NetApp

Shelves

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Hardware page overview

The Hardware page provides a graphical depiction of the storage array's physical components. From here, you can check component status and perform some functions related to those components.

Shelves

A shelf is a component that contains the hardware for the storage array (controllers, power/fan canisters, and drives). There are two types of shelves:

- **Controller shelf** — Contains the drives, power/fan canisters, and controllers. A controller can be a simplex configuration (one controller) or a duplex configuration (two controllers).

- **Drive shelf** (or **expansion shelf**) — Contains drives, power/fan canisters, and two input/output modules (IOMs). The IOMs, also known as environmental service modules (ESMs), include SAS ports that connect the drive shelf to the controller shelf.

Shelves are available in three sizes for housing up to 12, 24, or 60 drives. Each shelf includes an ID number, which is assigned by the controller firmware. The ID appears on the upper left of the shelf view.

The shelf view on the Hardware page shows the front or back components. You can switch between the two views by selecting either **Show back of shelf** or **Show front of shelf** from the upper right of the shelf view. You can also select **Show all front** or **Show all back** from the bottom of the page. The front and back views show the following:

- **Front components** — Drives and empty drive bays.
- **Back components** — Controllers and power/fan canisters (for controller shelves) or the IOMs and power/fan canisters (for drive shelves).

You can perform the following functions related to shelves:

- Turn on the shelf 's locator light, so you can find the physical location of the shelf in the cabinet or rack.
- Change the ID number shown in the upper left of the shelf view.
- View the shelf settings, such as the types of drives installed and the serial number.
- Move the shelf views up or down to match the physical layout in the storage array.

Controllers

A controller is the combined hardware and firmware that implements storage array and management functions. It includes the cache memory, drive support, and host-interface support (SAS, FC, iSCSI).

You can perform the following functions related to controllers:

- Configure the management ports for IP addresses and speed.
- Configure iSCSI host connections (if you have iSCSI hosts).

- Configure a Network Time Protocol (NTP) server and a Domain Name System (DNS) server.

- View controller status and settings.

- Allow users from outside the local area network to start an SSH session and change settings on the controller.

- Place the controller offline, online, or in service mode.

Drives

The storage array can include hard disk drives (HDDs) or solid state drives (SSDs). Depending on the shelf size, up to 12, 24, or 60 drives can be installed in the shelf.

You can perform the following functions related to drives:

- Turn on the drive's locator light, so you can find the physical location of the drive in the shelf.

- View drive status and settings.

- Re-assign a drive (logically replace a failed drive with an unassigned drive), and manually reconstruct the drive if necessary.

- Manually fail a drive so you can replace it. (Failing a drive allows you to copy the drive's contents before you replace it.)

- Assign or unassign hot spares.

- Erase secure-enabled drives.

Hardware terminology

Learn how the hardware terms apply to your storage array.

Component	Description
Storage array	A storage array includes the shelves, controllers, drives, software, and firmware.
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.
Controller	A controller consists of a board, firmware, and software. It controls the drives and implements the System Manager functions.
Drive	A drive is an electromagnetic mechanical device that provides the physical storage media for data.
Bay	A bay is a slot in the shelf where a drive or other component is installed.

Component	Description
Drive shelf	A drive shelf, also called an expansion shelf, contains a set of drives and two input/output modules (IOMs). The IOMs contain SAS ports that connect a drive shelf to a controller shelf or to other drive shelves.
Controller shelf	A controller shelf contains a set of drives and one or more controller canisters. A controller canister holds the controllers, host interface cards (HICs), and batteries.
Power/fan canister	A power/fan canister is an assembly that slides into a shelf. It includes a power supply and an integrated fan.
IOM (ESM)	An IOM is an input/output module that includes SAS ports for connecting the drive shelf to the controller shelf. (i) In previous controller models, the IOM was referred to as an environmental service module (ESM).
SFP	An SFP is a Small Form-factor Pluggable (SFP) transceiver.

How tos

View hardware components

The Hardware page provides sorting and filtering functions that make it easier to find components.

