 meters for enhanced flexibility and resilience.

In busy data centers, finding free rack space where you need it can be a challenge. With optical SAS you can add disk shelves to your existing NetApp storage with less concern for distance limitations. Now your expansion storage can be located many aisles away or on another floor. Optical SAS also greatly simplifies the deployment of NetApp MetroCluster™ technology for separation distances up to 500M.

NetApp optical SAS cabling:

- Enables 4-lane 6Gb/s optical SAS connectivity

- Uses existing QSFP connectors—requires no additional hardware
- Supports both Multimode (OM4) and Single-Mode (OS1) optical fiber types
- Is compatible with existing optical patch panel infrastructure

Refer to Table 3 for details on available cabling options.

Optimize Performance and Capacity

Many workloads are characterized by a large dataset with a small working set of active data that tends to change unpredictably. Previously, you had to choose between storage media that optimized for performance or optimized for cost. Now it's possible to optimize for both.

With Flash Pool technology, NetApp supports the combination of HDDs and SSDs in a single aggregate to dynamically cache random read and write operations, accelerating throughput while minimizing latency. Flash Pool takes advantage of the latency and throughput benefits of SSDs while maintaining the mass storage capacity of HDDs.

1. Source: NetApp internal estimates of revenue and storage capacity in the worldwide open-networked storage market, as of June 2012. VNX, VNXe, and Celerra NS can run any Flare or Dart operating system. The contribution of these products to the OS share has been estimated based on the proportion of NAS and SAN installations in these products (NAS – Dart; SAN – Flare).
 2. For details about Data ONTAP, see www.netapp.com/us/media/ds-3231-0412.pdf.

| SELECTION CRITERIA | STORAGE MEDIA | DISK SHELF |
|--|------------------------------------|----------------|
| • Performance density | Performance (10K RPM) density HDDs | DS2246 |
| • Best performance with hard disk drives | Performance (15K RPM) HDDs | DS4243 |
| • Maximum capacity | High-capacity (7.2K RPM) HDDs | DS4246 |
| • Lowest cost per gigabyte | | DS4486 |
| • Maximum storage density | | DS4486 |
| • Highest IOPS for random I/O | Ultrapformance SSDs | DS2246 |
| • Lowest latency | | |
| • Data security | Self-encrypting disk drives | DS2246 |
| • NetApp Storage Encryption | (AES-128 and AES-256) | DS4246 |
| • Flash Pool support | Pure SSD shelf | DS2246 |
| | Mixed shelf | DS2246, DS4246 |
| | SSDs + HDDs | |

Table 1) Storage media selection guide.

An existing aggregate can be converted into a Flash Pool configuration without requiring any data copying, downtime, or disruptions to data access.³

Storage Media to Meet a Variety of Needs

NetApp offers a variety of SSDs and HDDs to meet your needs, including both performance HDDs and high-capacity HDDs. These can be deployed alone or in hybrid configurations that combine HDD and flash.

Performance HDDs. Small form factor (SFF) 2.5” 10K RPM drives are the core of our performance HDD offerings. These drives offer great performance density and a variety of capacity options.

High-Capacity HDDs. You can maximize storage density and minimize cost per gigabyte by using high-capacity disk drives, deployed as secondary storage or for production workloads.

For those concerned with security, self-encrypting drives are available in both Performance and High-Capacity options.

NetApp Storage Encryption is the NetApp implementation of full-disk encryption using self-encrypting drives. All data on a drive is automatically encrypted, so you know that data at rest is protected. Key management is provided by an external appliance or software.

See Table 1, “Storage media selection guide,” to identify the right media and disk shelf options for your applications.

DS2246 disk shelf

The NetApp DS2246 is our performance-optimized disk shelf that packs 24 drives in only 2U of rack space by using SFF drives. Compared to the 4U-high DS4243 disk shelf, the DS2246 doubles the storage density, increases performance density (IOPs per rack unit) by 60%, and reduces power consumption by 30% to 50%.

DS4246 disk shelf

The NetApp DS4246 provides an ideal balance between performance and capacity. It is 4U high and supports 6Gb/sec SAS connections. It can be configured with either 24 large form factor (LFF) high-capacity disk drives or a combination of SSDs and high-capacity disk drives to support Flash Pool configurations.

DS4486 disk shelf

The capacity-optimized DS4486 holds 48 high-capacity disk drives. This disk shelf looks like the DS4246 from the front, but it is slightly longer and uses a tandem disk carrier to enclose twice as many LFF disk drives in 4U of rack space.

