Main interface

SANtricity 11.5

NetApp
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Main interface

Interface overview

Concepts

System Manager Home page

The Home page provides a dashboard view for the daily management of your storage array. When you log into System Manager, the Home page is the first screen displayed.

The dashboard view comprises four summary areas that contain key information about the state and health of your storage array. You can find more information from the summary area.

- **Notifications**

  The Notifications area displays problem notifications that indicate the status of the storage array and its components. In addition, this portlet displays automated alerts that can help you troubleshoot issues before it affects other areas of your storage environment.

- **Performance**

  The Performance area allows you to compare and contrast resource usage over time. You can view a storage array's performance metrics for response time (IOPS), transfer rates (MiB/s), and the amount of processing capacity being used (CPU).

- **Capacity**

  The Capacity area displays a chart view of the allocated capacity, free storage capacity, and unassigned storage capacity in your storage array.

- **Storage Hierarchy**

  The Storage Hierarchy area provides an organized view of the various hardware components and storage objects managed by your storage array. Click the drop-down arrow to perform a certain action on that hardware component or storage object.

What's new in SANtricity System Manager

System Manager includes the following new features.

New features in Version 11.53

This version includes only minor enhancements and fixes.

New features in Version 11.52

New feature	Description
NVMe over FC host interface	An NVMe over Fibre Channel host connection can now be ordered for EF570 or E5700 controller models, in addition to the existing support for NVMe over RoCE and NVMe over InfiniBand. System Manager includes statistics for this new connection type in **Settings › System** under "NVMe over Fibre Channel details."

New features in Version 11.51

This version includes only minor enhancements and fixes.

New features in Version 11.50

New feature	Description
NVMe over RoCE interface	An NVMe over RoCE host connection can now be ordered for EF570 or E5700 DE Series controllers. System Manager includes new functions for configuring the network connection to the host (available from the Hardware page or from **Settings › System**, and functions for viewing data about the NVMe over RoCE connections to the storage array (available from **Support › Support Center** or from **Settings › System**.
Manual drive selection for volume groups	In addition to convenient automatic selection, a new option is available for selecting individual drives when you create a volume group. In general, automatic drive selection is recommended, but the individual drive selection option is available for environments with special drive location requirements.
SANtricity Unified Manager	Unified Manager is a separately installed, browser-based application that discovers and manages E2800 series controllers and E5700 series controllers. While this new application is not a new feature of System Manager, it does provide a new browser-based enterprise framework from which System Manager can be launched for discovered storage arrays. The new Unified Manager can be downloaded from the Support software downloads area.

Setup wizard

Concepts

Setup wizard overview

Use the Setup wizard to configure your storage array, including hardware, hosts, applications, workloads, pools, alerts, and AutoSupport.

When you open System Manager for the first time, the Setup wizard launches.

The Setup wizard prompts you to perform basic configuration tasks, such as naming your storage array, configuring your hosts, selecting applications, and creating pools of storage.

If you cancel the wizard, you cannot manually relaunch it.

The wizard automatically relaunches when you open System Manager or refresh your browser and *at least one* of the following conditions is met:

- No pools and volume groups are detected.
- No workloads are detected.
- No notifications are configured.

Setup wizard terminology

Learn how the Setup wizard terms apply to your storage array.

Term	Description
Application	An application is a software program, such as Microsoft SQL Server or Microsoft Exchange.
Alert	Alerts notify administrators about important events that occur on the storage arrays. Alerts can be sent via email, SNMP traps, or syslog.
AutoSupport	The AutoSupport feature monitors the health of a storage array and sends automatic dispatches to technical support.
Hardware	The storage system hardware includes storage arrays, controllers, and drives.
Host	A host is a server that sends I/O to a volume on a storage array.
Object	An object is any logical or physical storage component. Logical objects include volume groups, pools, and volumes. Physical objects include the storage array, array controllers, hosts, and drives.

