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Datasheet

# NetApp E5600 Series

Achieve field-proven and reliable performance efficiency for modern enterprise applications

**The Challenge**
Your enterprise relies on core applications that are critical to business success. To achieve business goals, you need consistent application performance and continuous availability. To deliver value and reduce complexity, you must have proven storage systems that work with your application software. Because your operations depend on these applications, they must have greater than 99.999% availability. To reach this goal, you need proven storage that is purpose-built for hybrid storage environments.

**The Solution**
Your enterprise must have storage that can meet your performance and capacity demands without sacrificing simplicity and efficiency. That is why the NetApp E5600 system was designed with NetApp SANtricity OS adaptive caching algorithms, which address a large range of application workloads. Those workloads range from high-IOPS or bandwidth-intensive streaming applications to a mixture of workloads that deliver high-performance storage consolidation.

With fully redundant I/O paths, advanced data protection features, and extensive diagnostic capabilities, the E5600 storage systems enable you to achieve greater than 99.999% availability and provide data integrity and security.

Nearing 1 million systems shipped, NetApp E-Series technology is found in enterprise SAN application environments that support retail points of sale, web servers, billing systems, databases, and data warehouses. E-Series systems also are found in collaboration environments, media applications, sporting events, surveillance, research, backup, and simulations of all kinds. These systems can be small—for example, a system in which E-Series is the only storage in a mixed-workload environment. Or they can be some of the world's largest storage systems in database, data warehouse, or parallel file systems. It is almost impossible to get through your day without touching E-Series technology.

**Dynamic Disk Pools**
Dynamic Disk Pools (DDP) technology simplifies the management of traditional RAID groups by distributing data parity information and spare capacity across a pool of drives. The DDP technology enhances data protection by enabling faster rebuilds after a drive failure, protecting against potential data loss if additional drive failures occur. DDP dynamic rebuild technology uses every drive in the pool to rebuild a failed drive, enabling exceptional performance under failure.

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DDP technology eliminates complex RAID management. With the DDP feature, there are no idle spares to manage, and you do not need to reconfigure RAID when you expand your system. Compared with traditional RAID, DDP technology also significantly reduces the impact on performance after one or more drives fail.

A key feature of DDP technology is the capability to dynamically rebalance data across all the drives in the pool when drives are added or removed. Unlike the rigid configuration of a traditional RAID volume group, which has a fixed number of drives, the DDP feature lets you add or remove multiple drives in a single operation. DDP technology dynamically rebalances across the remaining (or additional) drives more quickly than traditional RAID does. This faster rebalancing also applies to a rebuild case. If additional drives fail, faster rebuilds on failed drives reduce the exposure window for data loss from days to minutes.

### Balanced Performance
The E5600 storage system continues the NetApp E-Series' longstanding heritage of balanced performance that is designed to support any workload. High-performance file systems and data-intensive bandwidth applications benefit from the ability of the E5600 to sustain high read and write throughput. Database-driven transactional applications benefit from the system's high IOPS and low latency. Regardless of the application workload, the E5600 is designed to support maximum performance efficiency.

### Proven Data Replication and Disaster Recovery Protection
With NetApp SANtricity Cloud Connector, you have flexible and cost-effective backup and recovery to the cloud from any E5600 Series system. With NetApp SANtricity Remote Volume Mirroring, you also have a proven and efficient disaster recovery method for maintaining access to business-critical data in site outages. Available for both FC and IP networks, SANtricity Remote Volume Mirroring provides highly available data storage across a campus, across the state, or around the world. This mirroring simplifies data replication management to meet the application service levels of both virtual and traditional environments.

### Modular Flexibility
The E5600 system offers multiple form factors and drive technology options to best meet your requirements. The ultradense 60-drive system shelf supports up to 600TB in just 4U and is optimal for environments with vast amounts of data and limited floor space. The E5624 24-drive system shelf combines low power consumption and exceptional performance density with its cost-effective 2.5-inch drives. The 12-drive shelf is a great fit for cost-conscious organizations that need both performance and capacity. All three shelves support E5600 controllers, or they can be used for expansion, helping you optimize configurations to best meet performance, capacity, and cost requirements.

