

# Smart Storage Administrator User Guide

NEC Express Server  
Express 5800 Series

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# Overview

## Array and controller configuration

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You can configure arrays and controllers during the initial provisioning of the server or compute module and at any time after the initial configuration. Configuration tasks can be initiated using Smart Storage Administrator (accessible through EXPRESSBUILDER) or the System Utility.

During the initial provisioning of the server or compute module, an array is required to be configured before the operating system can be installed. You can configure the array using either of the options below:

- When you launch EXPRESSBUILDER, you can build an appropriate array for any drives using SSA.
- You can use the System Utility. This utility create the primary array that is required.

SSA provides a full set of array configuration features while the System Utility provides a limited set of features. However, users may prefer using the System Utility during the initial configuration of the server or computer module since the System Utility loads faster than SSA during that step.

For more information, see User Guide for RAID Controller.

After the initial provisioning of the server or compute module, you can use either SSA or the System Utility to configure the arrays and controllers.



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**IMPORTANT:** N8103-197 SAS Controller supports only view status.

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## Smart Storage Administrator

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SSA is the main tool for configuring arrays on RAID Controllers. It exists in three interface formats: the SSA GUI, the SSA CLI, and SSA Scripting. All formats provide support for configuration tasks. Some of the advanced tasks are available in only one format.

SSA is accessible both offline and online:

- **Accessing SSA in the offline environment:** Using one of multiple methods, you can run SSA before launching the host operating system. In offline mode, users can configure or maintain detected and supported ProLiant devices, such as optional RAID Controllers and integrated RAID Controllers. Some SSA features are only available in the offline environment, such as setting the boot controller and boot volume.
- **Accessing SSA in the online environment:** This method requires an administrator to download the SSA executables and install them. You can run SSA online after launching the host operating system.

### More Information

[Accessing SSA in the offline environment](#)

[Accessing SSA in the online environment](#)

### Benefits of using SSA

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Smart Storage Administrator is an advanced utility that enables you to perform many complex configuration tasks.

Using SSA over other configuration utilities provides the following benefits:

- GUI, CLI, and Scripting interfaces are available.
- English, Japanese are supported.
- Applications can be executed using the following tools:
  - All server platform host operating systems supported with server (For a list of supported operating systems, see a product page of server in the NEC Corporate Website (<http://www.nec.com/>))
  - EXPRESSBUILDER
- All formats can run in both online and offline environments.
- The utility can run on any machine that uses a supported browser.

## Support for configuration tasks

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SSA supports the configuration tasks listed below. Support for individual tasks varies according to your controller type. You should always have the latest firmware installed so that you have access to all of the features supported for your controller.

About the features your controller is supporting, see controller user guide.

- Assign a RAID level to a logical drive
- Assign spare drives to an array
- Configure multiple systems identically
- Copy the configuration of one system to multiple systems
- Create multiple logical drives per array
- Create or delete arrays and logical drives
- Enable or disable a physical drive write cache
- Expand an array
- Extend a logical drive
- Heal an array
- Identify devices by causing their LEDs to flash
- Migrate the RAID level or stripe size
- Move an array (copy all array data to a new array and then delete the old array)
- Move and delete individual LUNs
- Re-enable a failed logical drive
- Set the boot controller
- Set the expand priority, migrate priority, and accelerator ratio
- Set the spare activation mode
- Set the stripe size
- Set the surface scan delay
- Share a spare drive among several arrays
- Remove a drive from an array (restripe the data on an array to occupy fewer physical drives, then remove the excess drives from the array)
- Specify the size of the logical drive
- Split a RAID 1 array or recombine a split array (offline only)

- Split mirror backup and rollback of RAID 1, 1+0, 1 (ADM) and 10 (ADM) mirrors

## Minimum requirements

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Minimum video requirements to run the SSA GUI include a minimum monitor resolution of 1024x768 and 16-bit color. The GUI supports the following browsers:

- Mozilla Firefox 9.0 or later
- Microsoft Internet Explorer 9.0 or later
- Google Chrome

For a list of supported controllers, see a product page of server in the NEC Corporate Website (<http://www.nec.com/>).

## Accessing SSA

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### Accessing SSA in the offline environment

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To access and launch the SSA GUI in an offline environment, use one of the following methods:

- [Launching SSA with EXPRESSBUILDER](#)
- [Launching SSA during POST](#)

When offline SSA launches, an **Execution Mode** screen does not appear because SSA does not support Remote Service Mode in an offline environment. For this functionality, use [SSA in an online environment](#).

### Launching SSA with EXPRESSBUILDER

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#### Procedure

1. Boot the server.
2. Press F10 to launch EXPRESSBUILDER.
3. At the main screen, select Perform Maintenance.
4. At the Maintenance screen, select RAID Configuration.  
The system launches the SSA GUI.

### Launching SSA during POST

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#### Procedure

1. Boot the server.  
During POST, the system recognizes devices.
2. Press F10 to start EXPRESSBUILDER.  
A menu appears, listing the options for launching SSA.
3. Select **Smart Storage Administrator**.  
The system launches the SSA GUI, or if you are using Serial Console, the system launches the SSA CLI.

To stop application, hold down power supply button and turn off a server.

### Accessing SSA in the online environment

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To access, install, and launch SSA in the online environment, you must download the SSA executables. All three formats have separate executables.

SSA Scripting is a standalone application that is distributed with the SSA CLI application.

Both SSA and the SSA CLI need sg driver(scsi generic) to access RAID Controller in Linux. Red Hat Enterprise Linux 7.1 and later does not load sg driver automatically. You should load the driver and type 'modprobe sg' before running SSA or SSA-CLI.

To use SSA in the online environment, obtain the executable files from NEC Corporate Website (<http://www.nec.com/>) or Starter Pack.

## Install SSA

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### Procedure

#### Microsoft OS

1. Sign-in to the Windows with Administrators privilege.
2. Put on the Starter Pack in the media drive.
3. Move to Starter Pack directory and run the start\_up.bat.
4. Click [Integrated Installation] on the Starter Pack menu.
5. Select the [Standard Program Package], Click Install.

#### Linux OS

1. Open the contents.html in Start Pack directory.
2. Remember the [Filename] in [Description].
  - o Smart Storage Administrator (SSA) for Linux 64-bit
  - o Smart Storage Administrator (SSA) CLI for Linux 64-bit
  - o Smart Storage Administrator Diagnostic Utility (SSADU) CLI for Linux 64-bit
3. Login root user.
4. Put on the Starter Pack in the media drive.
5. Create a mount point. ※No need to procedure, if created.  
# mkdir /media/cdrom
6. Mount a Starter Pack.  
# mount -r -t iso9660 /dev/sr0 /media/cdrom
7. Move to packages.  
# cd /media/cdrom/packages
8. Install rpm files of filename in procedure 2.  
e.g.  
# rpm -ivh ssacli-x.x.x.x.x86\_64.rpm

Installed module, run the each execute file by the next way.

- o GUI, CLI - See "[Launching SSA](#)"
- o Scripting - Run the ssascripting.exe (Windows) , ssascripting (Linux)

## Launching SSA

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### Procedure

#### Microsoft OS

1. Click **Start**, and then select **Programs>Windows System>Smart Storage Administrator>Smart Storage Administrator**.  
SSA launches in application window. SSA then scans the system and detects controllers. When controller detection is complete, the controllers are available on the **Controller/Device** menu.
2. Configure a controller. For more information, see "[Configuring a controller](#)"  
When configuration is complete, continue with the next step.



3. (Optional) To make newly created logical drives available for data storage, use the operating system disk management tools to create partitions and format the drives.

#### Linux OS

1. From any command prompt, enter one of the following:  
`ssa -local`  
SSA launches in a browser window.
2. For a list of options, enter the following:  
`ssa -h`

## Array configuration guidelines

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Remember the following factors when you build an array:

- All drives grouped in a logical drive must be of the same type (for example, either all SAS or all SATA and either all hard drives or all solid state drives).
- For the most efficient use of drive space, all drives within an array should have approximately the same capacity. Each configuration utility treats every physical drive in an array as if it has the same capacity as the smallest drive in the array. Any excess capacity of a particular drive cannot be used in the array and is unavailable for data storage.
- The more physical drives configured in an array, the greater the probability that the array will experience a drive failure during any given period.
- To guard against the data loss that occurs when a drive fails, configure all logical drives in an array with a suitable fault-tolerance (RAID) method.

# SSA graphical user interface

## Using the SSA GUI

Access SSA with one of the many methods available:

- [Accessing SSA in the offline environment](#)
- [Accessing SSA in the online environment](#)

When you launch the SSA GUI, the application opens and SSA scans the system and detects controllers. This process can last up to 2 minutes. When controller detection is complete, the controllers are available on the **Devices/Tools** menu.

After the GUI is open, tasks are distributed among categories. For more information, see "[Navigating the GUI.](#)"

## Icon and key stroke legend

The SSA GUI includes many icons (also defined in the Help file) to help with identification and troubleshooting.

























Image	Description
	Critical
	Warning
	Informational
	Active Task(s)
	Paused/Offline Drive
	Server
	RAID Controller
	RAID Controller (Embedded)
	Array
	Logical Drive
	Assigned Physical Drive
	Unassigned Physical Drive
	Unassigned Drives
	Spare Drive
	Transient Drive
	Storage Enclosure
	Port
	Tape Drive

Image	Description
	Locked
	License Manager/Encryption Manager
	Cache Manager
	Array Diagnostic
	Smart SSD Wear Gauge Report
	None

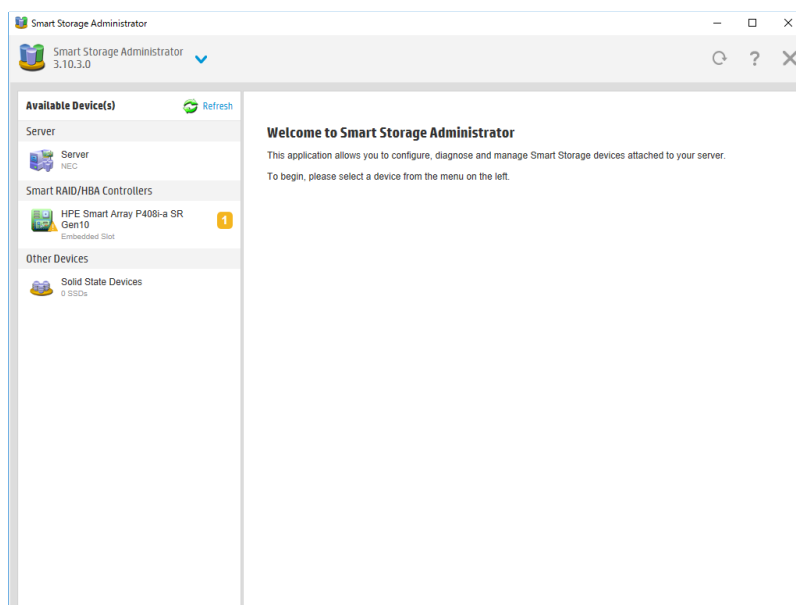
Keyboard functions and shortcuts can be used for navigating or performing actions in the GUI.

Key	Description
Tab	Cycle through selectable items on a page
Shift + Tab	Cycle backwards through selectable items on a page
F5	Rescan system (equivalent to clicking the Rescan System button)
B	Browse main menu
H	Open SSA Help
I	Exit SSA
Enter	Perform the action of the currently selected link or button <sup>1</sup>
Escape	Close non-action popups <sup>1</sup>
R	Refresh selected controller <sup>1</sup>

<sup>1</sup> Local keyboard shortcuts are available only when the action that the key activates is accessible.

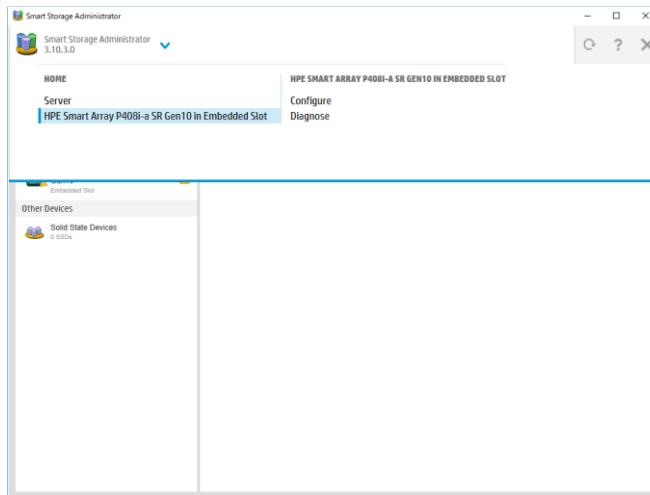
## Navigating the GUI

When you open SSA, the **Welcome** screen appears.



The following elements are visible:

- The **Smart Storage Administrator** quick navigation menu is in the top, left-hand corner of the screen. Clicking the down arrow displays the available devices, and clicking one of the available devices displays additional information and options for the device. You can also return to a server **Home** screen, or you can choose **Configuration** or **Diagnostics** for a device listed. For more information, see "[Configure screen](#)" or "[Diagnostics screen](#)."



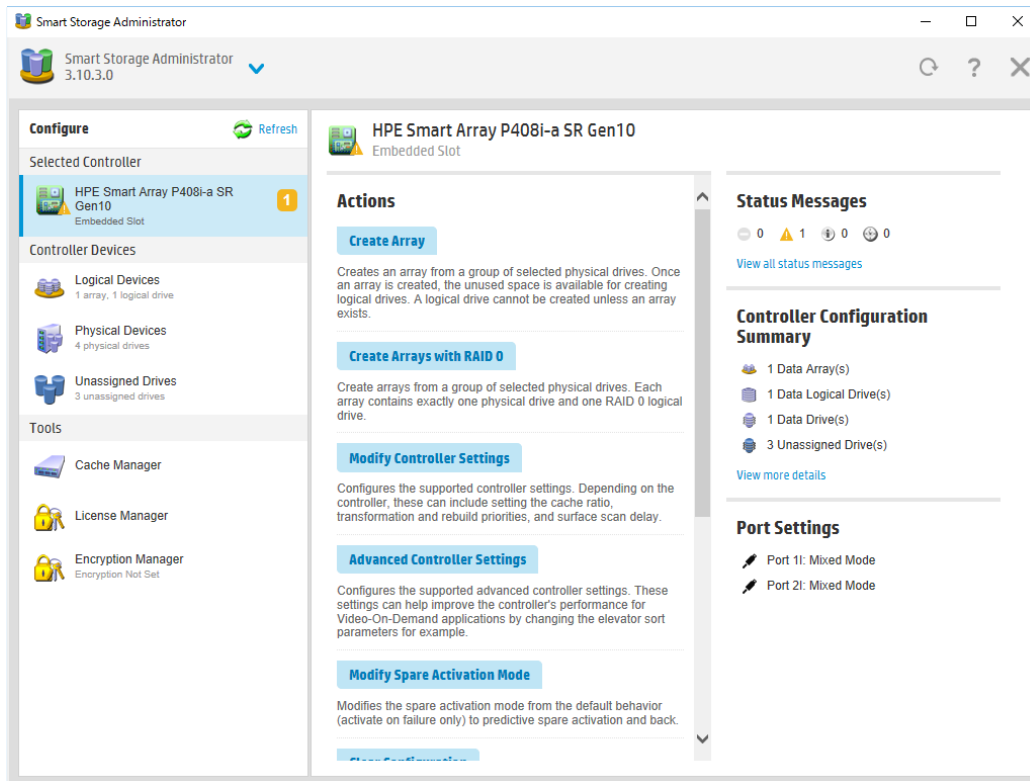
- **Available device(s)** are listed on the left-hand side of the screen. Clicking on a server or array controller displays the available actions, alerts, and summary for that device. You can point to the status alerts to see details on an alert.
- The **Rescan System and Reset Application** button is near the top right of the screen.
- After adding or removing devices, click **Rescan System and Reset Application** to update the list of available devices.
- The **Help** button is near the top right of the screen.
- To access help topics, press the **H** key or click **Help**. For more information, see "[SSA Help](#)."
- The **Exit** button is near the top right of the screen.

## Configure screen

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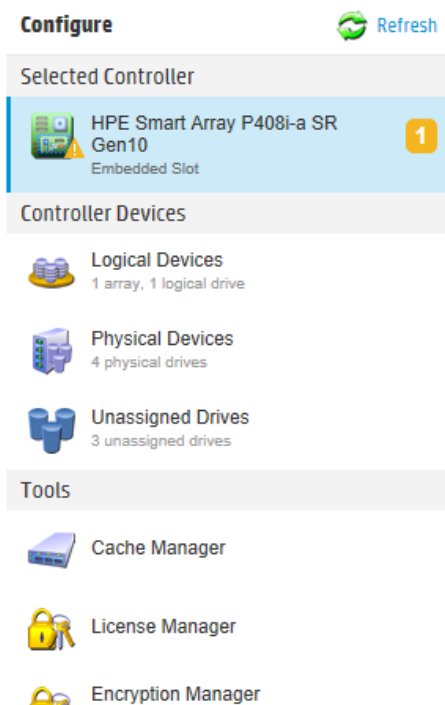
To access this screen, click either a device under **Configuration** in the quick navigation menu, or select an available device from the **Home** screen, and then click **Configure** under the available options.

The **Configure** screen displays the GUI elements from the **Welcome** screen and lists available actions, status messages, more detailed information, and a controller configuration summary for a selected controller.



When a controller is selected, the following elements appear:

- Controller Devices and Tools**—This panel, at left, displays systems, controllers, arrays, physical devices, unassigned drives, cache managers, and license managers. The panel also displays encryption managers.



- Actions**—This panel, in the middle, provides the following information and functionality:
  - Tasks that are available for the selected device based on its current status and configuration

- o Options and information pertinent to the task, after a task is selected
- **Status Messages**—This panel provides the following information and functionality:
  - o Status icons (critical, warning, and informational) with the number of individual alerts for each category
  - o A view all status messages link that displays device-specific alerts in a pop-up window
- **Controller Configuration Summary**—This panel provides a summary of the following elements:
  - o Data arrays
  - o Data logical drives
  - o Data drives
  - o Unassigned drives
  - o Spare drives
  - o **A View more details** link that displays more information in a pop-up window
- **Port settings**—This panel provides more information about the drives attached to the controller. The values vary according to the controller and include Mixed RAID and HBA mode.

For a list of possible tasks that are available on the **Configure** screen, see "[Configuration tasks](#)."

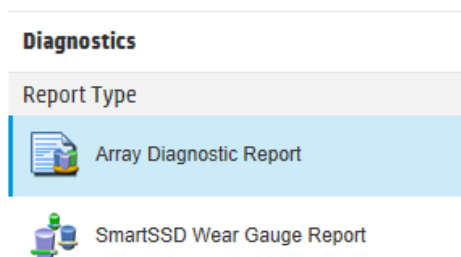
## Diagnostics screen

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To access this screen, either click a device under **Diagnostics** in the quick navigation menu, or select an available device from the **Home** screen, and then click **Diagnose** under the available options.

From the **Diagnostics** screen, you can run one of the following reports:

- Array Diagnostics Report
- SmartSSD Wear Gauge Report



When selecting either report, the available actions on the **Actions** panel include viewing the report or saving the report.

**Diagnostics**

Report Type

Array Diagnostic Report

SmartSSD Wear Gauge Report

**HPE Smart Array P408i-a SR Gen10**

Embedded Slot

---

**Actions**

View Diagnostic Report

Generate and display a diagnostic report for the selected device(s). The information for supported Solid State Drives. Once the report is generated you must click on the Save button.

---

Save Diagnostic Report

Generate a diagnostic report without presenting a graphical display.

For a list of possible tasks that are available on the Diagnostics screen, see "[Diagnostic tasks](#)."

## SmartSSD Wear Gauge Report

The SmartSSD Wear Gauge Summary provides a brief overview of the following:

- Total Solid State Drives with Wearout Status
- Total RAID Controller Solid State Drives
- Total Non RAID Controller Solid State Drives
- Total Solid State SAS Drives
- Total Solid State NVMe Drives
- Total Solid State Drives

When running a report, you can either view a graphic representation of the report with SSD usage and estimated lifetime information, or generate a report without a graphical display, with the option of saving the report.

## SSA help

The Help button, at upper right, opens the embedded SSA help file. In addition to providing information about the main screens and tabs, Help also provides several useful topics for new users, including the following:

- **Image Legend**—A visual reference list defining the icons and graphical buttons used in SSA
- **Keyboard Shortcuts**—A list of keys and operations they perform within the GUI

To view these help topics and others, press the **H** key or click **Help**. When the Help window opens, expand the topic "Getting Started with Smart Storage Administrator Overview."

The glossary in SSA help defines industry standard and Terminology related to SSA application.

## Configuring the language of the GUI

SSA can select a language by an option.

### Windows

```
C:\Program Files\Smart Storage Administrator\ssa\bin>ssa.exe -local -lang [ja | en]
```

### Linux

```
ssa -local -lang [ja | en]
```

# Configuration tasks

---

From the **Configure** screen, you can perform tasks related to controllers, arrays, physical drives, and logical drives.

When a controller or device is selected, the tasks that appear are a subset of the total number of possible tasks for the selected item. SSA lists or omits tasks based on the controller model and configuration. For example, if the selected controller has no unassigned physical drives, Create Array is not an available task.

The following table lists all the possible tasks for every type of item.

Item	Tasks
Controller	Accelerated I/O Path Advanced Controller Settings* Array Accelerator Settings Clear Configuration Controller Settings Create Array Disable Standby Controller Enable HBA/RAID/Smart Array Mode operations* Enable SmartCache* Manage Encryption* Manage License Keys* Modify Power Modes More Information Parallel Surface Scan Physical Drive Write Cache Settings Redundancy Settings View Status Alerts
Array	Bypass RAID components using SSA Smart Path* Change Array Drive Type Create Array Create Logical Drive Create Split Mirror Backup Convert Plaintext Data to Encrypted Data* Delete Expand Array Heal Array Manage Split Mirror Backup More Information Move Drives Re-Mirror Array Shrink Array Spare Management Split Mirrored Array View Status Alerts Volume Key Rekey
Logical drive	Create Logical Drive Create SmartCache for Logical Drive* Convert Plaintext Data to Encrypted Data* Delete Extend Logical Drive Instant Secure Erase Migrate RAID/Stripe Size Modifying Cache Write Policy Move Logical Drive More Information Re-enable Failed Logical Drive View Status Alerts Volume Key Rekey
Unused space	Create Logical Drive More Information



Item	Tasks
Physical drive	Erase Drive* View Status Alerts
Unassigned drives	Create Array Erase Drive* More Information

\*This task is not supported.

## Performing a Configuration task

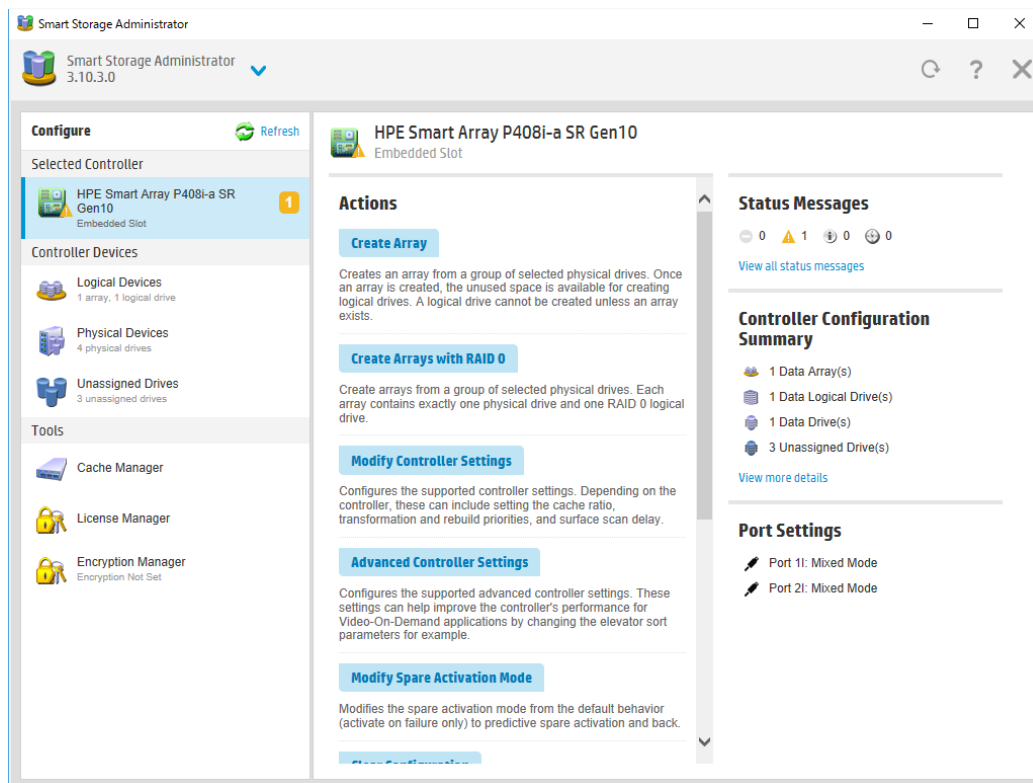
### Procedure

1. Open SSA.

For more information, see "[Using the SSA GUI.](#)"

2. Open the **Configure** panel by doing one of the following:
  - o Choose a device and click **Configure** in the quick navigation menu.
  - o Select an available device from the **Home** screen, and then click **Configure** under the available options.
3. Select a device from the **Devices** menu.