Term	Description
Pool	A pool is a set of drives that is logically grouped. You can use a pool to create one or more volumes accessible to a host. (You create volumes from either a pool or a volume group.)
Volume	A volume is a container in which applications, databases, and file systems store data. It is the logical component created for the host to access storage on the storage array. A volume is created from the capacity available in a pool or a volume group. A volume has a defined capacity. Although a volume might consist of more than one drive, a volume appears as one logical component to the host.
Volume group	A volume group is a container for volumes with shared characteristics. A volume group has a defined capacity and RAID level. You can use a volume group to create one or more volumes accessible to a host. (You create volumes from either a volume group or a pool.)
Workload	A workload is a storage object that supports an application. You can define one or more workloads, or instances, per application. For some applications, System Manager configures the workload to contain volumes with similar underlying volume characteristics. These volume characteristics are optimized based on the type of application the workload supports. For example, if you create a workload that supports a Microsoft SQL Server application and then subsequently create volumes for that workload, the underlying volume characteristics are optimized to support Microsoft SQL Server.

FAQs

What if I don’t see all of my hardware components?

If you do not see all your hardware components on the **Verify hardware** dialog box, it could mean that a drive shelf is not connected correctly, or that an incompatible shelf is installed in the storage array.

Verify that all drive shelves are connected correctly. If you are uncertain about which drive shelves are compatible, contact technical support.

What if I don’t see all of my hosts?

If you do not see your connected hosts, then automatic detection has failed, the hosts are improperly connected, or no hosts are currently connected.

You can configure hosts later, once you are done with the setup. You can create hosts either automatically or manually as follows:

- If you installed the Host Context Agent (HCA) on your hosts, the HCA pushes the host configuration information to the storage array. System Manager automatically configures these hosts and displays them in the **Initial Setup** wizard.
- You can manually create hosts and associate the appropriate host port identifiers by going to **Storage › Hosts**. Hosts that have been created manually also display in the **Initial Setup** wizard.
- The target and host must be configured for the host port type (for example, iSCSI or NVMe over InfiniBand), and a session to the storage established before automatic detection will work.

How do I know which host operating system type is correct?

The Host Operating System Type field contains the operating system of the host. You can select the recommended host type from the drop-down list or allow the Host Context Agent (HCA) to configure the host and appropriate host operating system type.

Host Operating System type	Operating System (OS) and multipath driver
AIX MPIO	The Advanced Interactive Executive (AIX) OS and the native MPIO driver
AVT_4M	Silicon Graphics, Inc. (SGI) proprietary multipath driver; refer to the SGI installation documentation for more information
Factory Default	This is reserved for the initial startup of the storage array and should be changed to match the host operating system and multipath driver being used for the particular host
HP-UX	The HP-UX OS with native multipath driver
Linux (ATTO)	The Linux OS and the ATTO Technology, Inc. driver (must use ATTO FC HBAs)
Linux (DM-MP)	The Linux OS and the native DM-MP driver
Linux (Pathmanager)	The Linux OS and the SGI proprietary multipath driver; refer to the SGI installation documentation for more information
Mac OS	The Mac OS and the ATTO Technology, Inc. driver

Host Operating System type	Operating System (OS) and multipath driver
ONTAP	FlexArray
Solaris (version 11 or later)	The Solaris 11 or later OS and the native MPxIO driver
Solaris (version 10 or earlier)	The Solaris 10 or earlier OS and the native MPxIO driver
SVC	IBM SAN Volume Controller
VMware	The ESXi OS
Windows or Windows Clustered	The Windows Server OS and Windows MPIO with a DSM driver
Windows (ATTO)	The Windows OS and the ATTO Technology, Inc. driver

After the HCA is installed and the storage is attached to the host, the HCA sends the host topology to the storage controllers through the I/O path. Based on the host topology, the storage controllers automatically define the host and the associated host ports, and then set the host type.

> If the HCA does not select the recommended host type, you must manually set the host type in System Manager.

How does identifying applications help me manage my storage array?

When you identify applications, System Manager automatically recommends a volume configuration that optimizes storage based on application type.

Optimizing volumes by application can make data storage operations more efficient. Characteristics such as I/O type, segment size, controller ownership, and read and write cache are included in the volume configuration. In addition, you can view performance data by application and by workload to assess the latency, IOPS, and MiB/s of applications and their associated workloads.

What is a workload?

For some applications in your network, such as SQL Server or Exchange, you can define a workload that optimizes storage for that application.