### Flexible Interface Options
The E5600 supports a complete set of host or network interfaces that are designed for either direct server attach or network environments. With multiple ports per interface, the rich connectivity provides ample options and bandwidth for high throughput. The interfaces include quad-lane SAS, iSCSI, FC, and

InfiniBand to connect with and protect investments in storage networking. The InfiniBand host interface supports either the SRP or the iSER protocol for low-latency connectivity. The E5600 also supports dual FC ports and dual iSCSI ports in a single host interface card for multiprotocol connectivity and mirroring.

### Maximum Storage Density
Today's storage must keep up with continuous growth and meet the most demanding capacity requirements. The E5600 is purpose-built for capacity-intensive environments that require efficient space, power, and cooling utilization. The system's ultradense 60-drive 4U disk shelf provides industry-leading performance and space efficiency that reduce rack space by up to 60%. Its high-efficiency power supplies and intelligent design can lower power use by up to 40% and can lower cooling requirements by up to 39%.

### High Reliability: No Scheduled Downtime
The E5600 storage system delivers high-speed, continuous data access. With over 20 years of storage development behind it, the E5600 is based on a field-proven architecture that provides high reliability and greater than 99.999% availability with appropriate configurations and service plans. As part of the E-Series family, the E5600 is covered by the NetApp AutoSupport® system for proactive maintenance.

The E5600 simplifies management and enhances organizational productivity. It also keeps data accessible through redundant components, automated path failover, online administration (including online SANtricity OS and drive firmware updates), active drive recovery mechanisms, and user-directed drive data evacuation. The system's advanced protection features and extensive diagnostic capabilities deliver high levels of data integrity, including data assurance (T10-PI), to protect against silent data corruption.

### Intuitive Management
NetApp SANtricity Storage Manager software offers extensive configuration flexibility, which allows optimal performance tuning and complete control over data placement. SANtricity software supports dynamic expansion, reconfigurations, and maintenance without interrupting storage system I/O.

### Application Integration
NetApp E-Series products are optimal for today's standard application environments, such as VMware and Microsoft Exchange, and for databases, such as Oracle databases and Microsoft SQL Server. They are also excellent for the growing open-source big data applications such as NoSQL databases, including Couchbase, MongoDB, Hadoop, and Splunk, and for software-defined data center initiatives such as OpenStack and Ceph. Because of its configurable options, the system integrates with any environment. The E-Series also meets the reliability and sustained performance demands of transactional applications, in which sustaining performance is critical.

The NetApp SANtricity Plug-Ins for Microsoft, VMware, Splunk, and Nagios environments provide a consolidated view of the NetApp E-Series systems. This view enables you to monitor and manage your NetApp E-Series storage from the application.

# E5600 TECHNICAL SPECIFICATIONS

All the data in the following table applies to dual-controller configurations.