The Actions, Status Messages, and Controller Configuration Summary panels appear. The listed tasks are available for this device in its current configuration. For more information, see "[Configuration tasks.](#)"



4. Click a task button.  
A list of all possible options for that task appears on the right side of the screen, replacing the task list.
5. Select the settings or configuration options for the device.
6. Use the Next and Back buttons to navigate multiple screens of options.
7. Click **Save** or **OK**.

## Creating an array

---

### Procedure

1. Open SSA.  
For more information, see "[Using the SSA GUI.](#)"
2. Open the **Configure** panel by doing one of the following:
  - o Choose a device and click **Configure** in the quick navigation menu.
  - o Select an available device from the **Home** screen, and then click **Configure** under the available options.
3. Select a controller from the **Devices** menu.  
The **Actions** panel appears.
4. Click **Create Array**.
5. Select the physical drives for the new array.
6. Click **Create Array**.
7. Make selections for **RAID Level, Strip Size/Full Stripe Size, Sectors/Track, Size** and **Caching**.
8. Click **Create Logical Drive**.
9. Click **Finish**.

By default, SSD Smart Path is enabled on SSD drives.



**IMPORTANT:** When physical drive connected to RAID Controller and without Array, OS can directly access to physical drive. But when the drive included in array, drive's data is lost. In the case, the following message output in OS log is acceptable.

- Windows: Disk x has been surprise removed.
- Linux: No message.
- VMware ESXi: No message

## Configuring a controller

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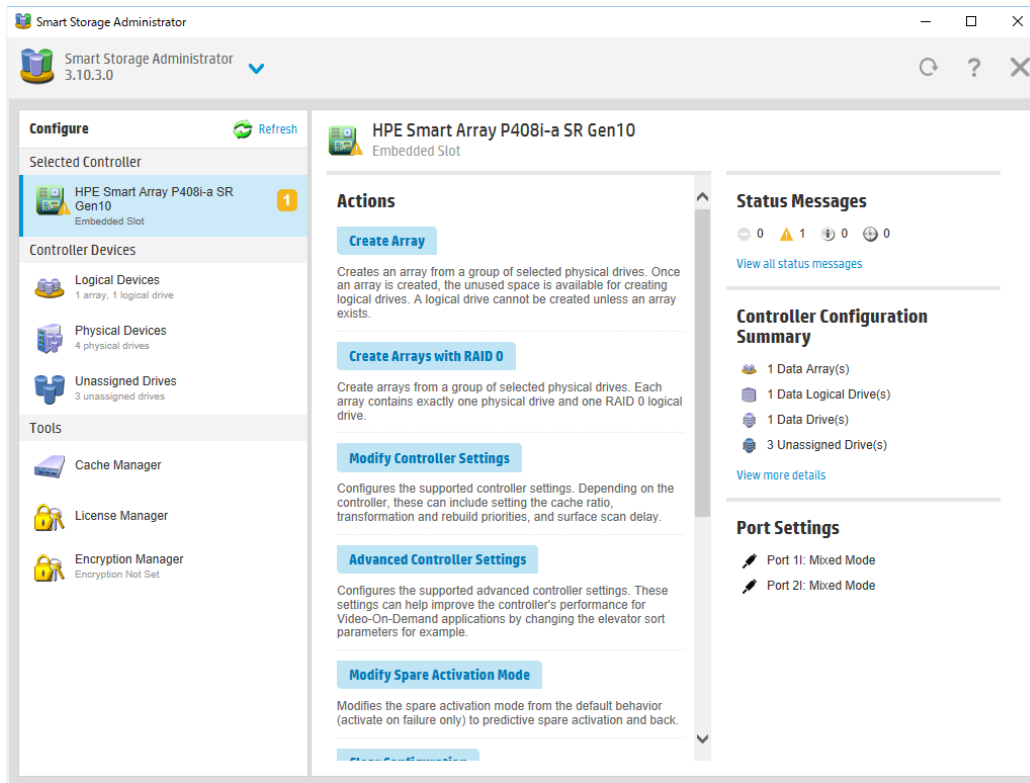
### Procedure

1. Open SSA.  
For more information, see "[Using the SSA GUI.](#)"
2. Open the **Configure** panel by doing one of the following:
  - o Choose a device and click **Configure** in the quick navigation menu.
  - o Select an available device from the **Home** screen, and then click **Configure** under the available options.

The **Configure** panel appears.



**IMPORTANT:** Screens may have different options available, depending on the server configuration.



3. Configure the controller. See "[Performing a Configuration task.](#)"
4. When prompted, save the configuration.
5. Do one of the following:
  - o Configure an additional controller. Repeat steps 3 through 5.
  - o Click **Exit SSA**.

## Enabling or disabling SSD Smart Path

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This Task is not supported.

## Rapid Parity Initialization

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### Initializing rapid parity

---

#### Procedure

1. Open SSA.  
For more information, see "[Using the SSA GUI.](#)"
2. Open the **Configure** panel by doing one of the following:
  - o Choose a device and click **Configure** in the quick navigation menu.
  - o Select an available device from the **Home** screen, and then click **Configure** under the available options.
3. Select **Logical Devices** from the **Devices** menu.  
A list of arrays appears.
4. Select an array, and select **Create Logical Drive** from the **Actions** menu.

5. Select **Parity Initialization Method** to **Rapid** and make selections for **RAID Level**, **Number of Parity Groups**, **Strip Size/Full Strip Size**, **Sectors/Track**, **Size**, and **Caching**. Depending on the controller used and drives selected, your options may appear different from the image below.

#### **RAID Level** (What's this...?)

- RAID 0
- RAID 1 (ADM)
- RAID 5

#### **Strip Size / Full Stripe Size** (What's this...?)

- 16 KiB / 32 KiB
- 32 KiB / 64 KiB
- 64 KiB / 128 KiB
- 128 KiB / 256 KiB
- 256 KiB / 512 KiB
- 512 KiB / 1024 KiB
- 1024 KiB / 2 MiB

#### **Sectors/Track** (What's this...?)

- 63
- 32

#### **Size** (What's this...?)

- Max. for MBR Partition Table: 2097152 MiB (2 TiB)
- Maximum Size: 11444026 MiB (10.9 TiB)
- Custom Size

#### **Parity Initialization Method** (What's this...?)

- Default: Online, parity block initialization
- Rapid: Offline, full zero-overwrite of all data and parity blocks

6. Click **Create Logical Drive** to continue.  
A summary page appears.
7. Click **Finish**.

## Changing the Spare Activation Mode

---

The spare activation mode feature enables RAID Controller to activate a spare drive under the following conditions:

- Predictive Spare Activation: When a data drive reports a predictive failure (SMART) status
- Failure Spare Activation: When a data drive fails; this mode is the default.

In normal operations, RAID Controller starts rebuilding a spare drive only when a data drive fails. With the predictive spare activation mode, rebuilding can begin before the drive fails, reducing the likelihood of data loss that could occur if an additional drive fails.

#### **Procedure**

1. Open SSA.  
For more information, see "[Using the SSA GUI](#)."
2. Open the **Configure** panel by doing one of the following:
  - o Choose a device and click **Configure** in the quick navigation menu.
  - o Select an available device from the **Home** screen, and then click **Configure** under the available

- options.
3. Select a controller from the **Devices** menu.  
The **Actions** panel appears.
  4. In the **Actions** panel, click **Modify Spare Activation Mode**.
  5. From the menu, select one of the following modes:
    - o Failure Spare Activation
    - o Predictive Spare Activation
  6. Click **OK**.

## Changing the Spare Management mode

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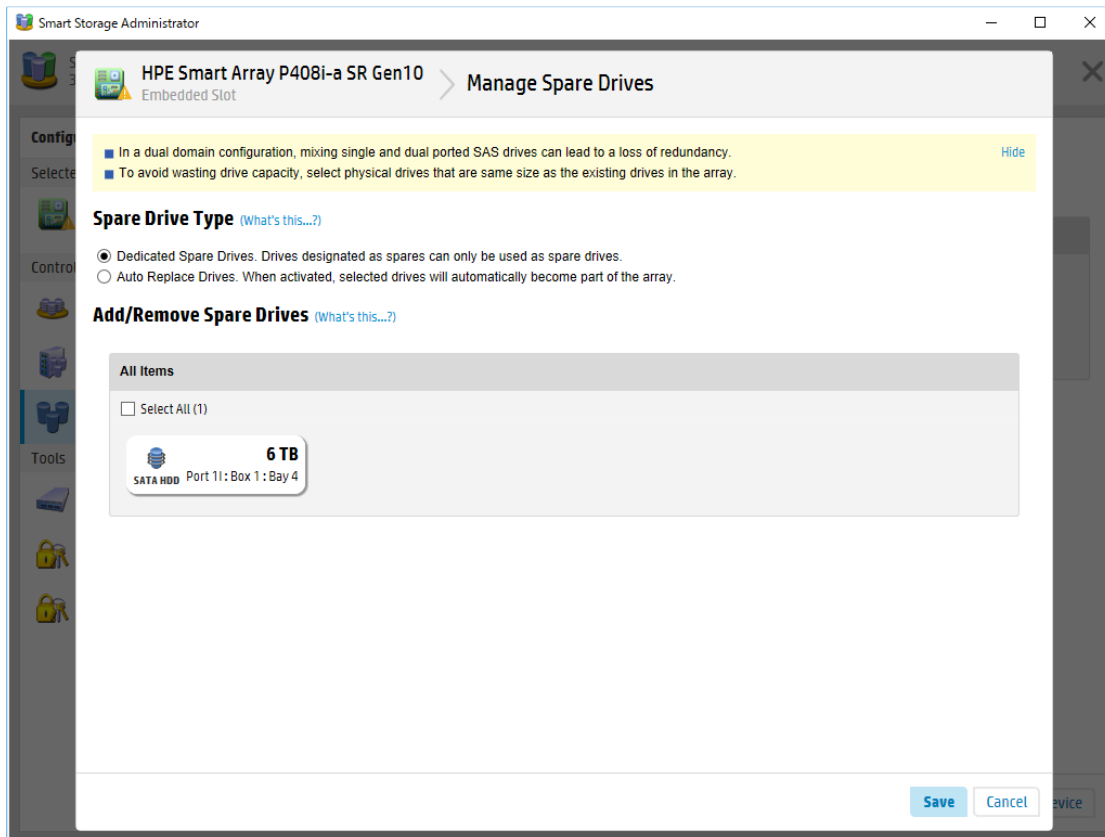
The Spare Management feature provides multiple methods for handling spare behavior. You can choose from the following options:

- **Dedicated Spare Drives**—When the failed data drive is replaced, it must be rebuilt from the data on the spare drive. In Dedicated Spare Drives mode, one spare can be dedicated to multiple arrays.
- **Auto-Replace Drives**—The spare for the failed data drive automatically becomes the replacement data drive. When the spare is replaced, the data drive does not need to be rebuilt. In Auto-replace mode, spare drives cannot be shared between arrays.

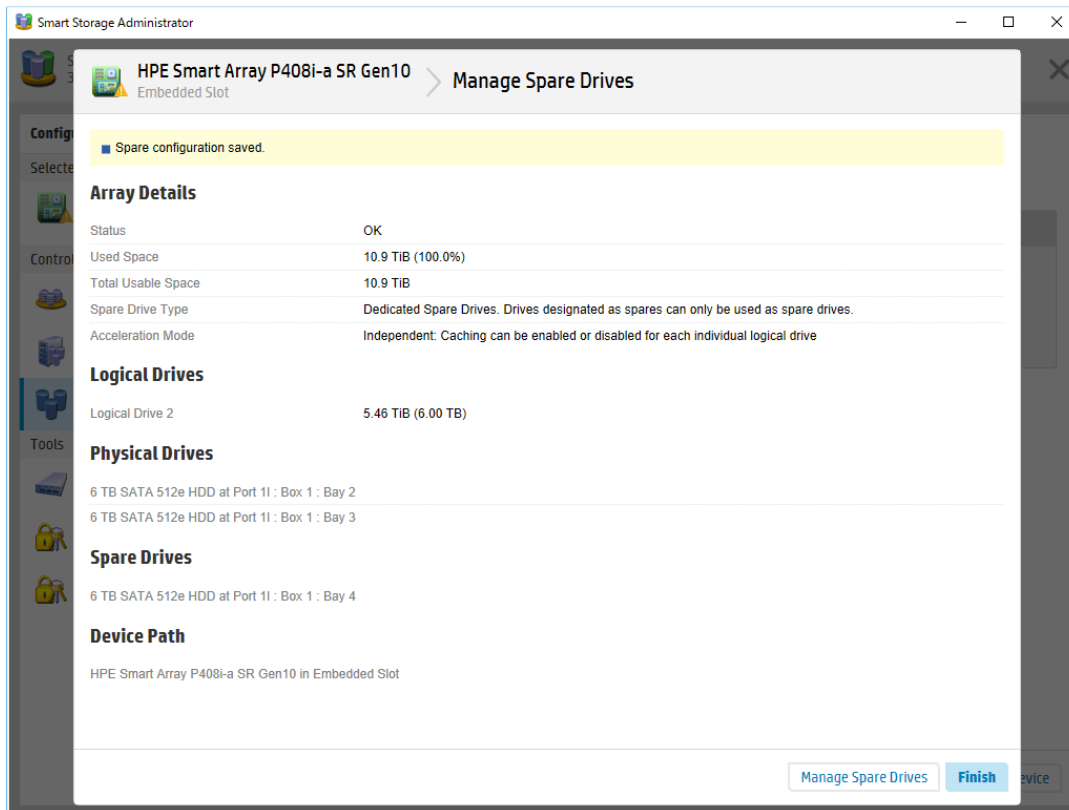
If assigning **Auto-Replace Drives** mode to an array with a RAID 0 drive, **Spare Activation Mode** must be set to **Predictive Spare Activation mode**.

### Procedure

1. Open SSA.  
For more information, see "[Using the SSA GUI](#)."
2. Open the **Configure** panel by doing one of the following:
  - o Choose a device and click **Configure** in the quick navigation menu.
  - o Select an available device from the **Home** screen, and then click **Configure** under the available options.
3. Select a controller from the **Devices** menu.
4. Select **Create Array** from the **Actions** panel.  
The Array details screen appears.
5. Select a controller, drive type, and physical drives, and click **Create Array**.
6. Select settings for **Create Plaintext Volume**, **RAID Level**, **Strip Size/Full Strip Size**, **Sectors/Track**, **Size**, and **Caching**. Click **Create Logical Drive** when complete.
7. Click **Manage Spare Drives**.



8. From the menu, select one of the following spare drive types:
  - o Dedicated Spare Drives
  - o Auto-Replace Drives
9. Select which drives will operate as spare drives in the array.
10. Click **Save**.



11. A confirmation screen appears. Click **Manage Spare Drives** to make additional selections, or click **Finish**.

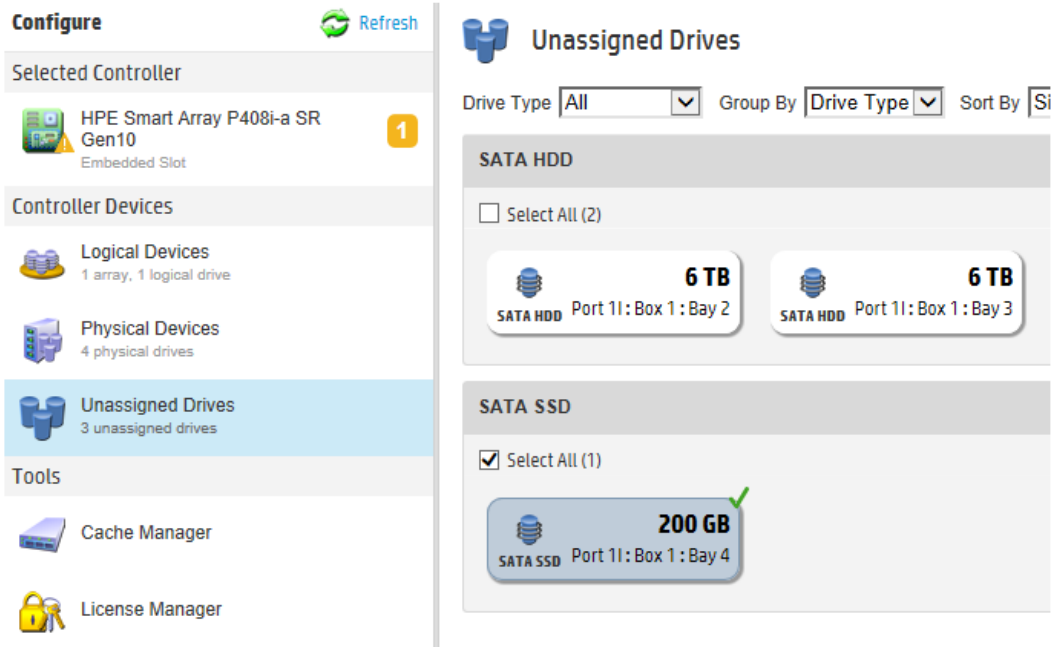
## Disabling Over Provisioning Optimization

Solid state devices can be optimized by deallocating all used blocks before any data is written to the drive. The optimization process is performed when the first logical drive in an array is created and when a physical drive is used to replace a failed drive. Not all controllers support this option.

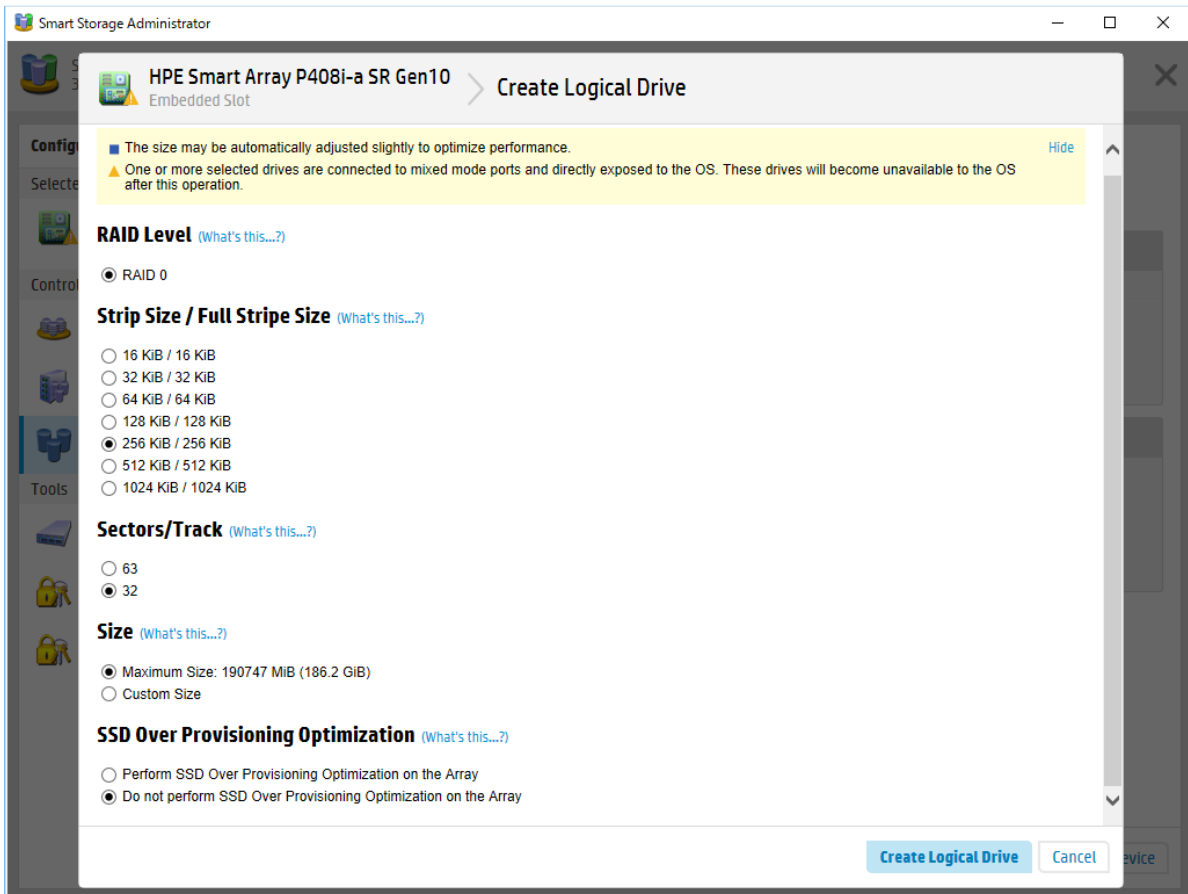
The SSD Over Provisioning Optimization feature allows the user to disable Over Provisioning Optimization in the GUI.

### Procedure

1. Open SSA.  
For more information, see "[Using the SSA GUI](#)."
2. Select **Unassigned Drives** located under **Controller Devices**.
3. To create an array, select from the list of available drives listed. When finished, click **Create Array**.



- The **Create Logical Drive** window appears. Under the option **SSD Over Provisioning Optimization**, select **Do not perform SSD Over Provisioning Optimization on the Array**.



- Click **Create Logical Drive**.



# Setting Auto RAID 0

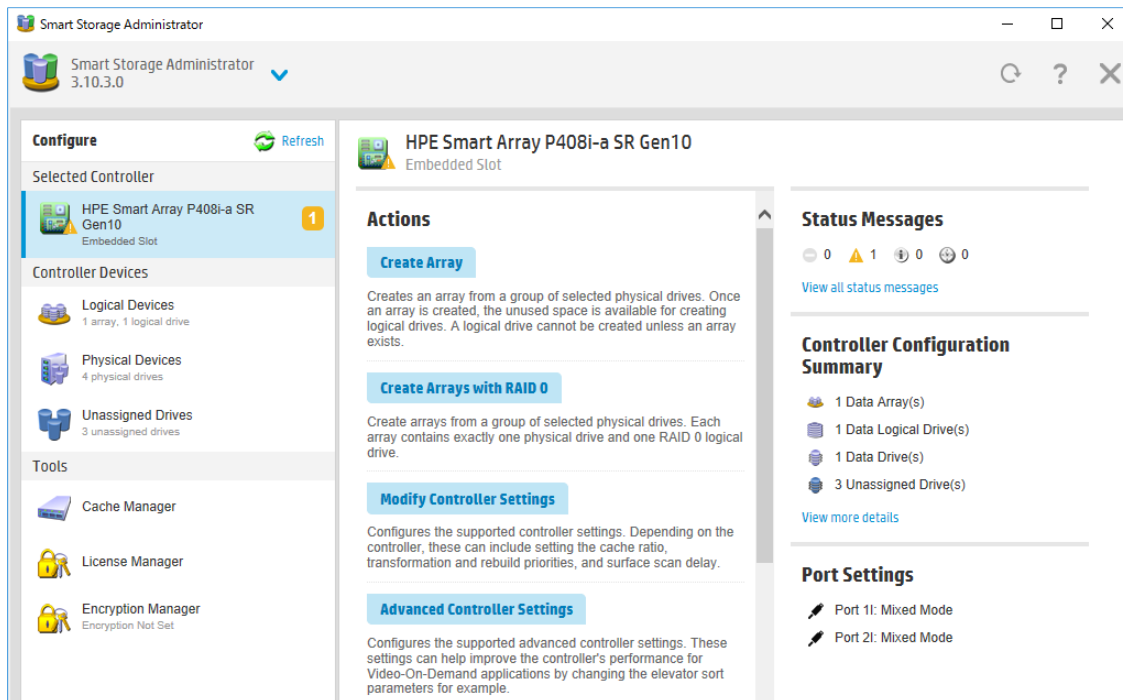


**CAUTION:** If you select this option for any logical drives, you will experience data loss for that logical drive if one physical drive fails. Assign RAID 0 to drives that require large capacity and high speed, but pose no data safety risk.