A workload is a storage object that supports an application. You can define one or more workloads, or instances, per application. For some applications, System Manager configures the workload to contain volumes with similar underlying volume characteristics. These volume characteristics are optimized based on the type of application the workload supports. For example, if you create a workload that supports a Microsoft SQL Server application and then subsequently create volumes for that workload, the underlying volume characteristics are optimized to support Microsoft SQL Server.

During volume creation, System Manager prompts you to answer questions about a workload's use. For

example, if you are creating volumes for Microsoft Exchange, you are asked how many mailboxes you need, what your average mailbox capacity requirements are, and how many copies of the database you want. System Manager uses this information to create an optimal volume configuration for you, which can be edited as needed.

How do I configure SNMP or syslog alerts?

In addition to email alerts, you can configure alerts to be sent by Simple Network Management Protocol (SNMP) traps or by syslog messages.

To configure SNMP or syslog alerts, go to **Settings › Alerts**.

How do I configure the delivery method for AutoSupport?

To access configuration tasks for AutoSupport delivery methods, go to **Support › Support Center**, and then click the AutoSupport tab.

The following protocols are supported: HTTPS, HTTP, and SMTP.

What type of data is collected through the AutoSupport feature?

The AutoSupport feature contains three standard dispatch types: event dispatches, scheduled dispatches, and on-demand and remote diagnostics dispatches.

The AutoSupport data does not contain any user data.

- **Event dispatches**

  When events occur on the system that warrant proactive notification to technical support, the AutoSupport feature automatically sends an event-triggered dispatch.

  - Sent when a support event on the managed storage array occurs.
  - Includes a comprehensive snapshot of what was going on with the storage array at the time the event occurred.
- **Scheduled dispatches**

  The AutoSupport feature automatically sends several dispatches on a regular schedule.

  - **Daily dispatches** — Sent once every day during a user-configurable time interval. Includes the current system event logs and performance data.
  - **Weekly dispatches** — Sent once every week during a user-configurable time interval and day. Includes configuration and system state information.
- **AutoSupport OnDemand and Remote Diagnostics dispatches**
  - **AutoSupport OnDemand** — Allows technical support to request retransmission of a previous AutoSupport dispatch when needed for troubleshooting an issue. All transmissions are initiated from the storage array, not from the AutoSupport server. The storage array checks in periodically with the AutoSupport server to determine if there are any pending retransmission requests and responds accordingly.
  - **Remote Diagnostics** — Allows technical support to request a new, up-to-date AutoSupport dispatch when needed for troubleshooting an issue. All transmissions are initiated from the storage array, not from the AutoSupport server. The storage array checks in periodically with the AutoSupport server to

determine if there are any pending new requests and responds accordingly.

How do I know if I should accept the recommended pool configuration?

Whether you accept the recommended pool configuration depends on a few factors.

Determine the type of storage that is best for your requirements by answering the following questions:

- Do you prefer multiple pools of smaller capacities, rather than the largest pools possible?
- Do you prefer RAID volume groups over pools?
- Do you prefer to manually provision your drives, rather than having a configuration recommended for you?

If you answered Yes to any of these questions, consider rejecting the recommended pool configuration.

System Manager has not detected any hosts. What do I do?

If you do not see your connected hosts, then automatic detection has failed, the hosts are improperly connected, or no hosts are currently connected.

You can configure hosts later, once you are done with the setup. You can create hosts either automatically or manually as follows:

- If you installed the Host Context Agent (HCA) on your hosts, the HCA pushes the host configuration information to the storage array. System Manager automatically configures these hosts and displays them in the **Initial Setup** wizard.
- You can manually create hosts and associate the appropriate host port identifiers by going to **Storage › Hosts**. Hosts that have been created manually also display in the **Initial Setup** wizard.
- The target and host must be configured for the host port type (for example, iSCSI or NVMe over InfiniBand), and a session to the storage established before automatic detection will work.

What is a hot spare drive?

Hot spares act as standby drives in RAID 1, RAID 5, or RAID 6 volume groups. They are fully functional drives that contain no data. If a drive fails in the volume group, the controller automatically reconstructs data from the failed drive to a hot spare.

If a drive fails in the storage array, the hot spare drive is automatically substituted for the failed drive without requiring a physical swap. If the hot spare drive is available when a drive fails, the controller uses redundancy data to reconstruct the data from the failed drive to the hot spare drive.