Steps

1. Select **Hardware**.
2. Use the functions described in the following table to view hardware components.

Function	Description
Front and back shelf views	To switch between front and back shelf views, select either **Show back of shelf** or **Show front of shelf** from the far right (the link that appears depends on the current view). The front view shows drives and any empty drive bays. The back view shows the controllers, and any IOM (ESM) modules, power/fan canisters, or empty controller bays. At the bottom of the page, you can also select Show all front or Show all back.
Drive view filters	If the storage array contains drives with different types of physical and logical attributes, the **Hardware** page includes drive view filters. These filter fields help you quickly locate specific drives by limiting the drive types displayed on the page. Under Show drives that are…, click the filter field on the left (by default, shows Any drive type) to see a drop-down list of physical attributes (for example, capacity and speed). Click the filter field on the right (by default, shows Anywhere in the storage array) to see a drop-down list of logical attributes (for example, volume group assignment). You can use these filters together or separately. (i) If the storage array contains drives that all share the same physical attributes, the Any drive type field on the left does not appear. If the drives are all in the same logical location, the Anywhere in the storage array field on the right does not appear.
Legend	The components are displayed in certain colors to depict their role states. To expand and collapse the descriptions of these states, click **Legend**.
Show status icon details	The status indicators can include text descriptions for availability states. Click **Show status icon details** to show or hide this status text.
Shelf/shelf icons	Each shelf view provides a list of related commands, along with properties and status. Click **Shelf** to see a drop-down list of commands. You can also select one of the icons along the top to see status and properties for individual components: controllers, IOMs (ESMs), power supplies, fans, temperature, batteries, and SFPs.

Function	Description
Shelf order	The shelves can be rearranged on the **Hardware** page. Use the up and down arrows on the top right of each shelf view to change the top/bottom order of shelves.

Show or hide component status

You can display status descriptions for drives, controllers, fans, and power supplies.

Steps

1. Select **Hardware**.

2. To see either the back or front components:

   - If you want to see the controller and power/fan canister components, but the drives are displayed, click **Show back of shelf**.

   - If you want to see the drives, but the controller and power/fan canister components are displayed, click **Show front of shelf**.

3. To view or hide pop-over status descriptions:

   - If you want to see a pop-over description of the status icons, click Show status icon details at the upper right of the shelf view (select the check box).

   - To hide the pop-over descriptions, click **Show status icon details** again (clear the check box).

4. If you want to see full status details, select the component in the shelf view, and then select **View settings**.

5. If you want to view the descriptions of the colored components, select **Legend**.

Switch between front and back views

The Hardware page can show either the front view or the back view of the shelves.

About this task

The back view shows the controllers/IOMs and the power-fan canisters. The front view shows the drives.

Steps

1. Select **Hardware**.

2. If the graphic shows the drives, click **Show back of shelf**.

   The graphic changes to show the controllers instead of the drives.

3. If the graphic shows the controllers, click **Show front of shelf**.

   The graphic changes to show the drives instead of the controllers.

4. **Optional:** you can select **Show all front** or **Show all back**, located at the bottom of the page.

Change view order of shelves

You can change the order of shelves displayed on the Hardware page to match the

physical order of shelves in a cabinet.

Steps

1. Select **Hardware**.

2. From the top right of a shelf view, select the up or down arrows to rearrange the order of shelves shown on the **Hardware** page.

Turn on shelf locator light

To find the physical location of a shelf shown on the Hardware page, you can turn on the shelf's locator light.

Steps

1. Select **Hardware**.

2. Select the drop-down list for the Controller Shelf or Drive Shelf, and then select **Turn on locator light**.

   The locator light for the shelf turns on.

3. When you have physically located the shelf, return to the dialog box and select **Turn off**.

Change shelf IDs

The shelf ID is a number that uniquely identifies a shelf in the storage array. Shelves are numbered consecutively, beginning with either 00 or 01, on the top left of each shelf view.