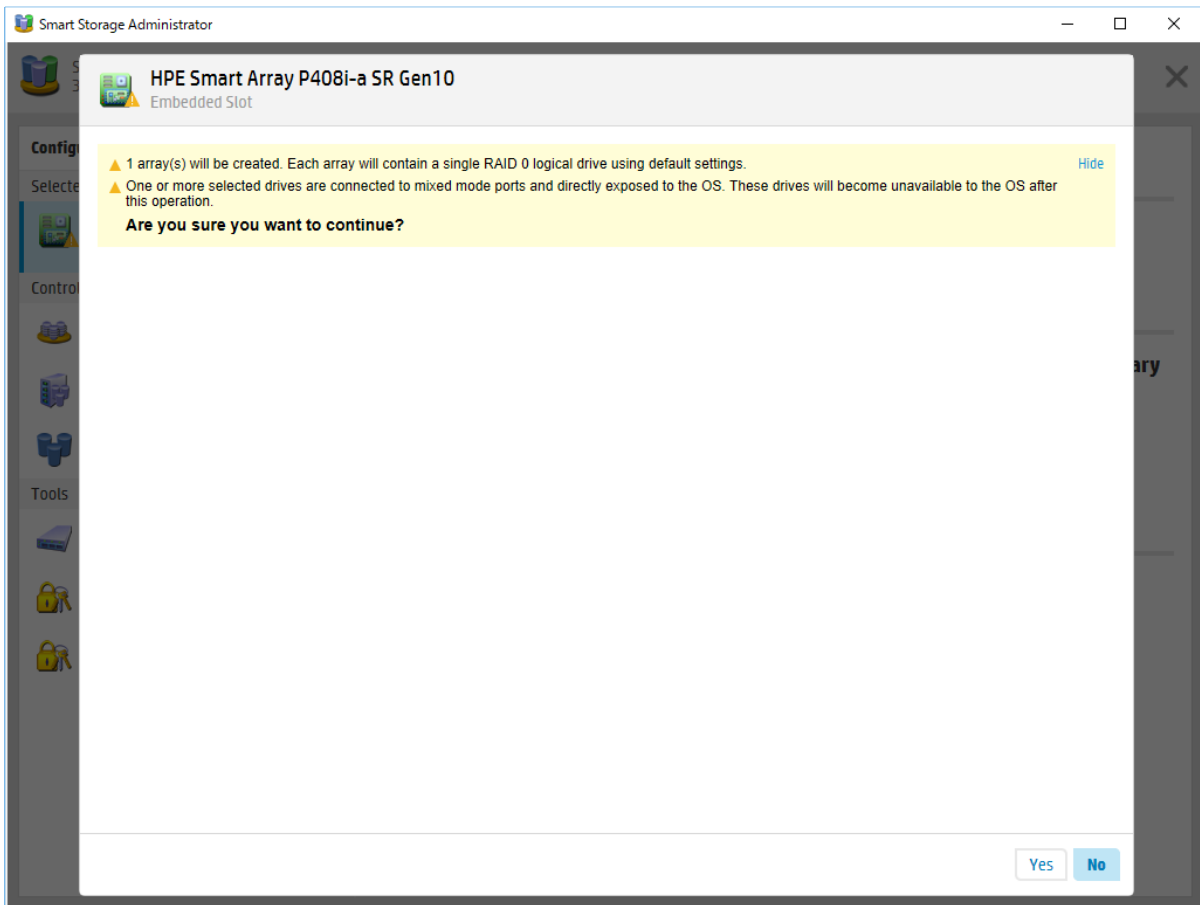
Auto Array RAID 0 creates a single RAID 0 volume on each physical drive specified, enabling the user to select multiple drives and configure as RAID 0 simultaneously. Each array contains one physical drive and one RAID 0 logical drive.

## Procedure

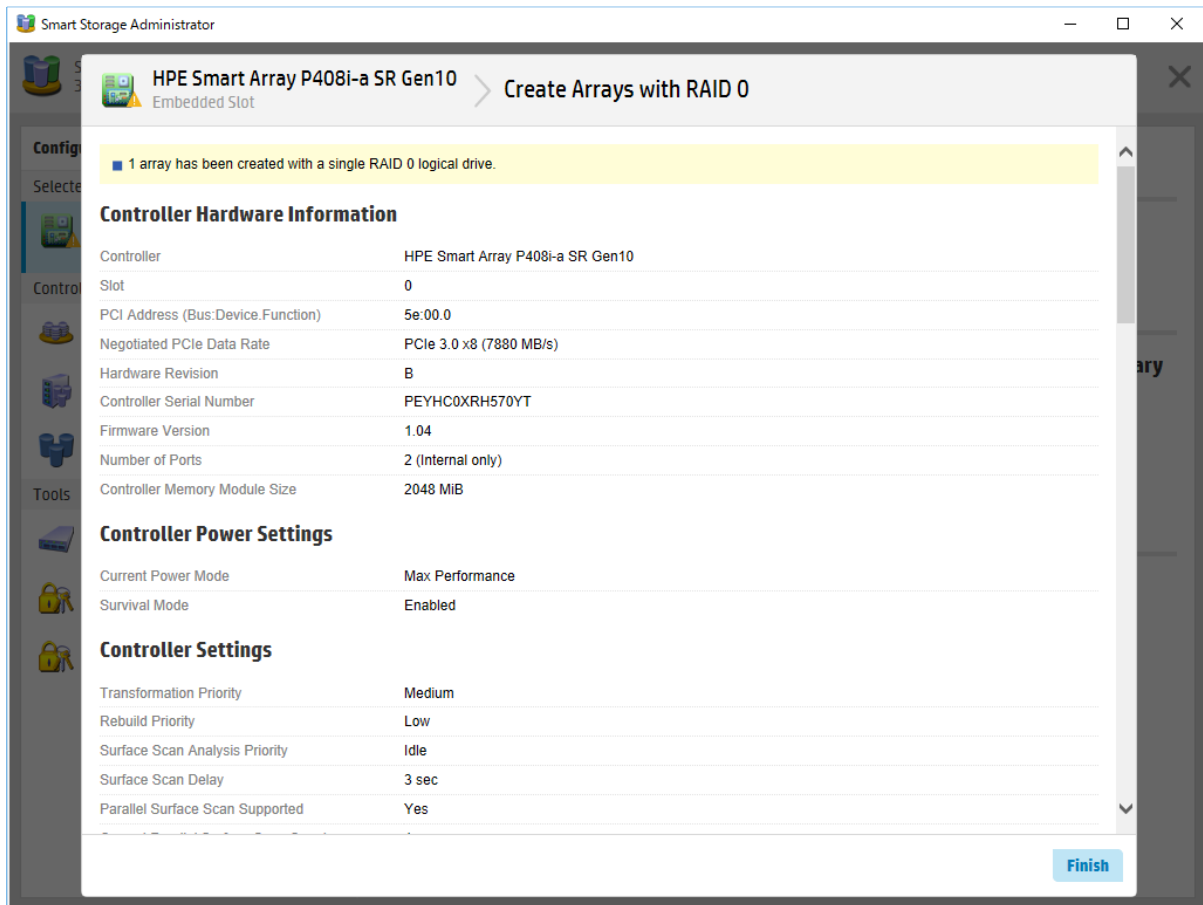
1. Open SSA.  
For more information, see "[Using the SSA GUI.](#)"
2. Select the controller.
3. Click **Create Arrays with RAID 0**.



4. A new window appears, confirming each array will contain a single RAID 0 logical drive. Click **Yes** to continue.



5. A new window appears, confirming RAID 0 configuration. Click **Finish** to complete.



## Modifying Parallel Surface Scan

### Procedure

1. Open SSA. For more information, see "[Using the SSA GUI.](#)"
2. Select a controller.
3. Click **Modify Controller Settings**.

## Actions

### Create Array

Creates an array from a group of selected physical drives. Once an array is created, the unused space is available for creating logical drives. A logical drive cannot be created unless an array exists.

---

### Create Arrays with RAID 0

Create arrays from a group of selected physical drives. Each array contains exactly one physical drive and one RAID 0 logical drive.

---

### Modify Controller Settings

Configures the supported controller settings. Depending on the controller, these can include setting the cache ratio, transformation and rebuild priorities, and surface scan delay.

---

### Advanced Controller Settings

Configures the supported advanced controller settings. These settings can help improve the controller's performance for Video-On-Demand applications by changing the elevator sort parameters for example.

---

### Modify Spare Activation Mode

Modifies the spare activation mode from the default behavior (activate on failure only) to predictive spare activation and back.

---

4. Under **Current Parallel Surface Scan Count**, use the slider to select the parallel surface scan count.



### Transformation Priority [\(What's this...?\)](#)

High  
Medium  
Low

### Rebuild Priority [\(What's this...?\)](#)

- High
- Medium High
- Medium
- Low

### Surface Scan Analysis Priority [\(What's this...?\)](#)

- Disabled
- High
- Idle (with delay)

Valid Range: 0 (Disabled) - 30 seconds

### Current Parallel Surface Scan Count [\(What's this...?\)](#)

### Physical Drive Write Cache State [\(What's this...?\)](#)

5. Click **Save Settings**.  
A summary page appears.
6. Click **Finish** to exit.

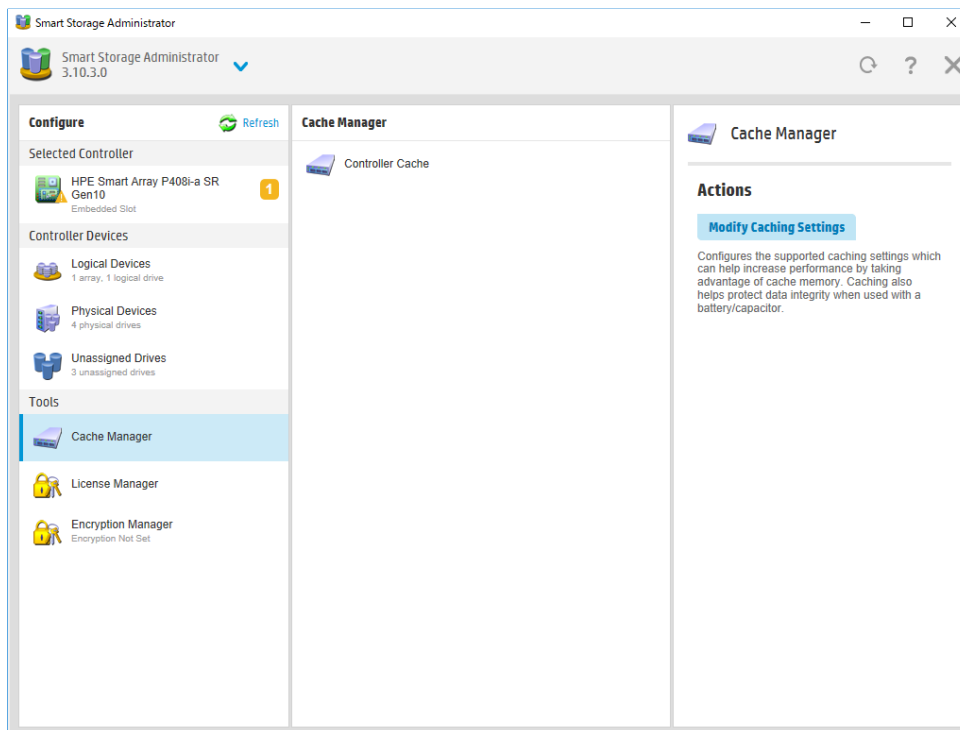
## Configuring controller cache

---

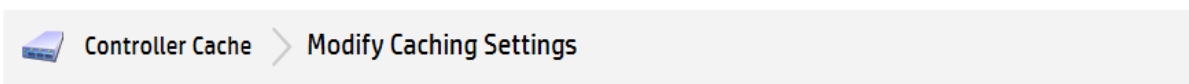
Caching increases database performance by writing data to the cache memory, instead of directly to the logical drives. Caching can be disabled to reserve the cache module for other logical drives on the array.

### Procedure

1. Open SSA.  
For more information, see "[Using the SSA GUI](#)."
2. Open the **Configure** panel by doing one of the following:
  - o Choose a device and click **Configure** in the quick navigation menu.
  - o Select an available device from the **Home** screen, and then click **Configure** under the available options.
3. Select **Cache Manager** from the **Tools** menu.
4. Click **Controller Cache** in the **Cache Manager** menu.



5. Click **Modify Caching Settings**.



■ Enabling write caching on a cache module without a fully charged battery/capacitor could cause data loss in the event of power failure. Use of this feature is not recommended unless proper precautions are followed to maintain power to the controller.

**Select the Logical Drives for which caching is to be enabled** [\(What's this...?\)](#)



**Enable Write Cache When Battery/Capacitor Not Present or Not Completely Charged** [\(What's this...?\)](#)

- Disabled
- Enabled

6. Select one or more logical drives to be cached.
7. Verify caching settings.
8. Click **OK**.

## SmartCache

This task is not supported.

## Caching write policies

---

This task is not supported.

## Working with mirrored arrays

---

---

Among the advanced tasks possible with the SSA GUI, you can split a mirrored array and then recombine it. This process entails splitting a RAID 1 or RAID 1+0 mirror into two identical new arrays consisting of RAID 0 logical drives.

Support for these procedures requires the following:

- The SSA GUI must be run in offline mode ("[Accessing SSA in the offline environment](#)").
- Mirrored arrays being split can have RAID 1, RAID 1+0, RAID 1 (ADM), or RAID 10 (ADM) configurations. Arrays with other RAID configurations cannot be split.

### Splitting a mirrored array

---

#### Procedure

1. Run the SSA GUI in offline mode. See "[Accessing SSA in the offline environment](#)."
2. Open the **Configure** panel by doing one of the following:
  - o Choose a device and click **Configure** in the quick navigation menu.
  - o Select an available device from the **Home** screen, and then click **Configure** under the available options.
3. Select **Arrays** from the **Devices** menu.
4. From the **Arrays** menu, select the appropriate array.
5. Select **Manage Data Drives** from the **Actions** panel.
6. Under **Available Array Action(s)**, select **Mirror Array**.
7. Select a physical drive.
8. Click **OK**.  
The mirrored array details are displayed.
9. Click **Finish**.
10. When SSA finishes splitting the array, two logical drives appear in the **Arrays** menu:
  - o When a RAID 1 or RAID 1+0 array splits, two RAID 0 logical drives are created.
  - o When an array that contains a RAID 1 (ADM) logical drive splits, a RAID 1 logical drive and a RAID 0 logical drive are created.
  - o When an array that contains a RAID 10 (ADM) logical drive splits, a RAID 1+0 logical drive and a RAID 0 logical drive are created.
11. Shut down the OS.
12. Power down the server.
13. With power off, remove the physical drives that constitute one of the new arrays.  
If you do not remove the physical drives for one of the arrays, the OS will be unable to distinguish between the two arrays when the server is restarted because the arrays are identical.
14. Power up the server.
15. Restart the OS.

## Recombining a split mirrored array

---

### Procedure

1. Run the SSA GUI in offline mode. See "[Accessing SSA in the offline environment.](#)"
2. Open the **Configure** panel by doing one of the following:
  - o Choose a device and click **Configure** in the quick navigation menu.
  - o Select an available device from the **Home** screen, and then click **Configure** under the available options.
3. Select **Arrays** from the **Devices** menu.
4. Select the appropriate array from the **Arrays** menu.
5. Select **Manage Data Drives** from the **Actions** panel.
6. In the **Available Tasks** panel, click **Manage Split Mirror Backup**.
7. Select the array to be mirrored to the source array.

This array is usually the array that was split from the original mirrored array. However, it can be any other array of the correct size.

8. Click **OK**.
9. When SSA finishes re-mirroring the array, restart the OS.

The controller uses the rebuild process to synchronize the mirrored drives. The drive online LED flashes during the rebuild process. Depending on the hard drive size and the server load, this process can take up to 2 hours. You can boot the OS during this time, but the logical drive is not fault-tolerant until the rebuild is complete.

## Creating a split mirror backup

---

This task splits an array that consists of one or more RAID 1, RAID 1+0, RAID 1 (ADM), or RAID 10 (ADM) logical drives, and then creates two arrays: a primary array and a backup array.

### Procedure

1. Run the SSA GUI in offline mode. See "[Accessing SSA in the offline environment.](#)"
2. Open the **Configure** panel by doing one of the following:
  - o Choose a device and click **Configure** in the quick navigation menu.
  - o Select an available device from the **Home** screen, and then click **Configure** under the available options.
3. Select **Arrays** from the **Devices** menu.
4. Select the appropriate array from the **Arrays** menu.
5. In the **Actions** panel, click **Create Split Mirror Backup**.  
A verification and message dialog box appears.
6. Click **OK**.
7. A details window appears. Click **Finish**.  
SSA creates the array according to the following rules:
  - o If the original array contained RAID 1 or RAID 1+0 drives, then the primary array will contain RAID 0 drives.
  - o If the original array contained RAID 1 (ADM) drives, the primary array will contain RAID 1 drives.
  - o If the original array contained RAID 10 (ADM) drives, the primary array will contain RAID 1+0 drives.
  - o The backup array always contains RAID 0 logical drives.
  - o The primary array continues to be fully accessible to the operating system while the backup array is hidden from the operating system.



8. When SSA finishes creating the split mirror backup, the new backup array appears in the **Devices** menu:  
The array includes the designation "Backup" at the beginning of the array name.

---

## Re-mirroring, rolling back, or re-activating a split mirror backup

---

### Procedure

1. Run the SSA GUI in offline mode. See "[Accessing SSA in the offline environment.](#)"
2. Open the **Configure** panel by doing one of the following:
  - o Choose a device and click **Configure** in the quick navigation menu.
  - o Select an available device from the **Home** screen, and then click **Configure** under the available options.
3. Select **Arrays** from the **Devices** menu.
4. Select the appropriate array from the **Arrays** menu.
5. In the **Available Tasks** panel, click **Manage Split Mirror Backup**.
6. Select one of the following actions:
  - o Re-mirror the array and preserve the existing data. Discard the backup array.  
This option re-creates the original mirrored array with the current contents of the primary array.
  - o Re-mirror the array and roll back to the contents of the backup array. Discard existing data.  
This option re-creates the mirrored array but restores its original contents, which are in the backup array. NEC recommends that you do not perform this option under the following circumstances:
    - o In an online environment
    - o If the logical drive to be rolled back is mounted
    - o If the logical drive to be rolled back is in use by the operating system
  - o Activate the backup array.  
This option makes the backup array fully accessible to the operating system. SSA removes the designation "backup" from the name of the array.

---

## Heal array

---

The Heal Array operation allows you to replace failed physical drives in the array with healthy physical drives. The original array and logical drive numbering will be unaffected after the replacement. Please note the following conditions and restrictions for the Heal Array operation:

- The replacement physical drives and the original drives must be of the same interface type (such as SAS or SATA) as the original drives.
- The operation is available only if enough unassigned physical drives of the correct size are available.
- The array has at least one failed drive.
- The array is not transforming (for example, rebuilding to a spare).
- The array has a working cache, making it capable of transformation.

---

## Change array drive type

---

SSA enables you to transfer the contents of an array to an existing empty array or a new array. During this operation, all logical drives transfer from the original array to the destination array. The original array is deleted, and the drives that were being used are freed and listed as unassigned drives.

Changing an array drive type is a time-consuming process for two reasons: all data in each logical drive is copied to the destination array, and the controller performs all data transformations while servicing IO requests to other logical drives.

To perform the operation, you must meet the following conditions:

- The destination array must have the same number of physical drives as the source or original array.
- Both the source and destination arrays must be in OK state.
- All existing logical drives in the source array must be in OK state.
- The destination array must have sufficient capacity to hold all logical drives present in the source array.

## Encryption Manager

---

---

This task is not supported.

## Managing modes

---

---

This task is not supported.

## Power modes

---

---

There are three available power modes:

- Maximum performance
- Minimum power
- Balanced

### Maximum performance (default)

This is the default setting. All settings are selected based on maximum performance. Power savings options that affect performance are disabled.

### Balanced

You can use this setting to save power with minimal effects on performance. For large queue depths, this setting affects throughput by 10% or less.

At lower queue depths or infrequent I/O, impacts on performance may be greater. This command is typically useful in environments using only hard drives, and is not recommended when using SSDs.

Settings are based on the user configuration, such as the number or types of drives, the RAID level, storage topology, and so forth. Significant changes to the configuration may require a reboot for optimal setting selection. If a reboot is required to change settings, SSA generates a warning.

### Minimum power

When settings are selected without regard to system performance, maximum power savings is achieved. NEC recommends this setting for very specific applications, but it is not appropriate for the majority of customers. Most applications will suffer significant performance reduction.



**IMPORTANT:** A reboot may be required after switching power modes in order to optimize savings and performance.



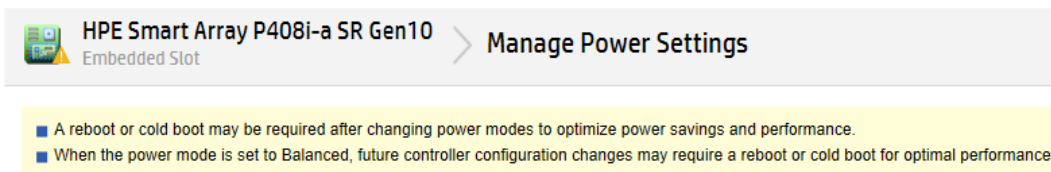
**IMPORTANT:** When the power mode is set to Balanced, future controller configuration changes may require a reboot for optimal performance.

## Modifying power modes

---

### Procedure

1. Open SSA. For more information, see "[Using the SSA GUI.](#)"
2. Select the controller.
3. Click on **Configure**.
4. Click **Modify Power Mode**.
5. Select a power mode:
  - o Min Power
  - o Balanced
  - o Max Performance



6. Click **OK**.
7. A summary page appears. Click **Finish** to exit.

## Viewing controller status

---

Use the SSA GUI to view the controller status, including the status of the cache and an attached battery or capacitor.

### Procedure

1. Open SSA. For more information, see "[Using the SSA GUI.](#)"
2. Select a controller.
3. Click **Configure**.
4. Under **Controller Configuration Summary**, click **View more details**.  
A new window appears.
5. Scroll down to **Controller Status** to view the status of the controller, cache, and battery or capacitor.

### Controller Status

Controller Status	OK
Cache Status	Permanently Disabled
Cache Status Details	Cache disabled; power source is not attached

## Options for erasing drives

---

This task is not supported.

## Erasing a drive

---

This task is not supported.

## Managing FLS

---

This task is not supported.

# Diagnostic tasks

---

SSA generates the following reports and logs:

- **Array diagnostic report**  
This report contains information about all devices, such as array controllers, storage enclosures, drive cages, as well as logical, physical, and tape drives. For supported solid state drives, this report also contains SmartSSD Wear Gauge information.
- **SmartSSD Wear Gauge report**  
This report contains information about the current usage level and remaining expected lifetime of solid state drives attached to the system.
- **Serial output logs**  
This log details the serial output for the selected controller.

For each controller, or for all of them, you can select the following tasks:

- View Diagnostic Report
- Save Diagnostic Report
- View SmartSSD Wear Gauge Report
- Save SmartSSD Wear Gauge Report

For the view tasks, SSA generates and displays the report or log. For the save tasks, SSA generates a report without the graphical display.

For either task, you can save the report. In online and offline environments, SSA saves the diagnostic report to a compressed folder, which contains an XML report, a plain text report, and a viewer file so you can display and navigate the report through a web browser.

Each SSA Diagnostics report contains a consolidated view of any error or warning conditions encountered. It also provides detailed information for every storage device, including the following:

- Device status
- Configuration flags
- Firmware version numbers
- Physical drive error logs

SSA Diagnostics never collects information about the data content of logical drives. The diagnostic report does not collect or include the following:

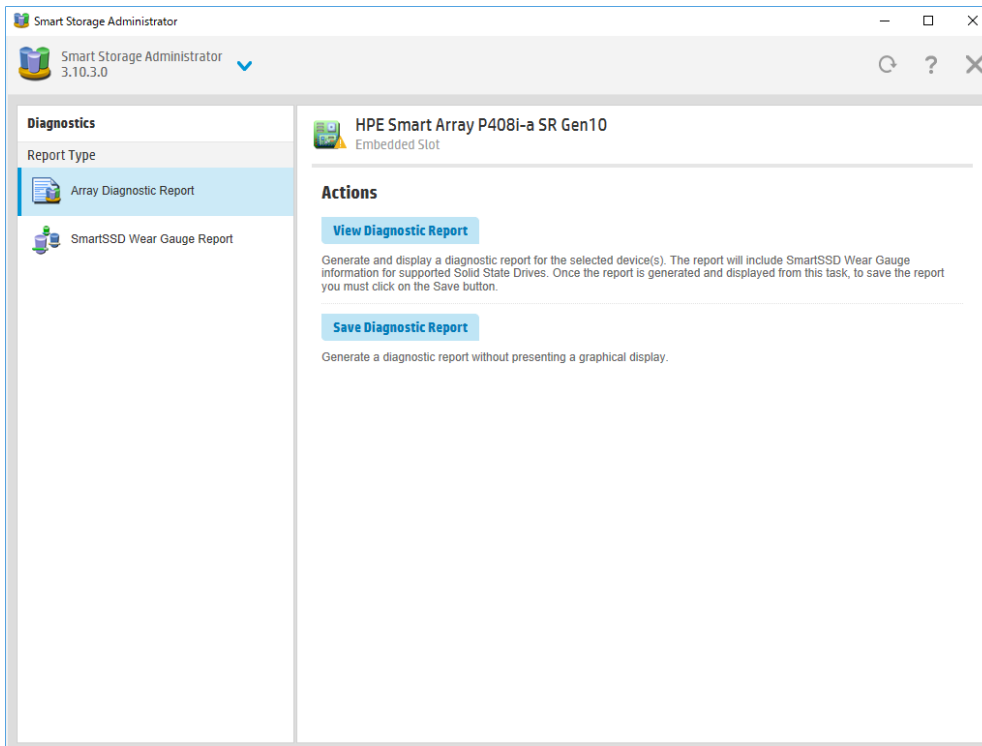
- File system types, contents, or status

- Partition types, sizes, or layout
- Software RAID information
- Operating system device names or mount points

## Performing a Diagnostics task

### Procedure

1. Open SSA.  
For more information, see "[Using the SSA GUI.](#)"
2. Open the **Diagnostics** panel by doing one of the following:
  - o Select a device and click **Diagnose** in the quick navigation menu.
  - o Select an available device from the **Home** screen, and then click **Diagnose** under the available options.
3. Select a report type.  
For this example, use the Array Diagnostic Report selection.
4. Select **Array Diagnostic Report**.  
The **Actions** panel for Array Diagnostic Report appears.



5. Click one of the task buttons:
  - o If you click **View Diagnostic Report**, the report appears. When you are finished viewing the current report, click **Close** or **Save**.
  - o If you click **Save Diagnostic Report**, wait for the report to generate, and then click **Close Report** or **Save Report**.