A hot spare drive is not dedicated to a specific volume group. Instead, you can use a hot spare drive for any failed drive in the storage array with the same capacity or smaller capacity. A hot spare drive must be of the same media type (HDD or SSD) as the drives that it is protecting.

> Hot spare drives are not supported with pools. Instead of hot spare drives, pools use the preservation capacity within each drive that comprises the pool.

What is a volume group?

A volume group is a container for volumes with shared characteristics. A volume group has a defined capacity and RAID level. You can use a volume group to create one or

more volumes accessible to a host. (You create volumes from either a volume group or a pool.)

What are the differences between pools and volume groups?

A pool is similar to a volume group, with the following differences.

- The data in a pool is stored randomly on all drives in the pool, unlike data in a volume group, which is stored on the same set of drives.
- A pool has less performance degradation when a drive fails, and takes less time to reconstruct.
- A pool has built-in preservation capacity; therefore, it does not require dedicated hot spare drives.
- A pool allows a large number of drives to be grouped.
- A pool does not need a specified RAID level.

Storage array administration

Concepts

Storage array overview

A storage array is a storage entity that is managed by the System Manager software. A storage array consists of a collection of both physical components and logical components.

Physical components

The physical components of a storage array are described in this table.

Component	Description
Controller	A controller consists of a board, firmware, and software. It controls the drives and implements the System Manager functions.
Shelf	A shelf is an enclosure installed in a cabinet or rack. It contains the hardware components for the storage array. There are two types of shelves: a controller shelf and a drive shelf. A controller shelf includes controllers and drives. A drive shelf includes input/output modules (IOMs) and drives. If your storage array contains different media types or different interface types, a drive shelf for each drive type appears.
Drive	A drive is an electromagnetic mechanical device that provides the physical storage media for data.

Component	Description
Host	A host is a server that sends I/O to a volume on a storage array.
Host bus adapter (HBA)	A host bus adapter (HBA) is a board that resides in a host and contains one or more host ports.
Host port	A host port is a port on a host bus adapter (HBA) that provides the physical connection to a controller and is used for I/O operations.
Management client	A management client is the computer where a browser is installed for accessing System Manager.

Logical components

The drives in the storage array provide the physical storage capacity for data. Use System Manager to configure the physical capacity into logical components, such as pools, volume groups, and volumes. These components are the tools that you use to configure, store, maintain, and preserve data on the storage array. The logical components of a storage array are described in this table.

Component	Description
Pool	A pool is a set of drives that is logically grouped. You can use a pool to create one or more volumes accessible to a host. (You create volumes from either a pool or a volume group.)
Volume group	A volume group is a container for volumes with shared characteristics. A volume group has a defined capacity and RAID level. You can use a volume group to create one or more volumes accessible to a host. (You create volumes from either a volume group or a pool.)
Volume	A volume is a container in which applications, databases, and file systems store data. It is the logical component created for the host to access storage on the storage array.
Logical unit number (LUN)	A logical unit number (LUN) is the number assigned to the address space that a host uses to access a volume. The volume is presented to the host as capacity in the form of a LUN. Each host has its own LUN address space. Therefore, the same LUN can be used by different hosts to access different volumes.

Administrator password protection

You must configure the storage array with an administrator password to protect it from unauthorized access.

Setting an administrator password

Setting an administrator password for your storage array protects it from users who unknowingly or maliciously run destructive commands. You are required to set an administrator password when you start System Manager for the first time.

There is one administrator password that is shared among all users. Any user who has this password can make configuration changes to the storage array, such as adding, changing, or removing objects or settings.

Entering your password

The system prompts you for the password only once during a single management session. A session times out after 20 minutes of inactivity, at which time, you must enter the password again.

If another user managing the same storage array from another management client changes the password while your session is in progress, you are prompted for a password the next time you attempt a configuration operation or a view operation.

For security reasons, you can attempt to enter a password only five times before the storage array enters a "lockout" state. In this state, the storage array will reject subsequent password attempts. You must wait 10 minutes for the storage array to reset to a "normal" state before you try to enter a password again.

Removing drives with password protection

The password is stored on a reserved area of each drive on the storage array. If you remove all drives from a storage array, its password will no longer work. To correct this condition, re-install one of the original drives to the storage array.