About this task

The controller firmware automatically assigns the shelf ID, but you can change that number if you want to create a different ordering scheme.

Steps

1. Select **Hardware**.

2. Select the drop-down list for the Controller Shelf or Drive Shelf, and then select **Change ID**.

3. In the **Change Shelf ID** dialog box, select the drop-down list to display available numbers.

   This dialog box does not display IDs currently assigned to active shelves.

4. Select an available number, and then click **Save**.

   Depending on the number you selected, the shelf order may be rearranged on the **Hardware** page. If desired, you can use the up/down arrows on the top right of each shelf to readjust the order.

View shelf component status and settings

The Hardware page provides status and settings for shelf components, including the power supplies, fans, and batteries.

About this task

The available components depend on the type of shelf:

- **Drive shelf** — Contains a set of drives, power/fan canisters, input/output modules (IOMs), and other supporting components in a single shelf.
- **Controller shelf** — Contains a set of drives, one or two controller canisters, power/fan canisters, and other supporting components in a single shelf.

Steps

1. Select **Hardware**.
2. Select the drop-down list for the Controller Shelf or Drive Shelf, and then select **View Settings**.

   The **Shelf Components Settings** dialog box opens, with tabs that show the status and settings related to the shelf components. Depending on the type of shelf selected, some tabs described in the table might not appear.

Tab	Description
Shelf	The Shelf tab shows the following properties: • **Shelf ID** — Uniquely identifies a shelf in the storage array. The controller firmware assigns this number, but you can change it by selecting **Shelf › Change ID**. • **Shelf path redundancy** — Specifies whether connections between the shelf and the controller have alternate methods in place (Yes) or not (No). • **Current drive types** — Shows the type of technology built into the drives (for example, a SAS drive that is secure-capable). If there is more than one drive type, both technologies are shown. • **Serial number** — Shows the serial number of the shelf.

Tab	Description
IOMs (ESMs)	The **IOMs (ESMs)** tab shows status of the input/output module (IOM), which is also called an environmental service module (ESM). It monitors the status of the components in a drive shelf and serves as the connection point between the drive tray and the controller. Status can be Optimal, Failed, Optimal (Miswire), or Uncertified. Other information includes the firmware version and the configuration settings version. Select Show more settings to see the maximum and current data rates, and the state of the card communication (either Yes or No). (i) You can also view this status by selecting the IOM icon, next to the Shelf drop-down list.
Power Supplies	The **Power Supplies** tab shows the status of the power supply canister and the power supply itself. Status can be Optimal, Failed, Removed, or Unknown. It also shows the part number of the power supply. (i) You can also view this status by selecting the Power Supply icon, next to the Shelf drop-down list.
Fans	The **Fans** tab shows the status of the fan canister and the fan itself. Status can be Optimal, Failed, Removed, or Unknown. (i) You can also view this status by selecting the Fan icon, next to the Shelf drop-down list.
Temperature	The **Temperature** tab shows the temperature status of the shelf components, such as the sensors, controllers, and power/fan canisters. Status can be Optimal, Nominal temperature exceeded, Maximum temperature exceeded, or Unknown. (i) You can also view this status by selecting the Temperature icon, next to the Shelf drop-down list.

Tab	Description
Batteries	The **Batteries** tab shows the status of the controller batteries. Status can be Optimal, Failed, Removed or Unknown. Other information includes the battery age, days until replacement, learn cycles, and weeks between learn cycles.
	(i) You can also view this status by selecting the Batteries icon [+ -], next to the Shelf drop-down list.
SFPs	The **SFPs** tab shows status of Small Form-factor Pluggable (SFP) transceivers on the controllers. Status can be Optimal, Failed, or Unknown. Select Show more settings to see the part number, the serial number, and the vendor of the SFPs.
	(i) You can also view this status by selecting the SFP icon [▯▯], next to the Shelf drop-down list.

3. Click **Close**.

Update battery learn cycles

A learn cycle is an automatic cycle for calibrating the smart battery gauge. The cycles are scheduled to start automatically, at the same day and time, in 8-week intervals (per controller). If you want to set a different schedule, you can adjust the learn cycles.