For more information about reports and viewing them in a browser, see the following sections:

- "[Reported information](#)"

- ["Identifying and viewing diagnostic report files"](#)
- ["Identifying and viewing SmartSSD Wear Gauge report files"](#)

## Using the SSA CLI

---

Access SSA with one of the many methods available:

- [Accessing SSA in the offline environment](#)
- [Accessing SSA in the online environment](#)

Some SSA CLI features are only available in the offline environment, such as setting the boot controller and boot volume.

SSA CLI has two operating modes:

- [Console mode](#)  
You can adjust several configuration parameters on several devices without having to restart SSA each time.
- [Command mode](#)  
You can make an isolated change of just one configuration parameter on one device.

For more information about using SSA CLI for Linux, see the following README.txt files:

- SSA: /opt/smartstorageadmin/ssacli/README.TXT
- SSACLI (32bit): /opt/smartstorageadmin/ssacli/ssacli-X.XX-X.X.XXXX.txt
- SSACLI (64bit): /opt/smartstorageadmin/ssacli/ssacli-X.XX-XX.XXXX\_XX.txt



**IMPORTANT:** For ESXi, When changing the construction of RAID such as create or delete logical drive, plug/unplug physical drive, please restart the sfcdb service.  
“/etc/init.d/sfcdb-watchdog restart”

---

## Opening the CLI in Console mode

---

The syntax of the command required to open the SSA CLI in Console mode depends on the operating system that you are using.

- For Microsoft Windows, enter the following text:  
C:\Program Files\Smart Storage Administrator\ssacli\bin\ssacli.exe  
Alternatively, click **Start**, and select **Programs>Windows System>Smart Storage Administrator CLI>Smart Storage Administrator CLI**.
- For Linux, enter the following text:  
# ssacli
- For ESXi 6.x, enter the following text:  
# /opt/smartstorageadmin/ssacli/bin/ssacli

After you have entered Console mode in either operating system, the screen displays the following message and console prompt:

```
HP Smart Storage Administrator CLI X.XX.X.X
Detecting Controllers...Done.
Type "help" for a list of supported commands.
Type "exit" to close the console.
=>
```

The remaining examples in the SSA CLI section of this guide are described as if entered in Console mode.

## Opening the CLI in Command mode

---

To use Command mode, identify the appropriate SSA CLI command ("[The <command> variable](#)"). Then, add the command to the end of the text line that is used for opening the CLI in Console mode.

The following examples use help as the command:

- Using Microsoft Windows:  
C:\Program Files\Smart Storage Administrator\ssacli\bin\ssacli.exe help
- Using Linux:  
[root@localhost root]# ssacli help
- Using ESXi 6.x:  
[root@localhost root]# /opt/smartstorageadmin/ssacli/bin/ssacli help

The remaining examples in the SSA CLI section of this guide are described as if entered in Console mode.

## CLI syntax

---

Whether entered in Command mode or Console mode, a typical SSA CLI command line consists of three parts: a target device, a command, and a parameter with values if necessary. Using angle brackets to denote a required variable and plain brackets to denote an optional variable, the structure of a typical SSA CLI command line is as follows:

```
<target> <command> [parameter=value]
```

### The <target> variable

---

This variable provides the path to the device that you want to configure. The device can be a controller, an array, a logical drive, or a physical drive. The syntax used is as follows:

```
controller all | slot=# | wwn=# | chassisname="AAA" | serialnumber=# | chassisserialnumber=# |  
[array=all | <id>] [logicaldrive all | #] [physicaldrive all | allunassigned | [#:]:#:#[#:]:#:#[#:]:#:]
```

For example:

```
controller slot=3  
controller wwn=500805F3000BAC11  
controller slot=2 array A  
controller chassisname="A" array B logicaldrive 2  
controller chassisname="A" physicaldrive 1:0  
controller all  
controller slot=2 array all  
controller slot=3 physicaldrive 1:2-1:5
```

### The <command> variable

---

The <command> variable can be any of the following words or phrases, corresponding to typical configuration tasks:

```
add  
create  
delete  
modify  
remove  
set target
```

Nonconfiguration commands are also available:

[diag](#)



[help](#)  
[rescan](#)  
[shorthand](#)  
[show](#)  
[version](#)

A command often requires a parameter, and some parameters require a value, but the specific parameters and values that are valid for a given command depend on the target to which you apply the command.

To determine the valid parameters and values for a particular combination of target and command variables, you can query the device. You can also inspect the example commands in other sections of this guide.

## Querying a device

---

If you do not know what values a parameter can have, you can sometimes query the device to find out by entering a ? as the value of the parameter.

**Example command:**

```
=> ctrl slot=0 ld 1 modify raid=0 ss=?
```

A typical screen response in this case could be:

Available options are:

```
8
16 (current value)
32
64
128
256 (default)
```

To determine which parameters can be queried, use the [help feature of the CLI](#).

## Hiding warning prompts

---

When you enter a command for an operation that can potentially destroy user data, the CLI displays a warning and prompts you for input (a y or an n) before continuing the operation. This situation is undesirable when running batch file scripts. To prevent warning prompts from being displayed, use the term forced as a parameter.

**Example command:**

```
ctrl slot=0 ld 1 delete forced
```

Under VMware ESXi 6.x, the forced flag is required for any command that has the option for a forced flag. If the forced parameter is not used, the system generates an error message notifying the user that the command could not be completed without this flag.

## Keyword abbreviations

---

Several commonly used keywords in the SSA CLI have acceptable abbreviations, as shown in the following table. For a complete list of abbreviations, enter help shorthand in the SSA CLI.

Keyword	Abbreviation in SSA CLI	Keyword	Abbreviation in SSA CLI
adapterid	ai	nobatterywritecache	nbwc
allunassigned	au	numberparitygroups	npg
arrayaccelerator	aa	parallelscsi	ps
acheratio	cr	physicaldrive	pd
chassisname*	ch*	postprompttimeout	ppto
chassisserialnumber	csn	queuedepth	qd
chassisslot	chs	raid1writebuffering	r1wb

Keyword	Abbreviation in SSA CLI	Keyword	Abbreviation in SSA CLI
configurationmode	cm	rebuildpriority	rp
connectionname	cn	serialnumber	sn
controller	ctrl	spareactivationmode	sam
ctrlpath	cp	ssdoverprovisioningoptimization	ssdopo
degradedperformancemode	dpo	ssdphysicaldrive	ssdpd
drivetype	dt	stripesize	ss
drivewritecache	dwc	surfaceanalyseventnotify	saen
elevatorsort	es	surfacescandelay	ssd
enclosure	enc	surfacescanmode	ssm
exitonerror	eo	surfacescanpriority	sp
expandpriority	ep	tapedrive	td
inconsistencyrepairpolicy	irp	waitforcacheroom	wfcr
licensekey	lk	—	—
logicaldrive	ld	—	—
mnpdelay	mnpd	—	—

\*The CLI also uses this keyword and abbreviation for the terms **box name** and **RAID array ID**.

## The show command

The show command enables you to obtain information about a device.

### Syntax:

```
<target> show [detail] | [status]
```

When you specify a target that consists of several devices, the information in the output is normally less comprehensive than when you specify only one device as the target. You can use the [detail] parameter in this case to retain all the information usually given for individual devices.

An extra parameter is available for controller targets: config. This parameter is used as follows:

```
<target controller> show config [detail]
```

If you use the config parameter, the output includes information about each device connected to the controller.

### Example 1:

```
=> ctrl slot=0 show
```

A typical output would be:

```
HPE Smart Array P408i-a SR Gen10 in Slot 0 (Embedded)
  Bus Interface: PCI
  Slot: 0
  Serial Number: PEYHCOXRH570YT
  RAID 6 (ADG) Status: Enabled
  Controller Status: OK
  Hardware Revision: B
  Firmware Version: 0.01-868
  Rebuild Priority: High
  Expand Priority: Medium
  Surface Scan Delay: 3 secs
  Surface Scan Mode: Idle
  Parallel Surface Scan Supported: Yes
  Current Parallel Surface Scan Count: 1
  Max Parallel Surface Scan Count: 16
```

Queue Depth: Automatic  
Monitor and Performance Delay: 60 min  
Elevator Sort: Enabled  
Degraded Performance Optimization: Disabled  
Inconsistency Repair Policy: Disabled  
Write Cache Bypass Threshold Size: 1040 KiB  
Wait for Cache Room: Disabled  
Surface Analysis Inconsistency Notification: Disabled  
Post Prompt Timeout: 15 secs  
Cache Board Present: True  
Cache Status: OK  
Cache Ratio: 10% Read / 90% Write  
Drive Write Cache: Disabled  
Total Cache Size: 2.0 GB  
Total Cache Memory Available: 1.8 GB  
No-Battery Write Cache: Disabled  
SSD Caching RAID5 WriteBack Enabled: True  
SSD Caching Version: 2  
Cache Backup Power Source: Batteries  
Battery/Capacitor Count: 1  
Battery/Capacitor Status: OK  
SATA NCQ Supported: True  
Spare Activation Mode: Activate on physical drive failure (default)  
Controller Temperature (C): 43  
Capacitor Temperature (C): 38  
Number of Ports: 2 Internal only  
Encryption: Disabled  
Express Local Encryption: False  
Driver Name: SmartPqi.sys  
Driver Version: 63.30.0.64 Pass 1  
PCI Address (Bus:Device.Function): 5E:00.0  
Negotiated PCIe Data Rate: PCIe 3.0 x8 (7880 MB/s)  
Controller Mode: Mixed  
Port Max Phy Rate Limiting Supported: False  
Latency Scheduler Setting: Disabled  
Current Power Mode: MaxPerformance  
Survival Mode: Enabled  
Sanitize Erase Supported: True  
Sensor ID: 0  
    Location: Capacitor  
    Current Value (C): 38  
    Max Value Since Power On: 38  
Sensor ID: 1  
    Location: ASIC  
    Current Value (C): 43  
    Max Value Since Power On: 43  
Sensor ID: 2  
    Location: Unknown  
    Current Value (C): 39  
    Max Value Since Power On: 39  
Primary Boot Volume: None  
Secondary Boot Volume: None

**Example 2:**

=> ctrl all show

Because this target consists of several devices, the output will be brief. A typical output would be:

```
HPE Smart Array P408i-a SR Gen10 in Slot 0 (Embedded) (sn: PEYHCOXRH570YT)
HPE Smart Array P408e-p SR Gen10 in Slot 1 (sn: HSJ08SW3JCUSXZ)
```

**Example 3:**

=> ctrl slot=0 show config

The output in this case will have detailed information because the target consists of only one device. A typical output would be:

```
HPE Smart Array P408i-a SR Gen10 in Slot 0 (Embedded) (sn: PEYHCOXRH570YT)
```

```
Port Name: 1I (Mixed)
```

```
Port Name: 2I (Mixed)
```

```
Internal Drive Cage at Port 1I, Box 1, OK
```

```
Array A (SAS, Unused Space: 1805299 MB)
```

```
logicaldrive 1 (100.0 GB, RAID 0, OK)
```

```
physicaldrive 1I:1:1 (port 1I:box 1:bay 1, SAS HDD, 2 TB, OK)
```

```
Array B (SATA, Unused Space: 0 MB)
```

```
logicaldrive 2 (5.5 TB, RAID 0, OK)
```

```
physicaldrive 1I:1:2 (port 1I:box 1:bay 2, SATA HDD, 6 TB, OK)
```

```
Unassigned
```

```
physicaldrive 1I:1:3 (port 1I:box 1:bay 3, SATA HDD, 6 TB, OK)
```

```
physicaldrive 1I:1:4 (port 1I:box 1:bay 4, SATA HDD, 6 TB, OK)
```

```
SEP (Vendor ID HPE, Model Smart Adapter) 379 (WWID: 50014380409FB1D0, Port: Unknown)
```

## Displaying the current versions of the application layers

---

The version command displays the current versions of the application and other software layers.

**Syntax:**

```
version
```

**Example command:**

```
version
```

A typical output would be:

```
SSACLI CLI Version: X.XX.X.X
```

```
SoulAPI Version: X.X.XX.X
```

## The help command

---

To get help with the CLI, enter help at the CLI prompt, and then enter one or more help items, as follows:

```
=> help <item1> [item2] [item3]
```

A help item can be any of the following:

- A [CLI command](#)

- An SSA CLI [keyword or keyword abbreviation](#)
- A CLI parameter
- A term commonly used in SSA, such as migrate, extend, or cache
- The word shorthand (gives a list of abbreviations for keywords in the CLI)

The help feature of the SSA CLI behaves like a browser search engine in that each item that you add to the help input string reduces the amount of help output text. For example, help controller produces extensive information, while help controller remove restricts the help output to information about how the remove command applies to controllers.

## Typical procedures

---

The following sections describe some common SSA CLI procedures.

### Setting the boot controller

---

This procedure is only available in the offline environment and only applies to booting in Legacy BIOS Boot Mode.

The boot controller is the first controller that the system examines (after power up) to find a bootable logical drive or volume. The controller boots from the first logical drive by default. NEC recommends leaving the default setting in place. This will prevent an error when booting after replacing the boot volume or controller. To assign a designated boot volume, see "[Setting the boot volume.](#)"

**Syntax:**

```
<target> modify [bootcontroller=enable|disable]
```

where <target> is a controller with a volume that can be set as the boot volume.

**Example command:**

```
controller slot=1 modify bootcontroller=enable
```

### Setting the boot volume

---



**CAUTION:** Recommends setting the boot volume only in certain scenarios to prevent a system boot error.

---

This procedure is only available in the offline environment and only applies to booting in Legacy BIOS Boot Mode.

The boot volume is the volume that contains the OS and its support files. To work properly, the boot volume must be accessible by the designated boot controller. See "[Setting the boot controller.](#)"

**Scenario:** When the bootable volume is assigned Logical Drive 2 and a non-bootable logical drive is assigned as Logical Drive 1, a boot volume can be set without resulting in system error.

**Syntax:**

```
<target> modify [bootvolume=primary|secondary|none]
```

where <target> is a controller and a logical drive.

**Example commands:**

```
controller slot=1 ld 1 modify bootvolume=primary
controller slot=1 ld 2 modify bootvolume=secondary
controller slot=1 ld 1 modify bootvolume=none
```

## Setting the target

---

If you must perform several operations on a given target device, you can simplify the required commands by setting the device as the default <target> for the CLI operations.

After you have set the target, any command that you enter in the CLI without a specified <target> is automatically applied to the set target. If you must also perform operations on other devices, you can still do so at any time by specifying the <target> for each of those operations as usual. You can also change the set target or clear it completely. The set target is automatically cleared when you close the CLI.



**IMPORTANT:** You cannot use the set target command in batch file scripts.

---

### Syntax:

```
set target <target>
```

where <target> is a controller, array, or logical drive.

### Example command:

```
=> set target ctrl slot=3  
=> clear target
```

### Typical scenario

First, set a target as follows:

```
=> set target ctrl slot=0  
=> show target
```

```
controller slot=0
```

As an example of how the set target command works, check the status of array A on this controller:

```
=> array A show  
HPE Smart Array P408i-a SR Gen10 in Slot 0 (Embedded)  
Array: A  
Interface Type: SAS  
Unused Space: 1805299 MB (94.6%)  
Used Space: 100.0 GB (5.4%)  
Status: OK  
MultiDomain Status: OK  
Array Type: Data  
Smart Path: disable
```

The controller does not need to be specified because it is currently the set target.

Now clear the target, reset it, and enter a few commands for the new set target:

```
=> clear target  
=> set target ctrl slot=3  
=> array A add drives=1:7,1:8,1:9  
=> array B add spares=1:10,1:11  
=> ctrl slot=4 ld 3 modify ss=64  
=> modify rp=high
```

This sequence includes a command for a different target (the controller in slot 4) as a demonstration. The next command in the sequence (the one for modifying the rebuild priority) applies to the controller in slot 3, not the one in slot 4. This is because the command does not specify a <target> for the rebuild priority, so the default set target is used instead.

## Identifying devices

---

You can enter a command that causes the LEDs on target devices to flash, enabling you to identify the

devices. After an hour, the LEDs stop flashing. You can also stop LED flashing by entering the off command.

**Syntax:**

```
<target> modify led=on | off
```

**Example commands:**

```
=> ctrl slot=0 modify led=on  
=> ctrl slot=0 array A modify led=off
```

## Deleting target devices

---

**Syntax:**

```
<target> delete [forced]
```

where <target> can be a controller, array, or logical drive. Except in the case of controllers, you can delete several devices simultaneously if they are of similar type by using the all keyword.

Because deleting a target device can result in data loss, the screen displays a warning prompt unless you include the forced parameter.

**Example commands:**

```
=> ctrl slot=0 delete forced  
=> ctrl slot=3 ld all delete
```

## Generating a diagnostic report

---

SSA provides several ways for administrators to generate diagnostic information, including all three SSA formats.

In SSA CLI, the diag command outputs diagnostic information about a specified controller or all controllers on the system. The ssdrpt option generates the SmartSSD Wear Gauge report.

**Syntax:**

```
<target> diag <file=filename> [ris=on | off] [ssdrpt=on | off] [xml=on | off] [zip=on | off]
```

where the following is designated:

- <target> is a controller or all controllers.
- <file=filename> designates the target file in which the diagnostic information is saved.
- [ris=on | off] determines whether RIS information is or is not included. The off value is provided for backward compatibility and is ignored.
- [ssdrpt=on | off] specifies to generate or not generate the Smart SSD Wear Gauge report. The default is off.
- [xml=on | off] outputs diagnostic information in formatted XML. The off value is provided for backward compatibility and is ignored.
- [zip=on | off] compresses the output to a zipped file. Default behavior is uncompressed. The off value is provided for backward compatibility and is ignored.

**Example commands:**

```
ctrl all diag file=c:\allcontrollers.zip  
ctrl slot=4 diag file=c:\ctrl_slot4.zip  
ctrl ch="mybox" diag file=mybox.zip ssdrpt=on
```

## Erasing a physical drive

---

This command is not supported.

## Rescanning the system

---

A rescan detects devices that have been added to the system since the previous rescan or since the SSA CLI was started, whichever is more recent.

### Syntax:

Use the word `rescan` directly at the SSA CLI prompt, without any target device or parameters.

### Example command:

```
=> rescan
```

## Entering or deleting a license key

---

This command is not supported.

## Optimizing controller performance for video

---

This command is not supported.

## Creating a logical drive

---

### Syntax:

```
<target> create type=ld [parameter=value]
```

<target> is usually a controller, but it can be an array if you are creating an additional logical drive on an existing array.

If you want to create a logical drive on a group of physical drives that are not yet assigned to an array, you do not have to build the array first. In the CLI, unlike in the GUI, the array is created automatically at the same time as the logical drive.

The standard parameters used when creating a logical drive are described in the following table. If you do not specify a particular parameter, the CLI uses the appropriate default value.

Parameter	Acceptable values	Comments
drives	[#:]#:#,[#:]#:#,... [#:]#:#- [#:]#:# all allunassigned	The default setting is all.
raid	0 1 1adm 1+0 1+0adm 5 50 6 60 ?	The default setting is the highest RAID level that the controller model and number of drives can support, except 50 or 60 (which must be specified deliberately).
numberparitygroups	2 #	The default value is 2.
ss	8 16 32 64 128 256 512 1024 default ?	Units are KB. * The default setting depends on the RAID level.
size	# min max maxmbr ?	This parameter determines the preferred size of the logical drive. Units are MB. * The default setting is max.
sectors	32 63 default ?	The default setting depends on the operating system.
aa	enable disable ?	The default setting is enable.
drivetype	sas satalogical sata saslogical parallelscsi ss_sas ss_sata ?	—

\*Use only these units. Do not enter any extra text in the command to specify the units.

If you specify an array as the target, you can omit the drives parameter, because the drives are already implicitly defined by the array ID. This feature is useful if you are entering the command directly into the CLI console because you do not need to remember which drives belong to the array. When you write a batch file,



however, it is often easier to specify every drive in the array than to parse out the array ID.

When you use the drives parameter you can list each drive individually, you can specify a drive range, or you can specify both a range and some individual drives. A drive range can span ports, boxes, and bays. If you specify individual drives, they do not have to form a continuous sequence. If you specify a range, the CLI automatically excludes from the target any drive in the range that is unavailable (for example, a drive is excluded if it already belongs to an array, is a spare, has too small a capacity, or has failed).

If you want to specify an existing array by its drives rather than by array ID, then all of the drives that you specify must belong to the same array, and none of the drives in the array can be omitted.

#### Example commands:

```
ctrl slot=5 create type=ld drives=1:0,1:1,1:2,1:3 raid=adg
ctrl slot=5 create type=ld drives=1:1-1:4 raid=adg
ctrl slot=5 create type=ld drives=1:7,1:10-2:5,2:8-2:12 raid=adg
ctrl slot=5 array A create type=ld size=330 raid=adg
```

The following pair of commands demonstrates how the drives parameter can be used in a batch file to create two logical drives on the same array, one of 330 MB and the other of 450 MB:

```
ctrl slot=2 create type=ld drives=1:1-1:6 size=330 raid=adg
ctrl slot=2 create type=ld drives=1:1-1:6 size=450 raid=5
```

### Sample scenario

---

Consider a situation in which you want to create two arrays. One of these arrays needs two logical drives, while the other needs only one.

First, determine what physical drives are available and what their properties are:

```
=> ctrl slot=0 pd all show
```

For this sample scenario, the screen response is:

```
HPE Smart Array P408i-a SR Gen10 in Slot 0 (Embedded)
```

```
Unassigned
```

```
physicaldrive 1l:1:1 (port 1l:box 1:bay 1, SAS HDD, 2 TB, OK)
```

```
physicaldrive 1l:1:2 (port 1l:box 1:bay 2, SATA HDD, 6 TB, OK)
```

```
physicaldrive 1l:1:3 (port 1l:box 1:bay 3, SATA HDD, 6 TB, OK)
```

```
physicaldrive 1l:1:4 (port 1l:box 1:bay 4, SATA HDD, 6 TB, OK)
```

Knowing this information, you can now create the first array with one logical drive:

```
=> ctrl slot=0 create type=ld drives=1l:1:1
```

Now, verify that the array has been created:

```
=> ctrl slot=0 pd all show
```

In this case, the screen response is:

```
HPE Smart Array P408i-a SR Gen10 in Slot 0 (Embedded)
```

```
Array A
```

```
physicaldrive 1l:1:1 (port 1l:box 1:bay 1, SAS HDD, 2 TB, OK)
```

```
Unassigned
```

```
physicaldrive 1l:1:2 (port 1l:box 1:bay 2, SATA HDD, 6 TB, OK)
```

```
physicaldrive 1l:1:3 (port 1l:box 1:bay 3, SATA HDD, 6 TB, OK)
```

```
physicaldrive 1l:1:4 (port 1l:box 1:bay 4, SATA HDD, 6 TB, OK)
```

Create the second array on the two remaining physical drives. Before creating this array, determine what RAID options are available for these drives:

```
=> ctrl slot=0 create type=ld drives=1l:1:2,1l:1:3 size=300 raid=?
```

The response in this case is:

Available options are:

- 0
- 1 (default value)

Now, create the new array:

```
=> ctrl slot=0 create type=ld drives=1:1:13,1:1:14 size=300 raid=1
```

It is not strictly necessary to specify the RAID level in this example because it is the highest possible level for this scenario and will be used by default. However, it is included in the command as an example.

Now, verify that the array has been formed:

```
=> ctrl slot=0 pd all show
```

The screen response is:

```
HPE Smart Array P408i-a SR Gen10 in Slot 0 (Embedded)
```

```
Array A
```

```
physicaldrive 1l:1:1 (port 1l:box 1:bay 1, SAS HDD, 2 TB, OK)
```

```
Array B
```

```
physicaldrive 1l:1:2 (port 1l:box 1:bay 2, SATA HDD, 6 TB, OK)
```

```
physicaldrive 1l:1:3 (port 1l:box 1:bay 3, SATA HDD, 6 TB, OK)
```

```
Unassigned
```

```
physicaldrive 1l:1:4 (port 1l:box 1:bay 4, SATA HDD, 6 TB, OK)
```

To create a second logical drive on array B, you can specify the array (method A) or you can specify every physical drive in the array (method B).

```
=> ctrl slot=0 array B create type=ld size=900 (method A)
```

```
=> ctrl slot=0 create type=ld drives=1l:1:2,1l:1:3 size=900 (method B)
```

Finally, verify that the logical drives have all been created correctly:

```
=> ctrl slot=0 ld all show
```

```
HPE Smart Array P408i-a SR Gen10 in Slot 0 (Embedded)
```

```
Array A
```

```
logicaldrive 1 (2 TB, RAID 0, OK)
```

```
Array B
```

```
logicaldrive 2 (300.0 GB, RAID 0, OK)
```

```
logicaldrive 2 (900.0 GB, RAID 0, OK)
```

## Moving a logical drive

---

SSA now enables you to move a single logical drive from one array to another array.

When moving the logical drive, you can choose one of the following destinations:

- An existing array
- A new array you create

To move a logical drive to an existing array, use the following information.

**Syntax:**

```
<target> modify [newarray=]
```

**Command examples:**

```
ctrl slot=1 ld 3 modify newarray=C
ctrl slot=1 ld 3 modify newarray=? // shows the available arrays
```

To move a logical drive and create a new array, use the following information.

**Syntax:**

```
<target> modify [drives=[#: ]#:#,[#: ]#:#,[#: ]#:# - [#: ]#:#,...]
```

**Command examples:**

```
ctrl slot=1 ld 3 modify drives=2e:1:1-2e:1:4
ctrl slot=1 ld 3 modify drives=? // shows the available drives
```

You can use the `drivetype` parameter to specify the drive interface type. When selecting all physical drives, and multiple drive types exist, you must specify the drive interface type. Mixed drives are not allowed on the same array or logical drives. If all drives on a controller are the same type, this parameter is not needed.