In contrast to many capacity-optimized disk shelves, the DS4486 can be serviced from the front, and 10 DS4486 shelves in a 42U rack weigh less than 2,000 pounds (910 kg). The rack can be supported by a raised floor in a traditional data center.

DS4243 disk shelf

The NetApp DS4243 is 4U high and supports up to 24 hard disk drives (high-capacity or high-performance) with a 3Gb/sec SAS connection.

About NetApp

NetApp creates innovative storage and data management solutions that deliver outstanding cost efficiency and accelerate business breakthroughs. Discover our passion for helping companies around the world go further, faster at www.netapp.com.

Go further, faster®

3. For details about Flash Pool technology, see www.netapp.com/us/media/ds-3345.pdf.



| SPECIFICATION | DS2246 | DS4246 | DS4486 | DS4243 |
|--|---|---|---|---|
| Rack units | 2U | 4U | 4U | 4U |
| Drives per shelf enclosure | 24 | 24 | 48 | 24 |
| Supported Drive Types (see the Shelf and Media Technical Specifications on NetApp.com for specific drive information) | | | | |
| High-capacity HDDs | | ✓ | ✓ | |
| Performance HDDs | ✓ | | | ✓ |
| Self-encrypting HDDs ⁴ | ✓ | ✓ | | |
| Ultrapformance SSDs | ✓ (Pure and mixed) ⁵ | ✓ (Mixed only) ⁵ | | |
| I/O modules | Dual 6Gb/s | Dual 6Gb/s | Dual 6Gb/s | Dual 3Gb/s |
| Optical SAS support | ✓ | ✓ | ✓ | |
| Power supplies Cooling | Dual, redundant, hot-pluggable, integrated power supply and fan assemblies | Dual, redundant, hot-pluggable, integrated power supply and fan assemblies | Quadruple redundant, hot-pluggable, integrated power supply and fan assemblies | Dual (high-capacity) or quadruple (high-performance) redundant, hot-pluggable, integrated power supply and fan assemblies |
| Drive carrier form factor | 2.5" Small form factor | 3.5" Large form factor | 3.5" Large form factor | 3.5" Large form factor |
| Drive carrier | Single drive | Single drive | Tandem drives | Single drive |
| Enclosure dimensions | Height: 3.4" (8.5 cm) Width: 19" (48.0 cm) Depth: 19.1" (48.4 cm) Weight: 49lb. (22.2kg) | Height: 7" (17.8 cm) Width: 19" (48.3 cm) Depth: 24" (61 cm) Weight: 110lb. (49.9kg) | Height: 7" (17.8 cm) Width: 19" (48.3 cm) Depth: 28" (61 cm) Weight: 160lb. (72.5kg) | Height: 7" (17.8 cm) Width: 19" (48.3 cm) Depth: 24" (61 cm) Weight: 110lb (49.9kg) |
| MetroCluster™ ⁶ support | ✓ | ✓ | | ✓ |

4. Self-encrypting HDDs adhere to standards such as AES-128, AES-256, and FIPS 140-2.

5. A "pure" SSD shelf contains SSDs only; a "mixed" shelf contains a combination of SSDs and HDDs for use by Flash Pool. Flash Pool also works in "shelf-to-shelf" configurations in which SSDs from a pure SSD shelf are combined into an aggregate with HDDs from other shelves.

6. For details about MetroCluster, go to www.netapp.com/us/media/ds-2893-metrocluster-solnbrief.pdf.

Table 2) Comparison of NetApp disk shelves for FAS/V-Series storage systems (see the Shelf and Media Technical Specifications on NetApp.com for drive specifics).

| CABLE TYPE | LENGTHS | CONNECTIVITY | CONNECTOR TYPE |
|--|---|--|--|
| Multimode Active Optical Cable | 1m, 2m, 3m, 5m, 15m, 30m, 50m | Controller to shelf and shelf to shelf | QSFP to QSFP |
| Multimode Direct Cable Connect | Custom lengths up to 150m | Controller to shelf and shelf to shelf | QSFP transceivers with MPO cable |
| Multimode Optical Patch Panel Connect ⁷ | 5m and 30m Max total cable distance 150m | Controller to shelf | QSFP transceivers with MPO cable to LC, SC, or MTRJ breakout |
| Single-Mode Optical Patch Panel Connect ⁷ | 5m and 30m Max total cable distance 500m | Controller to shelf | QSFP to LC, SC, or MTRJ breakout |

7. MetroCluster configuration required.

Table 3) Optical SAS options.



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