About this task

Updating the learn cycles affect both controller batteries.

Steps

1. Select **Hardware**.

2. Select the drop-down list for the Controller Shelf, and then select **View settings**.

3. Select the **Batteries** tab.

4. Select **Update battery learn cycles**.

   The **Update Battery Learn Cycles** dialog box opens.

5. From the drop-down lists, select a new day and time.

6. Click **Save**.

FAQs

What is shelf loss protection and drawer loss protection?

Shelf loss protection and drawer loss protection are attributes of pools and volume groups that allow you to maintain data access in the event of a single shelf or drawer failure.

Shelf loss protection

A shelf is the enclosure that contains either the drives or the drives and the controller. Shelf loss protection guarantees accessibility to the data on the volumes in a pool or volume group if a total loss of communication occurs with a single drive shelf. An example of total loss of communication might be loss of power to the drive shelf or failure of both I/O modules (IOMs).

> ⓘ Shelf loss protection is not guaranteed if a drive has already failed in the pool or volume group. In this situation, losing access to a drive shelf and consequently another drive in the pool or volume group causes loss of data.

The criteria for shelf loss protection depends on the protection method, as described in the following table:

Level	Criteria for Shelf Loss Protection	Minimum number of shelves required
Pool	The pool must include drives from at least five shelves and there must be an equal number of drives in each shelf. Shelf loss protection is not applicable to high-capacity shelves; if your system contains high-capacity shelves, refer to Drawer Loss Protection.	5
RAID 6	The volume group contains no more than two drives in a single shelf.	3
RAID 3 or RAID 5	Each drive in the volume group is located in a separate shelf.	3
RAID 1	Each drive in a RAID 1 pair must be located in a separate shelf.	2
RAID 0	Cannot achieve Shelf Loss Protection.	Not applicable

Drawer loss protection

A drawer is one of the compartments of a shelf that you pull out to access the drives. Only the high-capacity shelves have drawers. Drawer loss protection guarantees accessibility to the data on the volumes in a pool or volume group if a total loss of communication occurs with a single drawer. An example of total loss of communication might be loss of power to the drawer or failure of an internal component within the drawer.

> ⓘ Drawer loss protection is not guaranteed if a drive has already failed in the pool or volume group. In this situation, losing access to a drawer (and consequently another drive in the pool or volume group) causes loss of data.

The criteria for drawer loss protection depends on the protection method, as described in the following table:

Level	Criteria for drawer loss protection	Minimum number of drawers required
Pool	Pool candidates must include drives from all drawers, and there must be an equal number of drives in each drawer. The pool must include drives from at least five drawers and there must be an equal number of drives in each drawer. A 60-drive shelf can achieve Drawer Loss Protection when the pool contains 15, 20, 25, 30, 35, 40, 45, 50, 55, or 60 drives. Increments in multiples of 5 can be added to the pool after initial creation.	5
RAID 6	The volume group contains no more than two drives in a single drawer.	3
RAID 3 or RAID 5	Each drive in the volume group is located in a separate drawer.	3
RAID 1	Each drive in a mirrored pair must be located in a separate drawer.	2
RAID 0	Cannot achieve Drawer Loss Protection.	Not applicable

What are battery learn cycles?

A learn cycle is an automatic cycle for calibrating the smart battery gauge.

A learn cycle consists of these phases:

- Controlled battery discharge
- Rest period
- Charge

The batteries are discharged to a predetermined threshold. During this phase, the battery gauge is calibrated.

A learn cycle requires these parameters:

- Fully charged batteries
- No overheated batteries

Learn cycles for duplex controller systems occur simultaneously. For controllers having backup power from more than one battery or set of battery cells, learn cycles occur sequentially.

Learn cycles are scheduled to start automatically at regular intervals, at the same time and on the same day of the week. The interval between cycles is described in weeks

ⓘ   A learn cycle might take several hours to complete.