For `drivetype`, use one of the following valid options:

```
[drivetype=sas | satalogical | sata | saslogical | parallelscsi | ss_sas | ss_sata | ?]
```

**Command examples:**

```
controller slot=5 ld 1 modify drives=? drivetype=sas
controller slot=5 array A modify drives=? drivetype=ss_sas
```

## Viewing enclosure information

---

The `enclosure` keyword is a valid target for the `show` command, and it outputs the storage enclosure information.

**Syntax:**

```
enclosure [ all | port:box | serialnumber=xxx ] show [ detail | status ]
```

where the target can be any valid storage controller.

**Example commands:**

```
controller slot=5 enclosure all show
controller slot=5 enclosure 4E:1 show detail
controller slot=5 enclosure serialnumber=UAB123456 show status
```

## Viewing SSD physical drives

---

The `ssdphysicaldrive` keyword is a valid target for the `show` command, and it outputs the solid state physical drives on the specified controller.

**Syntax:**

```
<target> ssdpd all show [detail]
```

where the target is any valid controller.

**Example commands:**

```
controller slot=5 ssdpd all show
controller slot=5 ssdpd all show detail
```

## Viewing SSD information

---

The `ssdinfo` keyword provides a summary for solid state drives for the specified controller.

**Syntax:**

```
<target> show ssdinfo [detail | summary]
```

**Command examples:**

```
controller slot=1 show ssdinfo
controller all show ssdinfo
controller all show ssdinfo detail
controller all show ssdinfo summary
```

## SmartCache in SSACLI

---

This command is not supported.

## SSD Smart Path

---

This command is not supported.

## Rapid Parity Initialization methods

---

RAID levels that use parity (RAID 5, RAID 6 (ADG), RAID 50, and RAID 60) require that the parity blocks be initialized to valid values. Valid parity data is required to enable enhanced data protection through background surface scan analysis and higher performance write operations. Two initialization methods are available:

- **Default** – Initializes parity blocks in the background while the logical drive is available for access by the operating system. A lower RAID level results in faster parity initialization.
- **Rapid** – Overwrites both the data and parity blocks in the foreground. The logical drive remains invisible and unavailable to the operating system until the parity initialization process completes. All parity groups are initialized in parallel, but initialization is faster for single parity groups (RAID 5 and RAID 6). RAID level does not affect system performance during rapid initialization.

Rapid Parity Initialization is available only for supported controllers and in arrays composed of supported physical drives.

Example: of creating a logical drive with Rapid Parity Initialization:

```
=> ctrl slot=3 create type=ld drives=1e:1:1-1e:1:4 parityinitializationmethod=rapid
```

## SSD Over Provisioning Optimization

---

Access to solid state devices can be optimized by deallocating all used blocks before any data is written to the drive. The optimization process is performed when the first logical drive in an array is created, and when a physical drive is used to replace a failed drive. Not all controllers support this option.

This feature is disabled by default in the CLI.

When creating the first logical drive in an array, the `ssdoverprovisioningoptimization` parameter specifies to initialize solid state drives supporting the rapid parity initialization feature. The only valid option is "on".

Example:

```
ctrl slot=1 create type=ld drives=1l:1:1 ssdoverprovisioningoptimization=on
ctrl slot=1 create type=ld drives=1l:1:2 ssdopo=on
```

## Managing spare drives

---

Assigning one or more online spare drives to an array enables you to postpone replacement of faulty drives. However, it does not increase the fault-tolerance level of any logical drives in the array. For example, a logical drive in a RAID 5 configuration suffers irretrievable data loss if two of its physical drives are simultaneously in a failed state, regardless of the number of spare drives assigned to the array.

Any drive that you want to use as a spare must meet the following criteria:

- It must be an unassigned drive or a spare for another array.
- It must be of the same type as existing drives in the array (for example, SATA or SAS).
- It must have a capacity no less than that of the smallest drive in the array.

**Syntax:**

```
<target> add spares=[#:]#:#,[#:]#:#,[#:]#:#-[#:]#:#,... | allunassigned [forced]
```

```
<target> remove spares=[#:]#:#,[#:]#:#,[#:]#:#-[#:]#:#,... | all
```

where <target> is an array (or logical drive, if the array contains only one logical drive). The forced parameter represses any warning message prompts. If you specify a drive range, any drives in the range that do not meet the previous criteria are not used.

**Example commands:**

```
=> ctrl slot=3 array B add spares=1:6
=> ctrl slot=4 array all add spares=1:5,1:7
=> ctrl slot=5 array A add spares=1:1-1:5
=> ctrl slot=5 array A remove spares=1:1-1:5
```

## Setting the spare activation mode

---

The spare activation mode feature enables RAID Controller to activate a spare drive under the following conditions:

- Predictive Spare Activation: When a data drive reports a predictive failure (SMART) status
- Failure Spare Activation: When a data drive fails. This mode is the default.

In normal operations, RAID Controller starts rebuilding a spare drive only when a data drive fails. With the predictive failure activation mode, rebuilding can begin before the drive fails, reducing the likelihood of data loss that could occur if an additional drive fails.

Use the spareactivationmode keyword to toggle the spare activation mode for the controller between drive failure and drive predictive failure.

**Syntax:**

```
<target> modify spareactivationmode=[ failure | predictive ]
```

**Example commands:**

```
controller slot=1 modify spareactivationmode=predictive
controller slot=1 modify spareactivationmode=failure
```

## Spare Management Mode in SSACLI

---

The sparetype keyword allows you to specify the spare type as "dedicated" (default) or "autoreplace." A dedicated spare temporarily takes over for a failed drive and can be shared between arrays. An autoreplace spare replaces a failed drive and cannot be shared between arrays.

**Command example:**

To add a spare with spare type of autoreplace:

```
=> ctrl slot=1 array A add spares=1e:1:5 sparetype=autoreplace
```

## Expanding an array

---

You can increase the storage space on an array by adding physical drives. Any drive that you want to add must meet the following criteria:

- It must be an unassigned drive.
- It must be of the same type as existing drives in the array (for example, SATA or SAS).
- It must have a capacity no less than that of the smallest drive in the array.



**IMPORTANT:** An array expansion, logical drive extension, or logical drive migration takes about 15 minutes per gigabyte. While this process is occurring, no other expansion, extension, or migration can occur simultaneously on the same controller. Controllers that do not support a battery-backed write cache do not support this process.

**Syntax:**

```
<target> add drives=[#:]#:#,[#:]#:#,[#:]#:#-[#:]#:#,... |allunassigned [forced]
```

where <target> is an array (or a logical drive, if the array contains only one logical drive). The forced parameter represses any warning message prompts. If you specify a drive range, any drives in the range that do not meet the previous criteria are not used.

If you add an odd number of drives to an array that contains a RAID 1+0 logical drive, you are prompted to convert the RAID 1+0 logical drive to RAID 5 or RAID 6 (ADG). Adding the forced parameter to the command prevents this prompt from appearing.

**Example commands:**

```
=> ctrl slot=3 array A add drives=1:0,1:1  
=> ctrl slot=4 ld 1 add drives=allunassigned  
=> ctrl slot=5 array A add drives=1:1-1:5
```

## Shrinking an array

---

You can shrink the size of an array by removing a drive from an existing array. Observe the following criteria:

- After the shrink, the array must have sufficient capacity to contain all of the configured logical volumes.
- You may not remove drives from the array if the resulting number of drives does not support the fault tolerance (RAID level) of any existing logical drive. For example, if you have an array with four physical drives and a RAID 5 logical drive, you can remove, at most, one drive, because RAID 5 requires at least three physical drives.
- If the array contains a RAID 1+0 logical drive, you can remove only an even number of drives.
- If the array contains a compound RAID (RAID 50 or RAID 60) logical drive, you can remove drives only in multiples of the number of parity groups. For example, an array with 10 physical drives and a RAID 50 logical drive can be shrunk by removing two or four drives only.

**Syntax:**

```
<target> remove drives=[#:]#:#-[#:]#:#
```

where <target> is an array, and the specified physical drives are being removed to shrink the array.

For example, in an existing array (array a), six drives (1e:1:4-1e:1:9) are in use. With all criteria met, you can shrink the array to four drives by removing the last two drives with the command: <array a> remove drives=1e:1:8-1e:1:9

**Example commands:**

```
=> array a remove drives=1e:1:12-1e:1:14  
=> array b remove drives=1c:1:6-1c:1:7
```

## Moving an array

---

You can move an array by designating different physical drives for the array. To move the array, each of the physical drives where the array will reside must meet the following criteria:

- It must be an unassigned drive.
- It must be of the same type as the physical drives currently in the source array (for example, SATA or SAS).
- The destination drives must have sufficient capacity to hold all the logical drives present in the source array.

Like array creation and expansion, the useable space in all drives is reduced to the size of the smallest physical drive in the destination disk set.

Moving an array automatically removes any previously assigned spare drives. If spares are assigned to the existing array, they must be designated for the array when it is moved.

**Syntax:**

```
<target> modify drives=[#:]#-[#:]#:#
```

where <target> is an array, and the specified physical drives are the new destination for the array.

For example, in an existing array, three 72-GB SAS drives (1e:1:4-1e:1:6) are the source. Another drive of the same size is the spare (1e:1:9). With all criteria met, you can move the array to three different 72-GB SAS drives by specifying the new destination drives in the command (1e:1:12-1e:1:14). To maintain the same spare drive, be sure to designate the spare drive for the moved array.

**Example commands:**

```
=> array a modify drives=1e:1:12-1e:1:14  
=> array b modify drives=1c:1:6-1c:1:7
```

## Replacing an array

---

You can replace an array by designating different physical drives for the array. To replace the array, each of the physical drives where the array will reside must meet the following criteria:

- The destination drives must all be the same type (for example, SATA or SAS), but do not have to be same type as the drives in the source array.
- A destination drive does not have to be an unassigned drive, but if it is assigned, it must be a drive assigned to the array being replaced.
- The destination drives must have sufficient capacity to hold all the logical drives present in the source array.

Like array creation and expansion, the useable space in all drives is reduced to the size of the smallest physical drive in the destination disk set.

Replacing an array automatically removes any previously assigned spare drives. If spares are assigned to the existing array, they must be designated for the array when it is moved.

**Syntax:**

```
<target> modify drives=[#:]#-[#:]#:#
```

where <target> is an array, and the specified physical drives are the new destination for the array.

For example, in an existing array, three 72-GB SAS drives (1e:1:4-1e:1:6) are the source. Another drive of the same size is the spare (1e:1:9). With all criteria met, you can move the array to three different 72-GB SAS or SATA drives by specifying the new destination drives in the command (1e:1:12-1e:1:14). To maintain the same spare drive, be sure to designate the spare drive for the moved array.

**Example commands:**

```
=> array a modify drives=1e:1:12-1e:1:14  
=> array b modify drives=1c:1:6-1c:1:7
```

## Setting Auto RAID 0

---

Auto Array RAID 0 creates a single RAID 0 volume on each physical drive specified, enabling the user to select multiple drives and configure as RAID 0 simultaneously. Each array contains one physical drive and one RAID 0 logical drive.

**Example command:**

```
=> ctrl slot=1 create type=array0 drives=allunassigned
```

## Extending a logical drive

---

If the operating system supports logical drive extension, you can use any unassigned capacity on an array to enlarge one or more of the logical drives on the array.



**IMPORTANT:** An array expansion, logical drive extension, or logical drive migration takes about 15 minutes per gigabyte. While this process is occurring, no other expansion, extension, or migration can occur simultaneously on the same controller. Controllers that do not support a battery-backed write cache do not support this process.

---

**Syntax:**

```
<target> modify size=# |max|? [forced]
```

where <target> is a logical drive.

If the operating system does not support logical drive extension, carrying out this command makes data on the logical drive unavailable. Therefore, the CLI displays a warning prompt as a safeguard in case you are using such an operating system. To prevent the prompt from appearing, use the forced parameter.

**Example commands:**

```
=> ctrl slot=3 ld 1 modify size=max
=> ctrl slot=4 ld 1 modify size=?
=> ctrl slot=3 ld 2 modify size=500 forced
```

**Migrating a logical drive**

This command enables you to adjust the stripe size (data block size) or RAID level of a selected logical drive.

Consider the following factors before performing a migration:

- For some RAID-level migrations to be possible, you might need to add one or more drives to the array.
- For migration to a larger stripe size to be possible, the array might need to contain unused drive space. This extra space is necessary because some of the larger data stripes in the migrated array are likely to be filled inefficiently.




---

**IMPORTANT:** An array expansion, logical drive extension, or logical drive migration takes about 15 minutes per gigabyte. While this process is occurring, no other expansion, extension, or migration can occur simultaneously on the same controller. Controllers that do not support a battery-backed write cache do not support this process.

---

**Syntax:**

```
<target> modify [raid=0|1+0|1|5|6|50|60|adg|1adm|10adm|?]
[ss=8|16|32|64|128|256|512|1024|default|?]
```

where <target> is a logical drive.

The following limitations apply to this command:

- You cannot simultaneously query the RAID level and the stripe size of any given logical drive.
- If you do not specify a RAID level for a query or migration, the CLI uses the existing value by default.
- If you do not specify a stripe size, the CLI uses the default stripe size value for the RAID level that you specify.

**Example commands:**

```
=> ctrl slot=3 ld 1 modify raid=1
=> ctrl slot=4 ld 2 modify ss=16
=> ctrl slot=2 ld 3 modify raid=5 ss=16
```

**Changing the Rebuild Priority setting**

The Rebuild Priority setting determines the urgency with which the controller treats an internal command to rebuild a failed logical drive.

- At the low setting, normal system operations take priority over a rebuild.
- At the medium setting, rebuilding occurs for half of the time, and normal system operations occur for the rest of the time.
- At the medium high setting, rebuilding is given a higher priority over normal system operations.
- At the high setting, the rebuild takes precedence over all other system operations.

If the logical drive is part of an array that has an online spare, rebuilding begins automatically when drive



failure occurs. If the array does not have an online spare, rebuilding begins when the failed physical drive is replaced.

**Syntax:**

```
<target> modify rp=high | mediumhigh | medium | low | ?
```

where <target> is a controller.

**Example command**

```
=> ctrl slot=3 modify rp=high
```

---

## Changing the Expand Priority setting

The Expand Priority setting determines the urgency with which the controller treats an internal command to expand an array.

- At the low setting level, normal system operations take priority over an array expansion.
- At the medium setting, expansion occurs for half of the time, and normal system operations occur for the rest of the time.
- At the high setting, the expansion takes precedence over all other system operations.

**Syntax:**

```
<target> modify ep=high | medium | low | ?
```

where <target> is a controller.

**Example command:**

```
=> ctrl slot=3 modify ep=high
```

---

## Setting the surface scan mode

The `surfacescanmode` keyword sets the surface mode for the controller. The available modes are `disable`, `high`, or `idle`. If you specify the `idle` mode, you must also specify a surface scan delay value.

**Syntax:**

```
<target> modify [ surfacescanmode=disable | idle | high | ? ]
```

**Example commands:**

```
controller slot=1 modify surfacescanmode=high
controller slot=1 modify surfacescanmode=disable
controller slot=1 modify surfacescanmode=idle surfacescandelay=3
```

---

## Changing the surface scan delay time

The setting for the surface scan delay determines the time interval for which a controller must be inactive before a surface scan analysis is started on the physical drives that are connected to it.

Surface scan analysis is an automatic background process that ensures that you can recover data if a drive failure occurs. The scanning process checks physical drives in fault-tolerant logical drives for bad sectors, and in RAID 5 or RAID 6 (ADG) configurations, it also verifies the consistency of parity data.

**Syntax:**

```
<target> modify ssm=idle ssd=#
```

where <target> is a controller and # is a number between 1 and 30. This number determines the delay time in seconds, but you do not need to include units with the command.

**Example command:**

```
=> ctrl sn=P56350D9IP903J modify ssm=idle ssd=3
```

---

## Parallel Surface Scan

This command allows the user to set the parallel surface scan count for the controller. A value of "1" will disable the feature, and the maximum count value is "16".

## Target:

The target can be any valid controller.

## Example commands:

```
controller slot=1 modify surfacescanmode=idle surfacescandelay=3 parallelsurfacescancount=16
controller slot=1 modify parallelsurfacescancount=16
ctrl slot=3 modify pssc=16
```

## Re-enabling a failed logical drive

---

If a logical drive has failed and the data on it is invalid or non-recoverable, you can re-enable the logical drive so that it can be reused. This process preserves the structure of the logical drive and merely deletes data, whereas a delete command applied to a logical drive deletes the logical drive structure as well as the data.

### Syntax:

```
<target> modify reenable [forced]
```

### Example command:

```
=> ctrl slot=3 ld 1 modify reenable forced
```

## Changing the controller cache ratio

---

The controller cache ratio setting determines the amount of memory allocated to read and write operations. Different types of applications have different optimum settings. You can change the ratio only if the controller has a battery-backed cache (because only battery-backed cache can be used for write cache) and if there are logical drives configured on the controller.

### Syntax:

```
<target> modify cr=#/#|?
```

where <target> is a controller, and #/# is the cache ratio in the format read percentage/write percentage.

### Example command:

```
=> ctrl slot=3 modify cr=25/75
```

## Enabling or disabling the drive cache

---

On controllers and drives that support physical drive write cache, you can use this command to enable or disable the write cache for all drives on the controller.



**CAUTION:** Because physical drive write cache is not battery-backed, you could lose data if a power failure occurs during a write process. To minimize this possibility, use a backup power supply.

---

### Syntax:

```
<target> modify drivewritecache=enable|disable|? [forced]
```

where <target> is a controller that supports drive write cache.

### Example command:

```
=> ctrl slot=5 modify dwc=enable
```

## Enabling or disabling the array accelerator

---

If the controller has an array accelerator, you can disable or enable it for specified logical drives.



**NOTE:** Disabling the array accelerator for a logical drive reserves use of the accelerator cache for other logical drives on the array. This feature is useful if you want the other logical drives to have the maximum possible performance (for example, if the logical drives contain database information).

---

### Syntax:

```
<target> modify aa=enable|disable|?
```

where <target> is a logical drive.

**Example command:**

```
=> ctrl slot=3 ld 1 modify aa=enable
```

## Enabling a script to exit on error

---

When a script encounters an error during execution, the `exitonerror` keyword enables the script to decide whether to continue or to exit the application and return an exit code. When `exitonerror` is enabled, the last command line entry will cause the application to exit.

**Syntax:**

```
set [exitonerror=enable | disable]
```

Example commands:

```
set exitonerror=enable
set eoe=disable
show exitonerror
```

## Using the Split Mirror command

---

The "splitmirror" command splits original RAID 1, RAID10 or ADM mirrored volumes into individual RAID0 volumes. The command will also split volumes into RAID1 or RAID10 volumes if ADM, and can be used to recombine the volumes. Optionally, the command will hide the new volume from the OS.

**Syntax:**

```
<target> splitmirror action=[splitwithbackup|remirror|rollback|activatebackup]
```

where <target> is the array.

**Actions**

The "splitwithbackup" action splits an array consisting of one or more RAID 1, RAID 1+0, RAID 1 (ADM), or RAID 10 (ADM) and creates two arrays: A primary array and a backup array. The new arrays have the following characteristics:

- If the original array contained RAID 1 or RAID 1+0 drives, the primary array will contain RAID 0 drives.
- If the original array contained RAID 1 (ADM) drives, the primary array will contain RAID 1 drives.
- If the original array contained RAID 10 (ADM) drives, the primary array will contain RAID 1+0 drives.

The backup array always contains RAID 0 logical drives. The primary array continues to be fully accessible to the OS while the backup array is hidden from the operating system.

The "remirror" action remirrors the array and preserves the existing data. Discard the backup array. This option recreates the original mirrored array with the contents of the primary array.

The "rollback" action remirrors the array and rollback to the contents of the backup array. Discard existing data. This option recreates the mirrored array but restores its contents to the point in time when the backup array was created. It is not recommended that this option be performed online, or while the logical drive to be rolled back is mounted or in use by the OS.

The "activatebackup" action activates the backup array. This option makes the backup array fully accessible to the operating system. The target can be any valid individual array target.

**Example command**

```
=> ctrl slot= 5 array A splitmirror action=split with backup
=> ctrl slot= 5 array A splitmirror action=remirror
=> ctrl slot= 5 array A splitmirror action=rollback
=> ctrl slot= 5 array A splitmirror action=activatebackup
```

## Enabling SmartCache Write-back

---

This command is not supported.

## Managing FLS

---

This command is not supported.

## Managing modes

---

This command is not supported.

## Power mode

---



**IMPORTANT:** A reboot may be required after switching power modes in order to optimize savings and performance.



**IMPORTANT:** When the power mode is set to Balanced, future controller configuration changes may require a reboot for optimal performance.

---

### Syntax:

```
<target> modify [powermode=minpower | balanced | maxperformance | ?]
```

Where <target> is any valid controller supporting this feature.

This command sets the power for the controller.

- A value of minpower sets static settings to the lowest possible value and dynamically reduces power based on the workload.
- A value of balanced sets statistic settings based on the configuration and dynamically reduces power based on the workload (recommended).
- A value of maxperformance sets static settings to the highest possible value and does not dynamically reduce power (default).

The target can be any valid individual controller target that supports the power mode feature.

### Example command:

```
controller slot=5 modify powermode=balanced
```

## Encryption commands

---

---

These commands are not supported.

# SSA Scripting

## Using SSA scripting

---

The SSA Scripting application has two scripting modes:

- Capture mode for [capturing a configuration](#)  
SSA inspects the configuration of all internal and external array controllers connected to the server and then writes a script file describing this configuration.
- Input mode for [configuration](#)  
SSA reads the array configuration described in a specified script file. See "[Creating an SSA script file.](#)"  
SSA then applies this configuration to a target system.

### Capturing a configuration

---

---

To capture the configuration of a system, enter the following command at the system command line prompt:  
`ssascripting -c FILENAME [-internal | -external] -e FILENAME`

The -c switch information, if provided, specifies the capture file name. The capture filename is optional. If no capture file is specified, SSA names the default capture file ssaoutput.ini and places it in the SSA working directory.

The -internal and -external switches limit capture to internal or external controllers.

The -e switch information is used only if SSA must generate an error file. The error filename is optional. By default, SSA names the error file error.ini and places it in the SSA working directory.

### Using an Input script

---

---

To use an Input script to configure or reconfigure a system, first locate a suitable SSA script or see "[Creating an SSA Scripting script file.](#)"

Then, enter the following command at the system command line prompt:

```
ssascripting -i FILENAME [-internal | -external] [-reset] -e FILENAME
```

The -i switch information specifies the input file to use.

The -internal and -external switches limit configuration operations to internal or external controllers.

The -reset flag destroys any existing data and overwrites the current configuration with the configuration specified in the script.

The -e switch information allows the user to rename an error file. By default, SSA names the error file error.ini and places it in the SSA working directory.

### Creating an SSA Scripting script file

---

---

To create a valid SSA script file, use one of the following methods:

- Modify the [sample custom input script](#).
- Create a Capture file for [capturing a configuration](#).  
You can create a capture file from any server that has SSA loaded, and then modify the values of the

options in the file as necessary for the target system. This method is useful for applying a standard configuration to several servers that have similar storage resources.

- Write an original script.

Each line of text in an SSA script file is in the format option=value and can be written in uppercase or lowercase letters. For information about possible option values and the minimum configuration information that a valid script must have, see the [sample custom input script](#).

You can add blank lines and comments to any script to make it easier to read and understand. To create a comment, enter a semicolon, and then enter the comment text. SSA ignores all text on the same line after a semicolon.

## Script file requirements

---

The script file used by SSA Scripting is a text file that contains options and parameters required to configure array controllers. In order to be successfully implemented, scripts must follow the guidelines below:

- Ordering of the options and parameters is important. Options need to be read in the sequence Control>Controller>Array>Logical Drive.
- Lines of the script file are written in the form option=value or left blank.
- Semicolons are used for comments within script files. If the first character in the line is a semicolon, SSA Scripting ignores everything up to the next line.

## Sample custom input script

---

The sample script in this section gives all possible values for each option.

- If an **option** is shown in bold type, you must enter a value for that option when writing your own script.
- Default options are not universal across controllers and firmware.

You can use this script as a template for your own script.