| | E5660 (DE6600) | E5624 (DE5600) | E5612 (DE1600) |
|---|---|---|---|
| Form factor | 4U/60 drives (both 2.5" and 3.5") | 2U/24 drives (2.5") | 2U/12 drives (3.5") |
| Maximum raw capacity | 600TB<br>3.8PB with expansion shelves<br>(using 10TB drives) | 76.8TB (using 3.2TB SSDs)<br>3.7PB with expansion shelves<br>(using 10TB drives) | 120TB<br>3.8PB with expansion shelves<br>(using 10TB drives) |
| Maximum drives[1] | 360 with 60-drive shelves<br>384 with mixed shelves<br>120 SSDs (25 SSDs per 60-drive shelf) | 384<br>120 SSDs | 192 with 12-drive shelves<br>384 with mixed shelves |
| Drives supported | 4/6TB NL-SAS 7.2K FDE/non-FDE<br>8/10TB NL-SAS 7.2K non-FDE<br>6/10TB NL-SAS 7.2K FIPS<br>900GB 1.2/1.8TB SAS 10K FDE/non-FDE<br>1.8TB SAS 10K FIPS<br>800GB, 1.6/3.2TB SSD non-FDE<br>800GB SSD FDE<br>1.6TB SSD FIPS | 900GB, 1.2/1.8TB SAS 10K FDE/non-FDE<br>1.8TB SAS 10K FIPS<br>800GB, 1.6/3.2TB SSD non-FDE<br>800GB SSD FDE<br>1.6TB SSD FIPS | 4/6TB NL-SAS 7.2K FDE/non-FDE<br>8/10TB NL-SAS 7.2K non-FDE<br>6/10TB NL-SAS 7.2K FIPS |
| DC power | Not available | Available Option | Available Option |
| System memory | 24GB/96GB[2] | | |
| Host I/O ports | 8-port 12Gb SAS<br>8-port 10Gb iSCSI<br>Optical 8-port 16Gb FC<br>4-port 56Gb (FDR) InfiniBand | | |
| Operating system and system management | SANtricity OS 8.30<br>SANtricity Storage Manager 11.30 | | |
| High-availability features | Dual active controller with automated I/O path failover<br>Auto–load balancing and path connectivity monitoring<br>Dynamic Disk Pools technology and traditional RAID levels 0, 1, 5, 6, and 10<br>Redundant, hot-swappable storage controllers, drives, power supplies, and fans<br>Automatic rebuild after a drive failure<br>Mirrored data cache with battery-backed destage to flash<br>Proactive drive health monitoring that identifies problems before they create issues | | |
| Host operating systems | Microsoft Windows Server, Red Hat Enterprise Linux, Novell SUSE Linux Enterprise Server, Apple macOS, Oracle Solaris, HPE HP-UX, CentOS Linux, Oracle Enterprise Linux, IBM AIX, VMware ESX | | |
| Included software features | SANtricity synchronous and asynchronous mirroring<br>SANtricity volume copy<br>SANtricity Cloud Connector<br>SANtricity Snapshot™ copies<br>SANtricity SSD cache<br>SANtricity thin provisioning<br>Dynamic Disk Pools | | |
| Optional software feature | SANtricity drive encryption | | |
| System capabilities | Data assurance (T10-PI)<br>Dynamic volume expansion<br>Dynamic capacity expansion and contraction<br>Dynamic RAID-level migration<br>Dynamic segment-size migration<br>System event monitor<br>NetApp AutoSupport automatic support system<br>Online SANtricity OS upgrades and drive firmware upgrades<br>VMware vSphere Storage APIs—Array Integration<br>Microsoft Windows Offloaded Data Transfer | | |
| Application plug-ins[3] | NetApp SANtricity Plug-In for VMware vCenter<br>NetApp SANtricity Performance App for Splunk Enterprise<br>NetApp SANtricity Plug-In for Nagios | | |
| Open management | NetApp SANtricity OpenStack Cinder<br>NetApp SANtricity Web Services Proxy (REST and SYMbol Web)<br>NetApp PowerShell Toolkit | | |
| System maximums | Hosts/partitions: 512<br>Volumes: 2,048<br>Snapshot copies: 2,048<br>Mirrors: 128 | | |

1. All models can reach 384 drives when configured with intermixed drive shelves.
2. System memory of 96GB is available with storage arrays that have FC or iSCSI host I/O ports only.
3. Plug-ins can be downloaded at no charge from mysupport.netapp.com.