Removing password protection

If you no longer want to have commands password-protected, enter the current administrator password, and leave the new password text boxes blank.

> Running configuration commands on a storage array can cause serious damage, including data loss. For this reason, you should always set an administrator password for your storage array. Use a long administrator password with at least 15 alphanumeric characters to increase security.

Problem notification

System Manager uses icons and several other methods to notify you that problems exist with the storage array.

Icons

System Manager uses these icons to indicate the status of the storage array and its components.

Icon	Description
	Optimal
	Non-optimal or failed
	Needs attention or fixing
	Caution

System Manager displays these icons in various locations.

- The Notifications area on the Home page displays the failed icon and a message.
- The Home page icon in the navigation area displays the failed icon.
- On the Components page, the graphics for drives and controllers display the failed icon.

Alerts and LEDs

In addition, System Manager notifies you of problems in other ways.

- System Manager sends SNMP notifications or email error messages.
- The Service Action Required LEDs on the hardware come on.

When you receive notification of a problem, use the Recovery Guru to help you fix the problem. Where necessary, use the hardware documentation with the recovery steps to replace failed components.

Critical events

Critical events indicate a problem with the storage array. If you resolve the critical event immediately, you might prevent loss of data access.

When a critical event occurs, it is logged in the event log. All critical events are sent to the SNMP management console or to the email recipient that you have configured to receive alert notifications. If the shelf ID is not known at the time of the event, the shelf ID is listed as "Shelf unknown."

When you receive a critical event, refer to the Recovery Guru procedure for a detailed description of the critical event. Complete the Recovery Guru procedure to correct the critical event. To correct certain critical events, you might need to contact technical support.

Operations in progress

The Operations in Progress page allows you to view a list of long-running operations that are currently running or are in a suspended, stopped, or failed state. You can take action on certain types of operations.

Long-running operations can affect system performance. For some operations, you have the option to stop the operation or change its priority so that more important operations complete first.

Operations that appear on the Operations in Progress page include the following:

Operation	Possible status of the operation	Actions you can take
Volume copy	Completed	Clear
	In progress	• Change priority • Stop
	Pending	Clear
	Failed	• Clear • Re-copy
	Stopped	• Clear • Re-copy
Volume create (thick pool volumes larger than 64TiB only)	In progress	*none*
Volume delete (thick pool volumes larger than 64TiB only)	In progress	*none*
Asynchronous mirror group initial synchronization	In progress	Suspend
	Suspended	Resume
Synchronous mirroring	In progress	Suspend
	Suspended	Resume
Snapshot image rollback	In progress	Cancel
	Pending	Cancel
	Paused	• Cancel • Resume
Drive evacuation	In progress	Cancel (depends on the drive evacuation type)
Add capacity to pool or volume group	In progress	*none*
Change a RAID level for a volume	In progress	*none*

Operation	Possible status of the operation	Actions you can take
Reduce capacity for a pool	In progress	*none*
Thin volume reclamation	In progress	*none*
Check the time remaining on an instant availability format (IAF) operation for pool volumes	In progress	*none*
Check the data redundancy of a volume group	In progress	*none*
Defragment a volume group	In progress	*none*
Initialize a volume	In progress	*none*
Increase capacity for a volume	In progress	*none*
Change segment size for a volume	In progress	*none*
Drive copy	In progress	*none*
Data reconstruction	In progress	*none*
Copyback	In progress	*none*

How tos

Set default units for capacity values

System Manager can display capacity values in either gibibytes (GiB) or tebibytes (TiB).

About this task

Abbreviation	Value
GiB	$1{,}024^3$ bytes
TiB	$1{,}024^4$ bytes

Preferences are stored in the browser's local storage so all users can have their own settings.

Steps

1. Select **Preferences › Set preferences**.

2. Click the radio button for either **Gibibytes** or **Tebibytes**, and confirm that you want to perform the operation.

Set default time frame for performance graphs

You can change the default time frame shown by the performance graphs.

About this task

Performance graphs shown on the Home page and on the Performance page initially show a time frame of 1 hour. Preferences are stored in the browser's local storage so all users can have their own settings.

Steps

1. Select **Preferences › Set preferences**.
2. In the drop-down list, select either **5 minutes**, **1 hour**, **8 hours**, **1 day**, or **7 days**, and confirm that you want to perform the operation.