**Action** = Configure|Reconfigure

**Method** = Custom

**Controller** = All|Slot [N][:N] | WWN [N] | First | SerialNumber [N] | IOcabinet [N],IOBay [N],IOchassis [N],Slot [N],Cabinet [N],Cell [N]

ClearConfigurationWithDataLoss = Yes|No |Forced

ReadCache = 0|10|20|25|30|40|50|60|70|75|80|90|100

WriteCache = 0|10|20|25|30|40|50|60|70|75|80|90|100

RapidParityInitialization = Enable|Disable

RebuildPriority = Low|Medium|Mediumhigh|High

ExpandPriority = Low|Medium|High

SurfaceScanDelay = N

SurfaceScanDelayExtended = N

SurfaceScanMode = Idle|High|Disabled

DriveWriteCache = Enable|Disable

NoBatteryWriteCache = Enable|Disable

BootVolumePrimary = Logical Drive Number|None

BootVolumeSecondary = Logical Drive Number|None

PowerMode = MinPower|Balanced|MaxPerformance

Latency = Disable|Low|High

; Array Options

; There can be multiple array specifications in the file

Array = A|B|C|D|E|F|G|...Z|AA|AB|AC... | Next

Drive = Port:ID... | Box:Bay... | Port:Box:Bay,... | N | \*

OnlineSpareMode = Dedicated | AutoReplace

OnlineSpare = Port:ID,... | Box:Bay,... | Port:Box:Bay | None | N

SplitMirror = SplitWithBackup|Rollback|Remirror|ActivateBackup

```

; Caching Array Options
; There can be only one Caching Array specification in the file
CachingArray = A|B|C|D|E|F|...Z|AA|AB|AC...
Drive = Port:ID,... | Box:Bay,... | Port:Box:Bay,...

; Logical Drive Options
; There can be multiple logical drive specifications in the file
; The maximum strip size depends on the number of drives in an array and the size of the controller
cache
LogicalDrive = 1|2|3... max Volumes | Next
Repeat = 0... max Volumes
RAID = 0|1|10|5|6|ADG|50|60
Size = N|Max|MAXMBR
SizeBocks = N
NumberOfParityGroups = N
Sectors = 32|63
StripSize = 8|16|32|64|128|256|512|1024
ArrayAccelerator = Enable|Disable
SSDOverProvisioningOptimization = Enable|Disable
OPTIONAL: Renumber = N
OPTIONAL: SetBootVolumePrimary = Enable
OPTIONAL: SetBootVolumeSecondary = Enable

; Caching Logical Drive Options
CachingLogicalDrive = 1|2|3... max Volumes/2
RAID = 0|1 ;FW and Controller dependent
Size = N
CachedLogicalDrive = Logical Drive Number

```

## Sample custom capture script

---

Running SSA Scripting in capture mode captures the configuration of all array controllers on the server in a capture file. The capture file can be used in input mode with minor edits to replicate the configuration to other array controllers.

Use of the "-internal" or "-external" command line switches effectively filters the controllers captured. For example, if the "-external" switch is used, then any controllers internal to the host computer are not captured in the output file.

Example:

```

; Date captured: Wed Jun 10 10:20:30 2017
; Version: 3.10.3.0 2017-05-17

Action= Configure
Method= Custom

; _____ Controller Specifications SLOT 0 _____
;
; Controller HPE Smart Array P408i-a SR Gen10, FirmwareVersion 1.04, License Keys Supported
; SerialNumber PEYHCOXRH570YT
; DriverName SmartPqi.sys
; DriverVersion 63.32.0.64 Pass 1
; SSDSmartPath Supported
Controller= SLOT 0
; PowerMode= MaxPerformance
; SurvivalMode= Enabled
ReadCache= 100
WriteCache= 0

```

```

WriteCacheBypassThreshold= 1040
RebuildPriority= Low
ExpandPriority= Medium
ParallelSurfaceScanCount= 1
SurfaceScanMode= Idle
SurfaceScanDelay= 3
Latency= Disable
DriveWriteCache= Disabled
NoBatteryWriteCache= Disabled
MNPDelay= 60
IRPEnable= Disabled
DPOEnable= Disabled
ElevatorSortEnable= Enabled
QueueDepth= Automatic
PredictiveSpareActivation= Disable
; Unassigned Drives
; 1l:1:2 (SATA HDD, 6000.0 GB), 1l:1:3 (SATA HDD, 6000.0 GB), 1l:1:4 (SATA HDD, 6000.0 GB)

; Array Specifications
Array= A
; Array Drive Type is SAS
; Array Free Space      0 GBytes
; 1l:1:1 (SAS HDD, 2000.3 GB)
Drive= 1l:1:1
OnlineSpare= No

; Logical Drive Specifications
LogicalDrive= 1
RAID= 0
Size= 1907697
; SizeBlocks= 3906963632
Sectors= 32
StripSize= 256
Caching= Disabled
; VolumeUniqueID= 600508B1001C9F7735C90621258F63C4

; PORT Specifications
Port=1l
; PortMode= Mixed

; PORT Specifications
Port=2l
; PortMode= Mixed

```

## Script file options

---

Options in SSA script files are divided into the following categories:

- [Control category](#)
- [Controller category](#)
- [Array category](#)
- [Logical Drive category](#)

Each category has several scripting options, but you do not always need to assign values to every option. SSA can use default values in some instances, while in other instances, a listed option might not be relevant for a particular configuration or scripting mode.



The options for each category are listed in the following table and described in more detail in the remainder of this section.

Category	Options	Description
Control	Action Method	These options define the overall behavior of SSA when it processes scripts and creates configurations. Control options can occur only once in a script file and must be listed first.
Controller	BootVolumePrimary BootVolumeSecondary Controller CacheState ClearConfigurationWithDataLoss DeleteLicenseKey DPOEnable DriveWriteCache ElevatorSortEnable ExpandPriority HBAMode IRPEnable Latency LicenseKey MNPDelay NoBatteryWriteCache ParallelSurfaceScanCount PowerMode QueueDepth RaidArrayId ReadCache RebuildPriority RapidParityInitialization SurfaceScanDelay SurfaceScanDelayExtended SurfaceScanMode WriteCache	Options in this category specify the controller that is to be configured (or the controller that had its configuration captured). Although the Controller option must begin this section of the script, you can script other options in this category in any order.  You can use one script file to configure all controllers in a system, and you can configure the controllers identically or individually. If you define each controller configuration individually, enter the option values for one controller and its arrays and logical drives before specifying the option values for another controller.
Array	Array ArrayRO CachingArray Drive DriveType Join OnlineSpare OnlineSpareMode SmartPath SplitMirror	These options describe an array that is to be configured on the controller that was previously specified in the script. (If no controller was previously specified, SSA stops processing the script and creates an error file.) Although the Array option must begin this section of the script, you can script the other options in this category in any order.
Logical Drive	ArrayAccelerator LogicalDrive NumberOfParityGroups PreferredPath RAID Renumber Repeat ResourceVolumeOwner Sectors ShrinkSize Size SizeBlocks StripSize StripeSize	These options describe a logical drive that is to be configured on an array that was previously specified in the script. (If no array was previously specified, SSA stops processing the script and creates an error file.) Although the LogicalDrive option must begin this section of the script, you can script the other options in this category in any order.

## Control category

The Control category has the following options:

- [Action mode](#)
- [Method mode](#)

## Action mode

---

You must specify an Action mode:

- In Configure mode, you can create new arrays, but you cannot modify existing arrays. The controller must be connected to unassigned physical drives for this mode to be available.
- In Reconfigure mode, you can modify existing arrays. For example, you can set up an array expansion, a logical drive extension, or a migration. These procedures do not destroy data, unless you specifically want the data to be deleted. In this mode, SSA does not change an existing option setting unless you specifically script a different value for that option.

If you use the `-reset` command line switch, the existing controller configuration is cleared with data loss as the first step in the configuration process. This command line switch is not compatible with Reconfigure mode.

## Method mode

---

The default value for this option is Custom.

In Auto mode, SSA can perform an expansion, extension, or migration without user intervention if the values that you set for other options imply that such an operation is necessary.

## Controller category

---

The Controller category has the following options:

- [Controller](#)
- [CacheState](#)
- [ClearConfigurationWithDataLoss](#)
- [DeleteLicenseKey](#)
- [DPOEnable](#)
- [DriveWriteCache](#)
- [ElevatorSortEnable](#)
- [FLS](#)
- [HBAMode](#)
- [IRPEnable](#)
- [LicenseKey](#)
- [MNPDelay](#)
- [NoBatteryWriteCache](#)
- [Power modes](#)
- [QueueDepth](#)
- [RapidParityInitialization](#)
- [ReadCache](#)
- [RebuildPriority](#)
- [SurfaceScanDelay](#)

- [SurfaceScanDelayExtended](#)
- [Video performance options](#)

---

## Controller

You must enter a value for this option because it identifies the controller that you want to configure:

- All—Configure all detected internal and external controllers in the system.
- Slot N[:N]—Configure the internal controller in slot number N. External controllers can be identified by appending the Port Number.
- WWN N—Configure the external controller that has the World Wide Name N.
- SerialNumber N—Configure the shared storage controller that has serial number N.
- IOCabinet[N],IOBay[N],IOChassis[N],Slot[N],Cabinet[N],Cell[N]—Configure the controller in the Integrity server that has the slot path information defined by this sequence of identifiers.

---

## CacheState

This option enables you to flush the cache or disable flushing of the cache. Values are FlushEnable and FlushDisable.

You can use this option to prevent stale cache issues.

---

## ClearConfigurationWithDataLoss

Clearing the configuration results in data loss because it deletes all logical volumes and arrays on the controller. If you clear a configuration, you can write commands later in the script file to create a new configuration from the liberated drive capacity.

The values for this option are as follows:

- Yes: The configuration will be cleared. All arrays and logical drives on the controller will be deleted. This option will fail if there are mounted logical volumes in the OS.
- Forced: The configuration will be cleared. All arrays and logical drives on the controller will be deleted.
- No: The configuration will not be cleared. This is the default option.

---

## DPOEnable

This option is not supported.

---

## DriveWriteCache

This option controls the settings of the write cache for all connected physical disks. For this option, the setting is Enable or Disable. Not all physical disks or controllers support this option.

---

## ElevatorSortEnable

This option is not supported.

---

## FLS

This option is not supported.

---

## HBAmode

This option is not supported.

## IRPEnable

---

This option is not supported.

## LicenseKey, DeleteLicenseKey

---

These options are not supported.

## MNPDelay

---

This option is not supported.

## NoBatteryWriteCache

---

With this option, the controller can enable write cache when no battery is present or when the battery fails. Values are Enable or Disable. The default is Disable.

Some controllers do not support this option.

## ParallelSurfaceScanCount

---

The ParallelSurfaceScanCount command specifies the number of parallel surface scans which can be active at any time. The minimum and maximum values are controller and firmware release dependent. This feature is not supported by all controllers.

N - number of scans

## Power modes

---



**IMPORTANT:** A reboot may be required after switching power modes in order to optimize savings and performance.



**IMPORTANT:** When the power mode is set to Balanced, future controller configuration changes may require a reboot for optimal performance.

This option modifies the controller power mode.

- A value of minpower sets static settings to the lowest possible value and dynamically reduces power based on the workload.
- A value of balanced sets statistic settings based on the configuration and dynamically reduces power based on the workload (recommended).
- A value of maxperformance sets static settings to the highest possible value and does not dynamically reduce power (default).

**Example:** PowerMode= [ MinPower | Balanced | MaxPerformance ]

## QueueDepth

---

This option is not supported.

## RapidParityInitialization

---

This option enables Rapid Parity Initialization. The RPI command is not supported on all controllers and is dependent on firmware and hard disk support. Command options are Enable or Disable.

## ReadCache, WriteCache

---

Enter a number between 0 and 100 to specify the percentage of cache that is to be allocated to drive reads or writes. The default values for both options are controller firmware-dependent.

The allowable cache ratios depend on the controller model and whether it has battery-backed write cache.

---

### RebuildPriority, ExpandPriority

These options establish the priority for rebuild and expand functions. Rebuild has four possible values: Low, Medium, MediumHigh, and High. MediumHigh is only available when Rapid Parity Initialization is enabled.

Expand has only three possible values: Low, Medium, and High.

These options are not required.

---

### SurfaceScanDelay

Enter a number between 0 and 30 to specify the duration of the surface scan delay in seconds. This option is not required. If you do not specify a value for this option, the delay remains unchanged. A value of 0 disables the scan.

---

### SurfaceScanDelayExtended

Enter a number between 0 and 300 to specify the duration of the surface scan delay in tenths of seconds. This option is not required. If you do not specify a value for this option, the delay remains unchanged. A value of 0 disables the scan.

If this parameter and SurfaceScanDelay are both in the input file, this parameter takes precedence.

---

### SurfaceScanMode

This parameter specifies the Surface Scan Mode with the following values:

- Idle—The delay interval is set with the normal values from SurfaceScanDelay or SurfaceScanDelayExtended.
- High—The surface scan enters a mode guaranteed to make progress despite the level of controller I/O.
- Disabled—No mode is selected.

---

### Video performance options

This option is not supported.

---

### Array category

The Array category has the following options:

- [Array](#)
- [ArrayRO](#)
- [CachingArray](#)
- [Drive](#)
- [DriveType](#)
- [OnlineSpareMode](#)
- [OnlineSpare](#)
- [SmartPath](#)
- [SplitMirror](#)

---

### Array

Enter a letter or pair of letters to identify the array that is to be created or reconfigured, and observe these additional limitations:

- In Configure mode, SSA creates a new array. The value that you specify for the array option must be the next available letter or pair of letters in the sequence, according to the number of existing arrays on the controller. AA follows Z, and BA follows AZ.
- In Reconfigure mode, SSA can either create a new array or reconfigure an existing array. In this case, the value that you specify can identify an existing array, or it can correspond to the next available array letter or pair of letters in the existing configuration.

## ArrayRO

---

The option ArrayRO creates a single drive array with a RAID0 volume for each argument. When ArrayRO is specified, DriveType is the only other valid command in the array section.

Command options:

- X:Y,...: Port: Id for controllers that use Port/Id drive numbering schemes. For Box/Bay numbering schemes, use Box:Bay.
- X:Y:Z,...: Port:Box:Bay for SAS controllers
- N: N number of drives will be used
- \*: Use all unconfigured drives

## CachingArray

---

This option specifies the Caching Array ID.

- In Configure mode, SSA creates a new caching array. The value that you specify for the array option must be the next available array letter in the existing configuration. AA follows Z, and BA follows AZ.
- In Reconfigure mode, the array letter identifies an existing array, or it can identify the next available array letter in the existing configuration to create a new array.

## Drive

---

You can use this option in the input file to specify new physical drives for the array. Use this option to build a new array or to expand, shrink, or move an existing array.

Observe the following guidelines:

- If you are expanding an array, each drive that you add must have a capacity no less than that of the smallest drive already in the array. The added drives and the existing drives in the array must all be the same type (for example, SAS or SATA).
- If you are moving or shrinking an array, SSA Scripting compares the current drives with the requested drives, and then determines whether you are moving or shrinking. Shrinking or moving an array is supported only in Custom method mode.
- If the value of the [ClearConfigurationWithDataLoss](#) option is Yes, you can use the Drive option to remove drives from an array.

**Custom method mode**—To specify the drives to be used in the array (different arrays on the same controller can use different methods), choose one of the following methods:

- To specify individual drives, use the applicable convention (port:ID, box:bay, or port:box:bay).
- To specify only the number of drives to use (not which specific drive IDs to use), enter that number as the value for this option. For example, if you enter drive=3, SSA uses the first three available drives to build or expand the array that you define in the remainder of the script. SSA automatically determines which drives are suitable to use.
- To use all available drives, enter an asterisk as the value for this option. An array that is configured using this method cannot have a spare.

## DriveType

---

This option specifies the interface type for drives that SSA Scripting must use to build the array.

Choose one of the valid drive types:

[SCSI | SAS | SATA | SATASSD | SASSSD]

The value is often used with the wildcard (\*) or number argument for Drive.

## OnlineSpareMode

---

The value for this option specifies the behavior of the spare drives when they are activated.

For controllers that support Auto Replace Drive, setting this value to **AutoReplace** enables a rebuilt spare drive to become a data drive in the array. When the failed data drive is replaced, it assumes the role of the former spare, eliminating the need for a second array rebuild.

Behavior	Description
Dedicated	Default value for spares
AutoReplace	The spare drive becomes a data drive when the rebuild is complete.  AutoReplace spares cannot be shared across arrays.

## OnlineSpare

---

The value for this option determines whether the array specified previously in the script will be configured with spare drives.

The interface type for drives and spare drives must match, for example, all SAS or all SATA.

- X:Y,...: Port:Id for controllers that use Port/Id drive numbering schemes. For controllers using Box/Bay numbering schemes, use Box:Bay.
- X:Y:Z,...: Port:Box:Bay for SAS controllers
- None: No spares will be added to the array and any existing spares on the array will be removed.
  - Configure mode: if the OnlineSpare option is not specified, the default value is None.
  - Reconfigure mode: If the OnlineSpare option is not specified, the spare state of the array will remain unchanged.
- N: N number of spares will be added to the array. SSA Scripting will choose the best available, unused physical drives for the spares.

## SmartPath

---

This option is not supported.

## SplitMirror

---

This option splits the original mirrored volumes into individual RAID0 volumes, optionally hiding the new volume from the OS. SplitMirror also recombines volumes. The command will only execute if scripting is started with the -offline command line option and the join target volumes are not in use by the OS.

SplitMirror operates on the following volumes:

- RAID1
- RAID10
- RAID1 ADM
- RAID10 ADM

SplitMirror uses the following commands:

- SplitWithBackup: The mirrored array is split into two new arrays and the newly created array is hidden from the OS.
- Rollback: The two arrays are recombined using the backup array as source data. Any changes made to the online array are lost.
- Remirror: The two arrays are recombined using the online array as source data.
- ActivateBackup: The backup volume is made visible to the OS.

## Logical Drive category

---

The Logical Drive category has the following options:

- [ArrayAccelerator](#)
- [LogicalDrive](#)
- [CachingLogicalDrive](#)
- [CachedLogicalDrive](#)
- [NumberOfParityGroups](#)
- [RAID](#)
- [Rename](#)
- [Repeat](#)
- [SetBootVolumePrimary](#)
- [SetBootVolumeSecondary](#)
- [Sectors](#)
- [Size](#)
- [SizeBlocks](#)
- [SmartCache Write-back](#)
- [SSDOPO](#)
- [StripSize](#)

### ArrayAccelerator

---

This option specifies whether the array accelerator is enabled or disabled for the specified logical drive. The default value is Enabled.

### LogicalDrive

---

The value that you enter for this option specifies the ID number of the logical drive that is to be created or modified. The first logical drive on an array must have an ID of 1 (not 0), and logical drive numbering must be contiguous.

- In Configure action mode, SSA accepts only the ID number of the next possible logical drive.
- In Reconfigure action mode, SSA also accepts the ID number of any existing logical drive.

### CachingLogicalDrive

---

The value that you enter for this option specifies the ID number of the caching logical drive that is to be created or modified. The first logical drive on an array must have an ID of 1 (not 0), and logical drive numbering must be contiguous.



- In Configure mode, SSA accepts only the ID number of the next possible logical drive.
- In Reconfigure mode, SSA also accepts the ID number of any existing logical drive.

Caching logical drives and cached data drives must be on the same Array Controller.

---

### CachedLogicalDrive

The value that you enter for this option specifies the data logical drive ID number to associate with the Caching logical drive.

In Configure mode, SSA accepts the ID number of any existing logical drive.

Caching logical drives and cached data drives must be on the same Array Controller.

---

### NumberOfParityGroups

When you create a RAID 50 or RAID 60 configuration, you must also set the number of parity groups.

You can use any integer value greater than 1 for this setting, with the restriction that the total number of physical drives in the array must be exactly divisible by the number of parity groups.

The maximum number of parity groups possible for a particular number of physical drives is the total number of drives divided by the minimum number of drives necessary for that RAID level (three for RAID 50, four for RAID 60).

---

### RAID

The value that you enter for this option specifies the RAID level of the logical drive.

- When the Action mode is Configure, SSA automatically selects the highest RAID level that the controller and drive configuration can support except RAID 50 or RAID 60. To specify RAID 50 or 60 for a controller that supports either of these RAID levels, use the Custom setting. In this case, you must also specify the number of parity groups ("[NumberOfParityGroups](#)").
- When the Action mode is Reconfigure, the default value is the existing RAID level for that logical drive. If you specify a different RAID setting, then SSA either ignores the new setting, or attempts to migrate the logical drive to the specified RAID level (when Method mode is Custom).

SSA supports the following values for RAID levels:

- 60—RAID 60
- 50—RAID 50
- ADG—RAID ADG is the equivalent of RAID 6
- 6—RAID 6
- 5—RAID 5
- 10ADM—RAID 1 with 3-way mirroring
- 10—RAID 10 (mirroring with 2 disks)
- 1ADM—RAID 1 with 3-way mirroring
- 1—RAID 1 (mirroring with 2 disks)
- 0—RAID 0

---

### Renumber

This option rennumbers the logical drive to N.

Typically used after a Join command, this option ensures the proper logical volume numbering is set, for example, the boot volume is ID 1.

Do not mix Renumber and Join operations in the same script, because SSA Scripting does not update its internal state after a renumber. If other commands are mixed with Renumber, commands targeting specific volumes might target the incorrect volume.

## Repeat

---

The value you enter for this option specifies the number of times that SSA is to repeat this logical drive configuration.

Use one of the following values:

- N—In Configure mode, SSA creates N new logical drives.
- MAX—SSA creates the maximum number of logical drives possible. The number of drives created depends on the number of existing drives and the maximum number of logical drives supported by the controller.

You must specify the logical drive ID as Next. This Size option controls the size of each logical drive, or if the size is set to MAX, the size of the volumes is set to consume all available space on the array.

## SetBootVolumePrimary

---

This option sets the current logical volume to be the primary boot volume on the current controller through the command Enable. This option is not supported on all array controllers.

## SetBootVolumeSecondary

---

This option sets the current logical volume to be the secondary boot volume on the current controller through the command Enable. This option is not supported on all array controllers.

## Sectors

---

This option specifies the number of sectors that are to comprise each track. Enter 32 to disable MaxBoot or 63 to enable it.

- For new logical drives, the default setting is 63 if the logical drive is larger than 502 GB. Otherwise, the default setting is 32.
- For an existing logical drive, the default setting is the existing setting.

Logical drive performance is likely to decrease with MaxBoot enabled.

## Size

---

This parameter specifies the size of the logical drive.

Use the following values to set the size:

- N—The size in MB
- MAX—Uses all available unused space in the array for the logical drive. This value is the default.
- MAXMBR—Creates the largest size of volume supportable by a 32-bit MBR (2TiB)

In Reconfigure mode, the default setting is the existing size of the logical drive. If you enter a larger value, SSA extends the logical drive to the new size if there is unused drive capacity on the same array, as long as the operating system supports logical drive extension. You cannot reduce the size of the logical drive.



**CAUTION:** Back up all data before extending a logical drive.

---

## SizeBlocks

---

This option specifies the size of the logical drive in 512-byte blocks. Use this option to set an exact size

without rounding.

When SSA Scripting captures a configuration, it reports volume sizes rounded down to the nearest MB. When the capture is played back, the size is reduced to fit within the already rounded MB size. This option prevents the loss of volume size over successive generations of captures.

However, if the size does not fit the geometry of the array, caused by different disks or RAID levels, the size will be rounded down to fit the geometry.

### SmartCache Write-back

---

This option is not supported.

### SSDOPO (SSDOOverProvisioningOptimization)

---

This option sets the over provisioning optimization parameter at volume creation time through the command Enable. This option is not supported on all array controllers, and only supported on some SSDs. This option is not valid in reconfigure mode.

### StripSize

---

Beginning with SSA, SSA CLI, and SSA Scripting, the StripSize option replaces the StripeSize option. When distributing data across multiple physical drives (striping), the **strip size** is the amount of data that is written to each physical drive. The **full stripe size** refers to the combined size of all the strips across all physical drives, excluding parity-only drives.

You can enter a numerical value for this option to specify the size of the data strips (in kilobytes), or you can leave this option blank and allow SSA to use a default value.

Strip sizes available for a RAID level vary based on the controller and the controller firmware level. The maximum strip size changes dynamically and is reduced for arrays with a large number of data drives or with smaller controller cache sizes. The controller must be able to read an entire strip of data at a time into cache memory during transformation. Available memory is the limiting factor.

The following strip sizes are available:

- 8–8 KB
- 16–16 KB
- 32–32 KB
- 64–64 KB
- 128–128 KB
- 256–256 KB
- 512–512 KB
- 1024–1024 KB

The default strip size value depends on the action mode:

- In Configure action mode, the default value is determined by the RAID level that you specified earlier in the script.
- In Reconfigure action mode, the default value for this option is the strip size that is already configured for the logical drive. If you enter a value that is different from the existing strip size, SSA attempts to migrate the logical drive to the strip size that you specify. (If you intend to migrate the logical drive, back up all data before starting the migration procedure.)

### Encryption support commands

---

These commands are not supported.

## Split/Join scripting

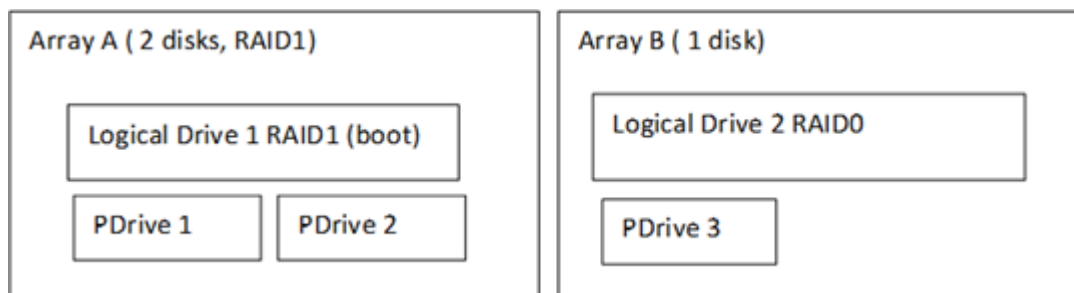
---

The SPLITMIRROR command enables you to split or join arrays and their associated drives. It is possible to execute the command only after starting the script with the `-offline` command in the CLI. The target volumes for the join operation cannot be in use by the operating system.

### Initial configuration example

---

In this example, two arrays are each set up with a logical drive, and three physical drives (PDrives) between them.