| DIMENSIONS AND WEIGHT | E5660 SYSTEM SHELF DE6600 DISK SHELF | E5624 SYSTEM SHELF DE5600 DISK SHELF | E5612 SYSTEM SHELF DE1600 DISK SHELF |
|---|---|---|---|
| Height | 7.0" (17.78cm) | 3.47" (8.81cm) | 3.4" (8.64cm) |
| Width | 19" (48.26cm) | 19" (48.26cm) | 19" (48.26cm) |
| Depth | 32.5" (82.55cm) | 19.6" (49.78cm) | 21.75" (55.25cm) |
| Weight[4] | **E5660:** 240.7lb (109.2kg) **DE6600:** 235.6lb (106.6kg) | **E5624:** 63.2lb (28.7kg) **DE5600:** 57.5lb (26.8kg) | **E5612:** 65.3lb (29.6kg) **DE1600:** 59.6lb (27.4kg) |

| POWER[4] | E5660 SYSTEM SHELF[5] | | E5624 SYSTEM SHELF[6] | | E5612 SYSTEM SHELF[6] | |
|---|---|---|---|---|---|---|
| | **Typical** | **Maximum** | **Typical** | **Maximum** | **Typical** | **Maximum** |
| kVA | 1.115 | 1.325 | 0.550 | 0.700 | 0.475 | 0.625 |
| Watts | 1,104 | 1,312 | 544 | 693 | 470 | 619 |
| BTU | 3,767 | 4,475 | 1,857 | 2,364 | 1,605 | 2,111 |

| POWER[4] | DE6600 DISK SHELF[5] | | DE5600 DISK SHELF[6] | | DE1600 DISK SHELF[6] | |
|---|---|---|---|---|---|---|
| | **Typical** | **Maximum** | **Typical** | **Maximum** | **Typical** | **Maximum** |
| kVA | 0.801 | 1.011 | 0.250 | 0.400 | 0.175 | 0.325 |
| Watts | 793 | 1,001 | 248 | 396 | 174 | 322 |
| BTU | 2,707 | 3,415 | 845 | 1,532 | 593 | 1,099 |

4. E5660, DE6600, E5612, and DE1600 weight and power numbers are based on 6TB/8TB NL-SAS drives.
5. The E5660 and D6600 nominal voltage range is between 200VAC and 240VAC.
6. The E5612, E5624, DE1600, and DE5600 nominal voltage range is between 100VAC and 240VAC.

Having such integration reduces the total cost of ownership by eliminating the need to manually compile critical information from several different tools. This benefit streamlines the correlation of configuration and performance problems across the entire set of IT components.

## Disk Encryption (Licensed)

SANtricity encryption combines local key management with drive-level encryption to enable comprehensive security for data at rest without sacrificing performance or ease of use. Because all drives eventually leave the data center through redeployment, retirement, or service, it is reassuring to know that your sensitive data is not leaving with them. SANtricity also supports FIPS-certified hard drives for security-sensitive customers.

## SSD Cache

The SSD cache feature provides intelligent analytics-based caching capability for read-intensive workloads. Hot data is cached by using higher-performance, lower-latency solid-state drives (SSDs) in the drive shelves. You don't need to set up complicated policies to define the trigger for data movement between tiers—you can simply set it and forget it. SSD cache is expandable to up to 5TB per storage system.

## DevOps-Ready System

To enable the automation and agility that are needed in the DevOps-based IT revolution, E5600 supports a REST-based web services proxy along with Java and Python client libraries. Modules for Puppet, Chef, and Ansible are available for open-source orchestration and configuration management. And for easy integration and automation in traditional IT and Windows ecosystems, E5600 also supports Windows PowerShell and Storage Management Initiative Specification (SMI-S) 1.6.

## ENERGY STAR Certification

All E-Series systems use "85% PLUS" power supplies, exceeding the EPA ENERGY STAR requirements of 80% efficiency. For the latest EPA ENERGY STAR–certified E-Series configurations, see www.netapp.com/us/company/ourstory/sustainability/energy-star.aspx.

## ASHRAE Compliance

All E-Series systems meet the certification requirements of ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers), a global society that advances human well-being through sustainable technology for the built environment.

- The E5612 and E5624 are ASHRAE A3 compliant.
- The E5660 is ASHRAE A2 compliant.

## About NetApp

Leading organizations worldwide count on NetApp for software, systems and services to manage and store their data. Customers value our teamwork, expertise and passion for helping them succeed now and into the future.
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