Recover from problems using Recovery Guru

The Recovery Guru is a component of System Manager that diagnoses storage array problems and recommends recovery procedures to fix the problems.

Steps

1. Select **Home**.
2. Click the link labeled **Recover from `n` problems** in the center-top of the window.

   The **Recovery Guru** dialog appears.

3. Select the first problem shown in the summary list, and then follow the instructions in the recovery procedure to correct the problem. Where necessary, use the replacement instructions to replace failed components. Repeat this step for each listed problem.

   Multiple problems within a storage array can be related. In this case, the order in which the problems are corrected can affect the outcome. Select and correct the problems in the order that they are listed in the summary list.

   Multiple failures for a power-supply canister are grouped and listed as one problem in the summary list. Multiple failures for a fan canister are also listed as one problem.

4. To make sure that the recovery procedure was successful, click **Recheck**.

   If you selected a problem for an asynchronous mirror group or a member of an asynchronous mirror group, click Clear first to clear the fault from the controller, and then click Recheck to remove the event from the Recovery Guru.

   If all of the problems have been corrected, the storage array icon eventually transitions from Needs Attention to Optimal. For some problems, a Fixing icon appears while an operation, such as reconstruction, is in progress.

5. **Optional:** To save the Recovery Guru information to a file, click the **Save** icon.

   The file is saved in the Downloads folder for your browser with the name `recovery-guru-failure-yyyy-mm-dd-hh-mm-ss-mmm.html`.

6. **Optional:** To print the Recovery Guru information, click the **Print** icon.

View and act on operations in progress

To view and take action on long-running operations, use the Operations in Progress page.

About this task

For each operation listed on the Operations in Progress page, a percentage of completion and estimated time remaining to complete the operation are shown. In some cases, you can stop an operation or place it at a higher or lower priority. You can also clear a completed Volume copy operation from the list.

Steps

1. On the **Home** page, select **Show operations in progress**.

   The Operations in Progress page appears.

2. If desired, use the links in the **Actions** column to stop or change priority for an operation.

   > Read all cautionary text provided in the dialog boxes, particularly when stopping an operation.

   You can stop a volume copy operation or change its priority.

3. Once a volume copy operation is complete, you can select **Clear** to remove it from the list.

   At the top of the Home page, an informational message and yellow wrench icon appear when an operation is complete. This message includes a link that allows you to clear the operation from the Operations in Progress page.

FAQs

Where can I find more information about display preferences?

You can find information about the available display options in the following help topics.

- To read more about the default units for displaying capacity values, see Set default units for capacity values.
- To read more about the default time frame for displaying performance graphs, see Set default time frame for performance graphs.

What are the supported browsers?

System Manager supports these browser versions.

Browser	Minimum version
Google Chrome	47
Microsoft Internet Explorer	11

Browser	Minimum version
Microsoft Edge	EdgeHTML 12
Mozilla Firefox	31
Safari	9

What are the keyboard shortcuts?

You can navigate around System Manager using the keyboard alone.

Overall navigation

Action	Keyboard shortcut
Move to the next item.	Tab
Move to the previous item.	Shift + Tab
Select an item.	Enter
Drop-down list—Move to the next or previous item.	Down arrow or up arrow
Check box—Select an item.	Spacebar
Radio buttons—Toggle between items.	Down arrow or up arrow
Expandable text—Expand or contract item.	Enter

Table navigation

Action	Keyboard shortcut
Select a row.	Tab to select a row, then press Enter
Scroll up or down.	Down arrow/up arrow or Page Down/Page Up
Change the sort order of a column.	Tab to select a column heading, then press Enter

Calendar navigation

Action	Keyboard shortcut
Move to the previous month.	Page Up

Action	Keyboard shortcut
Move to the next month.	Page Down
Move to the previous year.	Control + Page Up
Move to the next year.	Control + Page Down
Open the date picker if closed.	Control + Home
Move to the current month.	Control / Command + Home
Move to the previous day.	Control / Command + Left
Move to the next day.	Control / Command + Right
Move to the previous week.	Control / Command + Up
Move to the next week.	Control / Command + Down
Select the focused date.	Enter
Close the date picker and erase the date.	Control / Command + End
Close the date picker without selection.	Escape