### Performing the split operation

---

Use the following syntax for the Split operation:

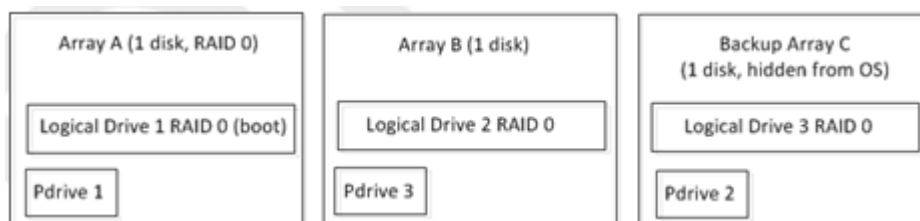
```
SplitMirror = SplitWithBackup
```

When the command executes, the mirrored array is split into two new arrays with one becoming a backup array.

In the example, Backup Array C will be hidden from the operating system. To split the RAID1 logical drive in the example configuration, the command would be used as follows, with the controller in Slot 6:

```
Action= Reconfigure  
Method= Custom  
Controller= SLOT 6  
Array= A  
SplitMirror= SplitWithBackup
```

The SPLITMIRROR command creates a new logical drive (3) and a new array (C) from the original Array. The configuration is shown in the following diagram:



### Executing the join command

---

Scripting must be launched with the `-offline` command line option to enable this command. This command has three options:

- SplitMirror = Remirror
- SplitMirror = Rollback
- SplitMirror = ActivateBackup

#### Example 1: SplitMirror = Remirror

This form of the command does the following:

- Recreates the original array
- Retains data from Logical Drive 1
- Removes Logical Drive 3, along with all data

To keep the modifications made to Logical Drive 1 after the SPLITMIRROR:

```
Action= Reconfigure
Method= Custom Controller= SLOT 6
Array= A
SplitMirror= Remirror
```

After the command executes, Array C is removed and physical drive 2 (PDrive2) is now a mirror of PDrive1, with the original contents of PDrive2 lost.

### Example 2: SplitMirror = Rollback

This form of the command does the following:

- Recreates the original array
- Retains data from Logical Drive 3 (that is, the original data at the time of the split)
- Removes Logical Drive 1, along with all data

To return to the original configuration at the time of the SPLITMIRROR:

```
Action= Reconfigure
Method= Custom Controller= SLOT 6
Array= A
SplitMirror= Rollback
```

After the command executes, physical drive 1 (PDrive1) becomes a mirror of PDrive2 (the original data at the time of the split), with the modifications to PDrive1 lost.

If this example is attempted while the system is online (that is, booted from Logical Drive 1), a blue-screen or kernel panic will likely result. Perform this command offline and ensure the volumes involved in the join are not mounted or otherwise used by the Operating System.

### Example 3: SplitMirror = ActivateBackup

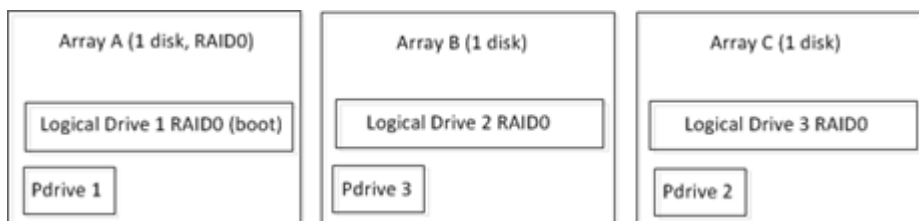
- Exposes the hidden logical drive to the operating system
- Retains the data from Logical Drive 1
- Retains the data from Logical Drive 3

To keep the modifications made to Logical Drive 1 and also access the original logical volume data at the time of the SPLIT, enter the following:

```
Action= Reconfigure
Method= Custom
Controller= SLOT 6
Array= A
SplitMirror= ActivateBackup
```

After the command executes, Logical Volume 3 is exposed to the Operating System.

There might be implications with the operating system with respect to the volume name, unique IDs, and so forth, which may require manual intervention by the System Administrator.



# Basic scripting scenarios

---

## Configure a two-disk array

---

### Task

Create a simple two-disk array with a 100 GB RAID 1 logical volume.

### Hardware configuration

- Storage system
- An unconfigured RAID Controller in slot 1  
If the controller contains an existing configuration, the script fails unless you add the `-reset` parameter to the command line to clear the existing configuration.
- Two available physical drives at the following location: 11:4:8 and 11:4:7

### Script

```
Action=Configure  
Method=Custom
```

```
Controller=Slot1
```

```
Array=A  
Drive=11:4:8, 11:4:7
```

```
LogicalDrive=1  
RAID=0  
Size=100000
```

### Summary

The script combines the two physical drives into a single 100 GB logical drive.

## Reconfigure to modify logical drive size

---

### Task

Reconfigure an existing 100 GB logical volume to modify its size to 200 GB.

### Hardware configuration

- Storage system
- An RAID Controller in slot 1
- An existing logical drive with a capacity equal to or larger than 200 GB

### Script

```
Action=Reconfigure  
Method=Custom
```

```
Controller=Slot1
```

```
Array=A  
LogicalDrive=1  
RAID=0  
Size=200000
```

## Summary

The script modifies the size of the logical drive only, because multiple transformations of a logical drive cannot be performed at the same time. For example, SSA Scripting must complete the size expansion before beginning another transformation, such as a RAID level change.

To modify existing arrays and volumes, the SSA GUI may be a more intuitive tool for some users. The GUI provides graphical feedback that guides the user and displays only available options.

## Reconfigure to modify RAID level

---

### Task

Reconfigure an existing RAID 0 logical volume to be a RAID 1 logical volume.

The selected RAID level is supported only if the minimum number of physical drives are available.

### Hardware configuration

- Storage system
- An RAID Controller in slot 1
- An existing logical drive

### Script

```
Action=Reconfigure  
Method=Custom
```

```
Controller=Slot1
```

```
Array=A  
LogicalDrive=1  
RAID=1
```

## Summary

The script modifies the RAID level of the logical drive only, because multiple transformations of a logical drive cannot be performed at the same time. For example, SSA Scripting must complete the RAID level change before beginning another transformation, such as a size expansion.

To modify existing arrays and volumes, the SSA GUI may be a more intuitive tool for some users. The GUI provides graphical feedback that guides the user and displays only available options. For example, the SSA GUI only displays optional RAID levels based on the minimum number of required physical drives.

## Configure by disk type and count

---

### Task

Create an array by specifying the type and count of disks for SSA Scripting to use. This example use two SAS drives. This method does not require you to specify physical disks by location.

### Hardware configuration

- Storage system
- An RAID Controller in slot 1
- Two available SAS physical disks

This script fails if two unused SAS drives are not available on the RAID Controller.

### Script

```
Action=Configure  
Method=Custom
```

```
Controller=Slot1
```

```
Array=A  
Drive=2  
DriveType=SAS  
LogicalDrive=1  
RAID=0
```

### Summary

This script does not specify a size, but uses the MAX default value to consume the fully available capacity of the physical drives.

SSA Scripting does not support arrays with mixed drive types. An array must comprise drives of the same type, for example all SAS or all SATA drives. Different arrays can have different drive types.

## Configure two arrays, one with a spare

---

### Task

Create two arrays with one online spare on a RAID Controller. One array uses two physical drives in a RAID 1 logical volume. The second array uses the remaining physical disks to create 20 identically sized RAID 5 logical volumes.

### Hardware configuration

- Storage system
- An unconfigured RAID Controller in slot 1
  - If the controller contains an existing configuration, the script fails unless you add the `-reset` parameter to the command line to clear the existing configuration.
- Numerous available physical drives at unspecified locations

### Script

```
Action=Configure  
Method=Custom
```

```
Controller=Slot1
```

```
Array=A  
Drive=2  
OnlineSpare=1  
LogicalDrive=1  
RAID=1  
Size=MAX
```

```
Array=B  
Drive=*  
LogicalDrive=NEXT  
Repeat=20  
RAID=5  
Size=MAX
```

### Summary

For both arrays, this script uses the MAX value to consume the fully available capacity of the physical drives.

For Array B, the Repeat option specifies the number of times to repeat the configuration. Instead of using the number 2, the script uses the NEXT value to specify the ID of the second logical drive. When using the Repeat option, you must also use the NEXT value for the LogicalDrive option. This script will fail if the controller does



not have the required number of disks connected.

## Advanced commands

---

### Controller=ALL

---

You can use Controller=All instead of the Slot=N command.

#### Advantages

- You do not need to determine where controllers are installed.
- You can target all controllers at once.

#### Examples

Change read cache to 100% on all controllers (only configured controllers, those with volumes, accept this command):

```
Controller=ALL  
ReadCache=100
```

Clear the configuration on all controllers:

```
Controller=ALL  
ClearConfigurationWithDataLoss=Yes
```

### Controller=First

---

You can use Controller=First instead of the Slot=N command.

#### Advantages

- You do not need to determine where controllers are installed.
- You can target the first controller found, a common practice with embedded controllers, because they are always slot 0. (Controllers are sorted by slot number, lowest to highest, and internal controllers before external ones.)

#### Example

Configure a volume on the embedded controller (or the controller in the lowest slot number, if an embedded controller does not exist):

```
Controller=First  
Array=A Drive=1E:1:1, 1E:1:2  
LogicalDrive=1 RAID=1
```

### -internal or -external

---

You can use the command line option -internal or -external instead of the default option, which is both internal and external controllers.

#### Advantage

This option filters the discovered controllers, restricting the command to only internal or only external controllers.

#### Example

When using the Controller=First command, if the system had no internal controllers (due to hardware failure or discovery failure) but had an external controller for shared storage, the script would attempt to create a volume on the external controller. To prevent that action, the -internal command line argument restricts discovery to only internal controllers:

```
# ssascripting -i input.txt -internal
```

```
Controller=First
Array=A
Drive=1E:1:1, 1E:1:2
LogicalDrive=1
RAID=1
```

## Array=Next

---

You can use Array=Next instead of the Array=A command.

### Advantage

You do not need to know how many arrays exist. The scripting software selects the next valid array identifier.

### Example

Add one array to the configuration, regardless of how many arrays already exist:

```
Controller=Slot1
Array=Next
Drive=1E:1:1, 1E:1:2
LogicalDrive=2
RAID=1
```

Recommends pairing the Array=Next command with [LogicalDrive=Next](#), because you would not create an array without also creating a logical drive, and this additional command does not require you to know how many logical drives already exist.

## LogicalDrive=Next

---

You can use LogicalDrive=Next instead of the LogicalDrive=N command.

### Advantage

You do not need to know how many logical drives exist. The scripting software selects the next valid identifier.

### Example

Add one logical drive to Array A, regardless of how many logical drives already exist:

```
Controller=Slot1
Array=A
Drive=1E:1:1, 1E:1:2
LogicalDrive=Next
RAID=1
```

## Repeat=N | MAX

---

You can use this command as part of the logical drive specification.

### Advantage

You can quickly divide the available space on an array into multiple volumes without specifying each volume individually.

### Example

Create the maximum number of logical volumes the controller supports (each volume is the same size, and the volumes, in total, use all available free space):

```
Controller=Slot1
Array=A
Drive=*
LogicalDrive=Next
Repeat=Max
RAID=1
```

## Drive=N

---

You can use Drive=N instead of specifying the actual paths (Drive=1E:1:1, 1E:1:2).

### Advantage

You can specify the number of drives needed for the configuration, and the scripting software selects the first available drives based on increasing path. This command is most useful when all drives in the configuration are the same size.

### Example

Add a logical drive to the configuration using four physical drives:

```
Controller=Slot1
Array=A Drive=4
LogicalDrive=1
RAID=5
```

## Drive=\*

---

You can use Drive=\* instead of specifying the actual paths (Drive=1E:1:1, 1E:1:2).

### Advantage

You can use all available drives for the configuration without knowing their number or actual path.

For this command to execute, all configuration rules must be met. For example, if only two physical drives exist, the scripting software uses both drives, but does not create volumes that require more than two drives, such as a RAID 5 volume.

### Example

Add a logical drive to the configuration using all unassigned drives:

```
Controller=Slot1
Array=A
Drive=*
LogicalDrive=1
RAID=5
```

In this example, three or more physical drives must be available to support the RAID level.

## OnlineSpare=N

---

You can use OnlineSpare=N instead of specifying the actual paths (OnlineSpare=1E:1:1, 1E:1:2).

### Advantage

You can specify the number of spares needed for the configuration, and the scripting software selects the first available drives based on increasing path. This command is most useful when all drives in the configuration are the same size.

### Example

Add a logical drive to the configuration using two spare drives:

```
Controller=Slot1
Array=A
Drive=1E:1:1, 1E:1:2
OnlineSpare=2
LogicalDrive=1
RAID=1
```

## OnlineSpare=\*

---

You can use OnlineSpare=\* instead of specifying the actual paths (OnlineSpare=1E:1:1, 1E:1:2).

### Advantage

You can use all available, unassigned drives as spares for the configuration without knowing the number of drives available or their actual paths.

Observe the following guidelines:

- You cannot exceed the controller settings for maximum number of spares allowed in an array, typically eight spares.
- You cannot combine this command with [Drive=\\*](#), because the script processes the Drive specification first and uses all available drives for that action, leaving no unassigned drives for the OnlineSpare request.

### Example

Add a logical drive to the configuration using all unassigned drives as spares:

```
Controller=Slot1
Array=A
Drive=1E:1:1, 1E:1:2
OnlineSpare=*
LogicalDrive=1
RAID=1
```

## DriveType=SCSI | SAS | SATA | SATASSD | SASSSD

---

You can specify what type of drive to use in a configuration.

### Advantage

You can ensure that only a certain type of drive is used in a configuration where multiple drive types exist.

### Example

Create one volume using all existing SAS solid state drives, and create one volume using all existing SATA drives:

```
Controller=Slot1
Array=A
Drive=*
DriveType=SASSSD
LogicalDrive=1
RAID=0
Array=B
Drive=*
DriveType=SATA
LogicalDrive=2
RAID=0
```

## Size=MAXMBR

---

You can use this command to limit the size of the volume to 232 blocks (2 TiB), which is the largest bootable volume supported on MBR-based systems.

### Advantage

You configure the largest possible, bootable volume size regardless of the free space available, provided that the free space is at least 2 TiB.

### Example

Create an array with a max sized bootable volume from a 3 TB disk at 1l:1:1:

```
Controller= Slot 1
Array= Next
Drive= 1l:1:1
LogicalDrive=Next
RAID= 0
Size= MAXMBR
```

### SizeBlocks=N

---

You can use this option to capture the exact number of 512-byte blocks in a volume, and then to recreate the exact size when playing back a capture.

#### Advantage

The Size value is rounded to the nearest Mebibyte. When you capture the same system repeatedly, this rounding can result in the eventual loss of a small amount of volume size. This option eliminates the rounding.

#### Example

Create an array with volume using exactly 20,971,520 512-byte blocks (exactly 10 GiB) using the disk at 1l:1:1:

```
Controller= Slot 1
Array= Next
Drive= 1l:1:1
LogicalDrive=Next
RAID= 0
SizeBlocks= 20971520
```

## Advanced scripting scenarios

---

---

### Clear the configuration on all internal controllers

---

#### Task

Clear the current configuration on all internal controllers in the system.

#### Hardware configuration

Unspecified

#### Script

```
# ssascripting -i input.txt - internal

Controller=ALL
ClearConfigurationWithDataLoss=Yes
```

#### Summary

By combining the advanced commands to specify -internal controllers first, and then ALL controllers, the user can clear configurations without affecting external controllers attached externally and without having to identify the internal controllers by slot or clear them one at a time.

## Add a simple volume on systems with mixed controller and physical disk configurations

---

### Task

Add a simple, one-disk RAID 0 volume on each system, using one script. However, do not add a new volume to systems booting from an external controller.

### Hardware configuration

The administrator has 500 systems, some with embedded controllers, some with controllers in expansion slots, and some booting from an external controller.

Each system has a different physical disk configuration, some disks in an internal drive cage and some in an external storage box. Each system can have a different number of arrays and volumes.

### Script

```
# ssascripting -i input.txt - internal
```

```
Controller=First  
Array=Next  
Drive=1  
LogicalDrive=Next  
RAID=0
```

### Summary

By combining the advanced commands to specify -internal controllers only, and then First controllers, the user does not add volumes to external controllers or to additional internal controllers on the same system. The Next command eliminates the need to identify specific arrays and volumes.

## Create multiple arrays on unconfigured systems with mixed physical disk configurations

---

### Task

Add two arrays, each with one volume, to each system. Configure the first array as an OS volume with RAID 1 and a single spare. Configure the second array to use all remaining disks in a RAID 5 volume with no spares.

### Hardware configuration

The administrator has 500 unconfigured systems with embedded controllers. Each system has a different physical disk configuration, some disks in an internal drive cage and some in an external storage box.

### Script

```
Controller=Slot0  
  
Array=A  
Drive=2  
OnlineSpare=1  
LogicalDrive=1  
RAID=1  
  
Array=B  
Drive=*  
LogicalDrive=2  
RAID=5
```

### Summary

The Slot0 specification targets embedded controllers only. Each array is configured using available drives. Array A uses two available drives, and the script eliminates the need to specify the drives by address. Array B uses all remaining available drives, again without specific drive addresses, but also without the administrator having to specify the number of drives, which can vary for each system.

## Create the maximum size bootable volume

---

### Task

When more than 2TiB of disk space is available, use all possible physical disks to create an array, create the maximum sized boot volume, and then consume the remaining space in another volume.

### Hardware configuration

The administrator has an unconfigured system with a controller.

### Script

```
Controller= Slot 1
Array= A
Drive= *
LogicalDrive=1 ; consumes the first 2TiB
RAID= 0
Size= MAXMBR
LogicalDrive=2 ; consumes remainder of free space
RAID=0
```

### Summary

Without specifying drives by name, the administrator instructs the controller to use available disk space, up to 2TiB, to create the first volume in an array. Any remaining disk space is consumed in a second volume automatically.

## Create a configuration with a specific block size

---

### Task

Identify the size of a logical volume in blocks, and then create a configuration for another logical volume that matches exactly, using block size instead of capacity.

Currently, all RAID Controller volumes consist of 512-byte blocks. When you create a custom configuration that uses the Size parameter, the script specifies the input size in MiB, which rounds the requested value into some number of blocks equal to or slightly greater than the requested size; the exact value depends on the array configuration.

However, if you use the SizeBlocks parameter to create the logical volume, then the script specifies the input size in the exact number of blocks, and no rounding occurs. In some cases, the RAID configuration might adjust the number of blocks in the new logical drive.

### Hardware configuration

The administrator has a system with a controller and a configured logical volume.

### Script output

To identify the size of an existing logical volume, in blocks, observe the output when you capture the existing configuration. Scripting outputs the current size of volumes in block units in a comment.

```
; Logical Drive Specifications
LogicalDrive= 2
RAID= 5
Size= 279964
; SizeBlocks= 573367088
Sectors= 32
StripSize= 512
Caching= Enabled
```

You can then use the size, specified in blocks, to configure another logical volume that is an exact match in size. When using an input script, you can specify either Size or SizeBlocks, but not both.

## Summary

To create a logical drive that uses the exact same configuration of another logical drive, use the `SizeBlocks` parameter to specify the size, thus avoiding the rounding that can occur with the `Size` parameter.

## XML support

---

SSA scripting supports an XML file format for input and output.

### XML output

---

To create an XML output document, use an XML suffix with the output file name:

```
C:\ssascripting -c out.xml
```

The following text is an example XML output file.

```
<?xml version="1.0"?>
<Config.document>
<!-- Date captured: Fri Apr 28 18:06:51 2017 -->
<!-- Version: 3.10.2.0 2017-04-14 -->
<Action>Configure</Action>
<Method>Custom</Method>

<Controller ID="SLOT 0">
  <!-- Controller HPE Smart Array P408i-a SR Gen10, FirmwareVersion 0.01, Build 868, License Keys
Supported -->
  <!-- SerialNumber PEYHCOXRH570YT -->
  <!-- PowerModeOperational= MaxPerformance -->
  <!-- PowerModeConfigured= MaxPerformance -->
  <!-- SurvivalMode= Enabled -->
  <ReadCache>10</ReadCache>
  <WriteCache>90</WriteCache>
  <WriteCacheBypassThreshold>1040</WriteCacheBypassThreshold>
  <RebuildPriority>High</RebuildPriority>
  <ExpandPriority>Medium</ExpandPriority>
  <ParallelSurfaceScanCount>1</ParallelSurfaceScanCount>
  <SurfaceScanMode>Idle</SurfaceScanMode>
  <SurfaceScanDelay>3</SurfaceScanDelay>
  <Latency>Disable</Latency>
  <DriveWriteCache>Disabled</DriveWriteCache>
  <NoBatteryWriteCache>Disabled</NoBatteryWriteCache>
  <MNPDelay>60</MNPDelay>
  <IRPEnable>Disabled</IRPEnable>
  <DPOEnable>Disabled</DPOEnable>
  <ElevatorSortEnable>Enabled</ElevatorSortEnable>
  <QueueDepth>Automatic</QueueDepth>
  <PredictiveSpareActivation>Disable</PredictiveSpareActivation>
  <!-- Unassigned Drives 1l:1:3 (SATA HDD, 6000.0 GB), 1l:1:4 (SATA HDD, 6000.0 GB) -->
  <UnassignedDrives>1l:1:3;SATA, 1l:1:4;SATA</UnassignedDrives>
  <Array ID="A">
  <DriveType>SAS</DriveType>
  <FreeSpaceKB>1073741823</FreeSpaceKB>
    <!-- 1l:1:1 (SAS HDD, 2000.3 GB) -->
    <Drive>1l:1:1</Drive>
    <OnlineSpare>No</OnlineSpare>
    <LogicalDrive ID="1">
      <Raid>0</Raid>
      <Size>102398</Size>
      <!--SizeBlocks= 209712000 -->
```



```

        <Sectors>32</Sectors>
        <StripeSize>256</StripeSize>
        <Caching>Enabled</Caching>

    <VolumeUniqueID>600508B1001CD47034E0898B726239A7</VolumeUniqueID>
    </LogicalDrive>
</Array>
<Array ID="B">
    <DriveType>SATA</DriveType>
    <FreeSpaceKB>0</FreeSpaceKB>
    <!-- 1l:1:2 (SATA HDD, 6000.0 GB) -->
    <Drive>1l:1:2</Drive>
    <OnlineSpare>No</OnlineSpare>
    <LogicalDrive ID="2">
        <Raid>0</Raid>
        <Size>5722013</Size>
        <!--SizeBlocks= 11718684464 -->
        <Sectors>32</Sectors>
        <StripeSize>256</StripeSize>
        <Caching>Enabled</Caching>

    <VolumeUniqueID>600508B1001CFD8A058129B9AB43121A</VolumeUniqueID>
    </LogicalDrive>
</Array>

<!-- PORT Specifications -->
<Port ID="1l">
    <!-- PortMode>Mixed</PortMode -->
</Port>

<!-- PORT Specifications -->
<Port ID="2l">
    <!-- PortMode>Mixed</PortMode -->
</Port>
</Controller>

</Config.document>

```

## XML input

XML input follows the same format as the document for [XML output](#). Use the same parameter order as the standard input format.

The following example shows a simple input script in both standard and XML formats.

Standard format	XML format
Action= Configure Method= Custom	<?xml version="1.0"?> <Config.document> <Action>Configure</Action> <Method>Custom</Method>
Controller= Slot 0	
Array=A Drive= 1l:1:1	<Controller ID="Slot 0"> <Array ID="A">
LogicalDrive= 1 RAID= 0 Size= 102398	<Drive>1l:1:1</Drive> <LogicalDrive ID="1"> <Raid>0</Raid> <Size>102398</Size> </LogicalDrive>
	</Array> </Controller>

---

**Standard format****XML format**

---

</Config.document>

---

## XML input file DTD

---

The following DTD outlines the parameters for an SSA scripting XML input file.

```
<!DOCTYPE Config.document [  
  <!ELEMENT Config.document ( Action, Method, Controller+ ) >  
  <!ELEMENT Action ( Configure | Reconfigure ) >  
  <!ELEMENT Method ( Auto | Custom ) >  
  
  <!ELEMENT Controller, Array ( ChassisName? | ClearConfigurationWithDataLoss | DriveWriteCache? |  
  ExpandPriority? | Initiator? | ReadCache? | RebuildPriority? | SurfaceScanDelay? | WriteCache? ) >  
    <!ATTLIST Controller ID PCDATA #REQUIRED >  
    <!ELEMENT ClearConfigurationWithDataLoss ( YES | NO ) NO >  
    <!ELEMENT DriveWriteCache ( ENABLE | DISABLE ) >  
    <!ELEMENT ExpandPriority ( HIGH | MEDIUM | LOW ) >  
    <!ELEMENT ReadCache ( 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 ) >  
    <!ELEMENT RebuildPriority ( HIGH | MEDIUM | LOW ) >  
    <!ELEMENT SurfaceScanDelay ( #PCDATA ) >  
    <!ELEMENT WriteCache ( 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 ) >  
  
  <!ELEMENT Array, LogicalDrive+ ( Drive, OnlineSpare ) >  
    <!ATTLIST Array ID PCDATA #REQUIRED >  
      <!ELEMENT Drive ( ALL | #PCDATA ) >  
      <!ELEMENT OnlineSpare ( YES | NO | #PCDATA ) >  
  
      <!ELEMENT LogicalDrive ( Raid, Repeat | Size, Sectors, StripeSize, ArrayAccelerator? ) >  
        <!ATTLIST LogicalDrive ID PCDATA #REQUIRED >  
        <!ELEMENT ArrayAccelerator ( ENABLE | DISABLE ) ENABLE >  
        <!ELEMENT Raid ( 0 | 1 | 1ADM | 10 | 10ADM | 4 | 5 | 6 | ADG | 50 | 60 ) >  
        <!ELEMENT Repeat ( MAX | #PCDATA ) >  
        <!ELEMENT Sectors ( 32 | 63 ) >  
        <!ELEMENT Size ( MAX | #PCDATA ) MAX >  
        <!ELEMENT StripeSize ( 8 | 16 | 32 | 64 | 128 | 256 | 512 ) >  
    ]>
```

## SSA scripting warning messages

Warning code	Warning message	Comment or clarification
4000	License key is already installed	The input file specified a license key. However, a license key is already installed on the controller.
4001	Clear configuration command failed - configuration is already cleared	The -reset option was used on a controller that does not have a configuration.
4002	Chassis name is already set to this value	The chassis name is already set to the supplied value. The command is ignored.
4003	One or more controller commands were skipped because the controller is not configured	Certain commands require that the controller be configured before they can be sent to the controller.
4004	Using Repeat function	Some commands have been ignored because the Repeat parameter has been specified in the input file.
4005	The system must be rebooted for the firmware flash to complete	A controller has been flashed with new firmware. The new firmware requires a reboot to take effect.
4006	Unable to set the array accelerator for this volume. The cache board may be missing or have a bad status, or the controller may not support a cache	The controller may not support a cache (for example, some Software RAID controllers) or the cache may be missing or defective.
4007	The controller does not have a battery attached	The operation requested requires a battery and one was not attached.
4008	The controller battery status is Failed	The operation requires a battery and the attached battery has failed.
4009	This parameter cannot be modified	The input script attempted to modify a parameter which is not modifiable.
4010	Rapid Parity Initialization is not available	Rapid Parity Initialization is not available on the selected volume; there may already be an RPI in progress, or the firmware does not support RPI.
4011	The command is not available when MODE=CONFIG	—
4012	The command is not available when MODE=RECONFIG	—

## SSA scripting error messages

Error code	Error message	Comment or clarification
0	—	No error exists. The program completed successfully.
2053	Too many coinciding expansion, migration, or extension operations	The new configuration requires more transformations than are possible at one time. For example, you cannot expand a logical volume and transform its RAID level at the same time.
2056	Controller does not support license keys	The controller does not support license key entry or deletion.
2059	Invalid license key	The entered license key is not a valid license key.
2064	Controller does not support SSP	The controller does not support SSP functions.
2817	Invalid Action	The requested actions are invalid, for example, combining -reset with capture mode.
2818	Invalid Method	The method must be either Custom or Auto.
2819	Invalid Controller	An invalid controller value was specified.
2821	No controllers detected	No controllers were detected. This error applies to

Error code	Error message	Comment or clarification
		Input mode only.
2823	Invalid Rebuild Priority	The specified rebuild priority is not supported.
2824	Invalid Expand Priority	The specified expand priority is not supported. This error also occurs if the controller does not allow expansion, and therefore does not support expand priority.
2826	Array not specified	The Array command is missing from the script file. Some commands were found that require an Array to be specified.
2827	New Array ID does not match the next available Array ID	The array ID in the script file does not match the array ID of the next available array. For example, if the configuration has an Array A and the input file specifies Array C (without Array B), then the script generates this error.
2828	New Array ID already exists	The array ID specified in the script file (in Configure mode) already exists in the configuration. Configure mode can only create new arrays.
2829	Cannot create Array	The controller will not allow a new array to be created, either because the controller has no unassigned physical drives attached or because the maximum number of arrays or logical drives has been reached already.
2830	Cannot expand Array	The Array could not be expanded, either because the controller does not support expansion, or the current configuration does not allow expansion to occur on the array.
2831	Cannot change Array Spare	The spare state of the array could not be changed. This error can occur when you attempt to add or drop a spare and the current configuration does not allow a spare state change for the array.
2832	Invalid physical drive. Possible reasons for this include: a typing error, the drive already exists in an array, the drive type does not match, or it is a failed drive.	A specified physical drive is not a valid physical drive, or it cannot be placed in the array.
2833	Invalid Spare	A specified spare is not a valid spare drive, or it cannot be placed in the array as a spare.
2834	Invalid logical drive	The logical drive ID is not valid.
2836	New Logical Drive ID does not match the next available logical drive ID. If you are attempting to replicate a configuration that has non-consecutive logical drive numbers, then you must change the script file so that the logical drive numbers are consecutive.	The script file specifies a logical drive ID that is not the first unused ID in the sequence. For example, this message appears if the controller has only Logical Drive 1 and the script file specifies creation of Logical Drive 3 (omitting Logical Drive 2). A common cause of this error is that the input file specifies nonsequential logical drive numbers. In this case, change the logical drive numbers in the input file so that they are sequential.
2837	New Logical Drive ID already exists	This error occurs in Configure mode when the logical drive ID specified in the script file already exists in the configuration. In Configure mode, you can create new logical drives only.
2838	Cannot create Logical Drive	The array has no free space, or the maximum number of logical drives has been reached already.
2839	Cannot migrate Logical Drive RAID	The controller does not support RAID migration, or migration is not possible with the current controller configuration.
2841	Cannot extend Logical Drive	The controller does not support extension, or the current controller configuration cannot be extended. For example, extension is not possible if the array

<b>Error code</b>	<b>Error message</b>	<b>Comment or clarification</b>
		has no free space.
2842	Invalid RAID	The specified RAID level is invalid or is not possible with the current physical disk and array configuration.
2843	Invalid Size	The specified size is invalid or is not possible with the current configuration.
2844	Invalid Stripe Size	The specified stripe size is invalid, not supported by the current RAID level, or not possible with the current configuration.
2849	Invalid ClearConfigurationWithDataLoss parameter	The valid parameters are Yes and No (default).
2850	Controller does not support Chassis Name	The controller does not support setting a chassis name.
2851	Invalid Chassis Name	The entered chassis name is invalid. Use characters from the set a-z, A-Z, 0-9, !, @, #, *, (, ), ,, -, _, +, :, ,, /, and [space]. The name cannot end with a space character or exceed the maximum number of characters allowed by the controller.
2852	Invalid SSP State	The requested SSP state is not a valid SSP state.
2853	Cannot change SSP settings	The SSP settings cannot be changed for the controller or logical drive.
2854	Invalid SSP Adapter ID	The adapter ID is not a valid adapter ID that was detected by the controller.
2857	Invalid Surface Scan Delay	—
2861	Controller does not support redundancy settings	The controller is not redundant or does not support redundancy settings.
2864	Invalid Preferred Path Mode	The specified value for the preferred path mode is not valid, or the controller is not available.
2865	Invalid Preferred Path	The specified preferred path is not a valid chassis slot for an available, active controller, or the controller is not available.
2866	Failure opening capture file	—
2867	Failure opening input file	—
2868	Failure opening error file	—
2877	There are no suitable spares available	SSA found no drives that could be used as spares for the specified array.
2880	Invalid Physical Disk Type Specified	—
2882	Invalid MNP delay	The specified value for MNP delay is invalid.
2883	Invalid Cache Logical Drive	The specified caching logical drive ID is invalid.
2884	Invalid Caching Array	The specified caching array ID is invalid.
2885	Error creating Caching Logical Drive	—
2886	Error creating Caching Array	—
2887	Error modifying Caching Volume	—
2888	Unable to modify Caching Arrays	Caching arrays cannot be modified once created.
2889	The requested Array modification is invalid	Error specifying the list of drives when reconfiguring an array

<b>Error code</b>	<b>Error message</b>	<b>Comment or clarification</b>
3000	Invalid Option	The value of the option supplied to this parameter is invalid.
3001	Invalid Command	The command is invalid.
3002	Command Failed	The controller returned an error for a command.
3003	License Key Delete Failed	SSA is unable to delete the license key.
3004	Invalid Sector Size	—
3005	Cannot delete Array	—
3006	Invalid Number of Parity Groups	—
3007	Chassis name is too long	—
3008	Chassis name is already in use	Another controller is already using the entered chassis name.
3009	Auto Configure failed	The Auto Configure mode was unable to complete auto configuration.
3010	Cannot extend logical drive, not enough free space for the requested size	—
3011	Cannot extend logical drive, requested size is too small	—
3012	Cannot specify both SIZE and SHRINKSIZE	The input file cannot specify both a SIZE and SHRINKSIZE parameter.
3013	Cannot shrink Array	The array shrink operation was not successful.
3014	Cannot move Array	The array move operation was not successful.
3015	Invalid operation - Advanced Pack support required	The requested operation requires a valid license key to be entered.
3016	Spare drives cannot be specified by a count in Reconfigure mode	When in Reconfigure mode, the requested spare drives must be specified by their addresses. A simple count cannot be used.
3017	Disk drives cannot be specified by a count in Reconfigure mode	When in Reconfigure mode, the requested data drives must be specified by their addresses. A simple count cannot be used.
3018	Invalid number of physical disks	—
3019	Cannot create Array - no physical disks specified	SSA cannot create an array unless physical disks are specified in the input file DRIVE parameter.
3020	SSP must be enabled in order to perform this operation	For the specified operation, SSA requires SSP to be supported and enabled.
3021	Invalid connection name	—
3022	The connectionname cannot be removed when the hostmode has a non-default value.	—
3023	Invalid Host Mode	—
3024	Invalid Adapter ID	—
3025	This controller does not have host mode modification capability	—
3026	You need to have administrator rights to continue	—
3027	Another instance of SSA is already running (possibly a service). Please terminate the SSA application before running SSA scripting.	—

Error code	Error message	Comment or clarification
3028	Invalid Drive Cache setting. Valid options are ENABLE and DISABLE.	—
3029	Invalid or out of order Command	Verify the ordering of the commands in the input configuration file.
3030	Invalid or missing Array for Reconfigure	Expecting a valid array in Reconfigure mode
3031	Invalid or missing Filename for Firmware Update	The firmware filename supplied is not a valid filename.
3032	Firmware Update Failed	The firmware flash operation on the controller failed.
3033	This controller has been configured with a more recent version of software. To prevent data loss, configuration changes to this controller are not allowed. Please upgrade to the latest version to be able to continue to configure this controller.	Some changes to SOULAPI are not backward-compatible. This check prevents the use of an older version of software on a controller configured with a newer version, possibly overriding changes and destroying data.
3034	Operations on this Array are temporarily unavailable while the Array is transforming.	The user requested too many simultaneous changes. For example, the user added new disks to an array (expand array) and changed the size or RAID level of logical volumes on the array. The solution is for the user to wait until the array transformation is complete.
3035	Invalid value for NoBatteryWriteCache	A problem exists with the NOBATTERYWRITECACHE command. Check the supplied argument. Not all controllers support this operation.
3036	Cannot delete Logical Drive	A problem occurred during the attempt to delete the specified logical drive. The drive may be in use by the OS, it may not exist, or it may not be the last logical drive on the array.
3038	The SplitMirror command is not valid for the specified Array	The operation is not available. Older array controllers/firmware may not support this command.
3046	This command is only available when running offline	The operation requested cannot be performed online. Boot to offline SSA Scripting and supply the -offline parameter.
3047	Caching Volume parameters are not valid for a data Volume	The parameters supplied are not applicable or valid.
3048	Invalid Spare Mode	—
3049	Encryption Login Failed	—
3050	Encryption Login command is not available	—
3051	The Encryption command is not available	—
3052	The Zeroize command failed	The controller firmware returned an error when attempting to set zeroize the encryption configuration.
3053	The Firmware Lock/Unlock failed	The controller firmware returned an error when attempting to lock or unlock the firmware.
3054	Unable to change the Key Manager Mode	The controller firmware returned an error when attempting to change the key manager mode.
3055	Unable to set the Key Encrypting Key	The controller firmware returned an error when attempting to set Key Encrypting Key name.
3056	Unable to set the boot password	The controller firmware returned an error when attempting to set the boot password.
3057	Unable to set the boot password state	The controller firmware returned an error when attempting to set the boot password state.
3058	The controller does not support encryption	An attempt was made to execute an encryption command on a controller which does not support encryption.
3059	Controller Encryption is disabled	An attempt was made to execute an encryption

<b>Error code</b>	<b>Error message</b>	<b>Comment or clarification</b>
		command when encryption was disabled.
3060	Login required for this Encryption command	A login is required before the encryption command can be attempted.
3061	Plaintext volumes are not allowed	The option to create future plaintext volumes was not selected when initially configuring the encryption configuration.
3062	Rekey of the encrypted volume failed	The controller firmware returned an error when attempting to rekey the selected logical volume.
3063	Plaintext to Ciphertext conversion of the volume failed	The controller firmware returned an error when attempting to convert the logical volume from plaintext to ciphertext.
3064	Instant Secure Erase failed	The controller firmware returned an error when attempting to perform an Instant Secure Erase operation on the selected logical volume.
3065	Error changing the Controller Encryption Mode	The controller firmware returned an error when attempting to change the encryption mode (on/off).
3066	Error - you must indicate acceptance of the End User License Agreement (EULA) using ACCEPTEULA=YES	—
3067	Unable to set the password	An attempt to set the encryption password failed.
3068	Unable to set the Recovery question/answer	An attempt to set the encryption recovery question/answer pair failed.
3100	SSD Smart Path is not supported	—
3101	The SSD Smart Path command failed	—
3102	Unable to lock controller. Make sure other instances of SSA, SSACLI, or SSASCRIPING are not configuring this controller	—



# Failure Notification

## RAID Report Service

### About the service

RAID Report Service notifies OS log (Windows: Event Log, Linux: syslog) of the event which occurred to RAID Controllers and attached devices in Windows and Linux.

This utility alerts influential events to NEC ESMPRO Manager by event monitoring system of NEC ESMPRO ServerAgentService. Install RAID Report Service, NEC ESMPRO ServerAgentService and set SNMP Service to send traps, then NEC ESMPRO ServerAgentService automatically alerts events of RAID system reported by RAID Report Service.



**IMPORTANT:** Use the RAID Report service, following setting:

- iLO Web: Encryption -> Security Settings -> Production. (HighSecurity or FIPS, RAID Report Service can't be used.)



- For more information about NEC ESMPRO Manager and NEC ESMPRO ServerAgentService, see document of each software.
- About the alert which notify to NEC ESMPRO Manager, see [RAID Report Service notice message](#).

### Installing the service



**IMPORTANT:** Before install RAID Report Service, you have to install NEC ESMPRO ServerAgentService and SSA CLI. If confirm the installation procedure, see NEC ESMPRO ServerAgentService Installation Guide and "[Install SSA](#)".



**IMPORTANT:** When RAID Report Service install, you should use the latest install module. See NEC Corporate Website (<http://www.nec.com/>) and confirm whether the latest module is released. If NEC Corporate Website doesn't release a module, the latest module is in the Starter Pack.



**IMPORTANT:** When RAID Report Service version update, install after uninstall old module.

#### Confirm a module version

target	procedure
Installed module	version.txt in install directory
website release module	each release memo
Starter Pack inside	mount Starter Pack and see this file: /software/{revision}/{OS}/raidsrv/ExUpInfo.xml <version>X.XX Rev.xxxx</version> ※{revision} depends on the Starter Pack version.

## Installing the downloaded module from website

---

Download latest module from NEC Corporate Website (<http://www.nec.com/>).

### Procedure

#### Microsoft OS

1. Sign-in to the Windows with Administrators privilege.
2. Extract downloaded zip file.
3. Run the setup.exe.

By default, installed in following directory.

C:\Program Files\RAID Report Service\

#### Linux OS

1. Login root user.
2. Extract downloaded zip file.  
# cp ./{filename}.zip /tmp/raidsrv  
# cd /tmp/raidsrv  
# unzip {filename}.zip
3. Add execute permission to the setup.sh and run.  
# chmod 755 ./setup.sh  
# ./setup.sh --install

By default, installed in following directory.

/opt/nec/raidsrv

## Installing the Starter Pack

---

Get Starter Pack from Option or NEC Corporate Website (<http://www.nec.com/>).

### Procedure

#### Microsoft OS

1. Sign-in to the Windows with Administrators privilege.
2. Put on the Starter Pack in media drive.
3. Move to Starter Pack directory and run the start\_up.bat.
4. Click [Integrated Installation] in Starter Pack menu.
5. Select the [Application], and [RAID Report Service]. Click Install.

By default, installed in following directory.

C:\Program Files\RAID Report Service\

#### Linux OS

1. Login root user.
2. Put on the Starter Pack in media drive.
3. Create a mount point. ※if already created, no need to this procedure.  
# mkdir /media/cdrom
4. Mount a Starter Pack.  
# mount -r -t iso9660 /dev/sr0 /media/cdrom
5. Move to packages.  
# cd /media/cdrom/software/{revision}/lnx/pp/raidsrv/  
{revision} depends on Starter Pack version.
6. Copy to zip file of RAID Report Service and extract.  
# cp ./EXPRESSBUILDER8\_\*.zip /tmp/raidsrv/  
# cd /tmp/raidsrv/

- ```
# unzip ./EXPRESSBUILDER8_*.zip
```
7. Add execute permission to raidsrvSetup.sh and run.  

```
# chmod 755 ./raidsrvSetup.sh
```

```
# ./raidsrvSetup.sh
```

By default, installed in following directory.  

```
/opt/nec/raidsrv
```

## Uninstalling the service

---

### Procedure

#### Microsoft OS

1. Sign-in to the Windows with Administrators privilege.
2. Uninstall with [Programs and Features] of Control Panel.

#### Linux OS

1. Login root user.
2. Uninstall using rpm command.

```
# rpm -r raidsrv
```

When command completed, Uninstall finished.

## Using the service

---

This utility is the resident service automatically starts after OS boot sequence. It is not necessary to start this utility manually.

## RAID Report Service notice message

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### priority, facility

| kind    | priority | facility | service |
|---------|----------|----------|---------|
| warning | warning  | daemon   | raidsrv |
| error   | err      | daemon   | raidsrv |

### Event List

Additional information is before and behind each event message.

**Example:** [%1 %2] Physical Device is Failed. %3

%1: RAID Contoroller and PCI slot

%2: Location of Physical Devices or Logical Drive ID

%3: Additional information according to the occurrence event

| Event ID | Kind    | Alert | Description                                                          | Deal Method                                                                                                         |
|----------|---------|-------|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| 337      | error   | ○     | Physical Device is Failed.                                           | Please replace the Physical Device.                                                                                 |
| 338      | warning | ○     | Detected S.M.A.R.T. Error.                                           | Please replace the Physical Device.                                                                                 |
| 339      | error   | ○     | A Fatal Error happened to Physical Device.                           | Please replace the Physical Device.                                                                                 |
| 340      | warning | ○     | Physical Device Endurance Remaining is Need to replace(10% or less). | Please replace the Physical Device.                                                                                 |
| 341      | error   | ○     | Physical Device Endurance Remaining is End of Life.                  | Please replace the Physical Device.                                                                                 |
| 347      | warning |       | Physical Device Endurance Remaining is Need to replace(20% - 11%).   | Physical Device Endurance is approaching. Please consider a replacing the Physical Device.                          |
| 439      | error   | ○     | Logical Drive is Offline.                                            | Please replace the Physical Device and remake the Logical Drive. Next restore the backup data to the Logical Drive. |

## Open Source Software

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RAID report service is including open source softwares assented to based on the following license.

### Windows

#### Apache License

python-iloest-library

jsonpath-rw

recordtype

#### MIT License

urlparse2

validictory

six

## **Python Software Foundation License**

Python2.7

## **The 3-Clause BSD License**

jsonpatch

jsonpointer

ply

decorator

cereal

## **Linux**

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## **The 3-Clause BSD License**

cereal

# Troubleshooting

## Diagnostic report

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### About the function

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Diagnostic report collects all possible information about storage devices in the system, detects all problems, and provides a detailed configuration report in .zip format.

The utility generates two types of reports:

- **Array diagnostic report**  
This report contains information about all devices, such as array controllers, storage enclosures, drive cages, as well as logical, physical, and tape drives. For supported SSD, this report also contains SmartSSD Wear Gauge information.
- **SmartSSD Wear Gauge report**  
This report contains information about the current usage level and remaining expected lifetime of SSD attached to the system.

For more information, see "[Reported information](#)."

### Reported information

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The array diagnostic report provides detailed information about devices (array controllers, storage enclosures, drive cages, physical drives, logical drives, and tape drives).

For example, device information on a typical embedded controller might include:

- Software versions
- Errors
- Controller information:
  - Name
  - Attached devices
  - Description
  - PCI bus
  - PCI device
  - PCI function
- Drive information:
  - Interface
  - WWID
  - Drive model
  - Serial number
  - Firmware revision
  - Total blocks

The SmartSSD Wear Gauge report contains information on the current usage level of and expected lifetime

remaining for SSD attached to the system.

For discovered SSDs, the report summary page provides the following calculated totals:

- Total Solid State Drives with Wearout Status
- Total RAID Controller Solid State Drives
- Total Non RAID Controller Solid State Drives
- Total Solid State SAS Drives
- Total Solid State SATA Drives
- Total Solid State Drives

In addition to these totals, the summary page also displays the following tables:

- Solid State Drives with Wearout Status
- Solid State Drives with Less Than an Estimated 56 Days of Life Remaining
- Solid State Drives with Less Than 2% Usage Remaining
- Solid State Drives with Less Than 5% Usage Remaining
- RAID Controllers
- Non RAID Controllers



**IMPORTANT:** Just after the new inserted SSD, "remaining life expectancy based on Work road" in SSA/SSACLI are sometimes indicated little extremely. It occurs because there is little unit time just after the insertion, but report by RAID report service doesn't occur.

When the generated report is viewed in a browser, the report page displays the following fields in the SmartSSD Status table.

| Field                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SSD Wear Status                                    | Indicates the SSD's wear status with one of the following messages: <ul style="list-style-type: none"><li>• OK</li><li>• Not Supported</li><li>• The SmartSSD Wear Gauge log is full. Wear Gauge parameters are not available.</li><li>• SSD has less than 5% usage remaining before wearout.</li><li>• SSD has less than 2% usage remaining before wearout.</li><li>• SSD has less than an estimated 56 days before it reaches the maximum usage limit for writes (wearout) and should be replaced as soon as possible.</li><li>• SSD has less than 5% of usage remaining before wearout. It has less than an estimated 56 days before it reaches the maximum usage limit and should be replaced as soon as possible.</li><li>• SSD has less than 2% of usage remaining before wearout. It has less than an estimated 56 days before it reaches the maximum usage limit and should be replaced as soon as possible.</li><li>• SSD has reached the maximum rated usage limit for writes (wearout) and should be replaced immediately.</li></ul> |
| Power Cycles                                       | Indicates the number of times the SSD has powered on from the powered off state                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Power On Hours                                     | Indicates the number of hours the SSD has been powered on                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Estimated Life Remaining Based On Workload To Date | Indicates an estimate of the number of days the SSD has before SSD Utilization reaches 100%. This field is not displayed when the SSD Utilization is still at 0%.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Usage Remaining                                    | Indicates the percentage of the SSD that has not worn out. Usage remaining is equal to the difference of 100 and the SSD Utilization percentage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| SSD Utilization                                    | Indicates the percentage of the SSD that has worn out                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## Diagnostic report procedures

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### Viewing the diagnostic report

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#### Procedure

1. Browse to the .zip file you created using the SSA.
2. Open the HTML file to view the report.

### Identifying and viewing diagnostic report files

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The diagnostic report output archive contains the following files:

- ADUReport.txt—Diagnostic report in text format
- ADUReport.xml—Diagnostic report in XML format
- ADUReportViewer.htm—HTML viewer for XML diagnostic report
- SlotX.txt (SlotX.old)—Controller serial output log

#### Procedure

1. Extract ADUReportViewer.htm to a directory.
2. Open ADUReportViewer.htm in the browser.

## SmartSSD Wear Gauge report procedures

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### Viewing the SmartSSD Wear Gauge report

---

#### Procedure

1. Browse to the .zip file you created using the SSA.
2. Open the HTML file to view the report.

### Identifying and viewing SmartSSD Wear Gauge report files

---

The SmartSSD Wear Gauge report output archive contains the following files:

- SmartSSDWearGaugeReport.txt—SmartSSD wear gauge report in text format
- SmartSSDWearGaugeReport.json—SmartSSD wear gauge report in JSON format
- SmartSSDWearGaugeReport.htm—HTML viewer for the JSON wear gauge report

#### Procedure

1. Extract the following files to a directory:
  - o SmartSSDWearGaugeReport.json
  - o SmartSSDWearGaugeReport.htm

All files must reside in the same directory.

2. Open SmartSSDWearGaugeReport.htm in the browser.



# Diagnosing array problems

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## Diagnostic tools

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To troubleshoot array problems and generate feedback about arrays, use the following diagnostic tools:

- RAID Report Service  
This service reports array events to the OS event log. You can get the service from the Starter Pack or the NEC Corporate Website (<http://www.nec.com/>). For more this utility, see "[RAID Report Service](#)".
- POST messages  
Array controllers produce diagnostic error messages (POST messages) at reboot. Many POST messages suggest corrective actions.
- Smart Storage Administrator  
This utility uses it through EXPRESSBUILDER. Also you can get it from Starter Pack or NEC Corporate Website (<http://www.nec.com/>). For more information about SSA, see "[About SSA](#)".