



Provision storage

E-Series Systems

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Table of Contents

- Provision storage 1
 - Provisioning overview 1
 - Create storage 4
 - Increase capacity of a volume 13
 - Change settings for a volume 14
 - Add volumes to workload 17
 - Change workload settings 18
 - Initialize volumes 18
 - Redistribute volumes 19
 - Change controller ownership of a volume 20
 - Change cache settings for a volume 21
 - Change media scan settings for a volume 22
 - Delete volume 23

Provision storage

Provisioning overview

In the Storage Plugin for vCenter, you can create data containers, called volumes, so the host can access storage on the array.

Volume types and characteristics

Volumes are data containers that manage and organize the storage space on your storage array.

You create volumes from the storage capacity available on your storage array, which helps organize your system's resources. The concept of "volumes" is similar to using folders/directories on a computer to organize files for quick access.

Volumes are the only data layer visible to hosts. In a SAN environment, volumes are mapped to logical unit numbers (LUNs). These LUNs hold the user data that is accessible using one or more of the host access protocols supported by the storage array, including FC, iSCSI, and SAS.

Each volume in a pool or volume group can have its own individual characteristics based on what type of data will be stored in it. Some of these characteristics include:

- **Segment size** — A segment is the amount of data in kilobytes (KiB) that is stored on a drive before the storage array moves to the next drive in the stripe (RAID group). The segment size is equal to or less than the capacity of the volume group. The segment size is fixed and cannot be changed for pools.
- **Capacity** — You create a volume from the free capacity available in either a pool or volume group. Before you create a volume, the pool or volume group must already exist, and it must have enough free capacity to create the volume.
- **Controller ownership** — All storage arrays can have either one or two controllers. On a single-controller array, a volume's workload is managed by a single controller. On a dual-controller array, a volume will have a preferred controller (A or B) that "owns" the volume. In a dual-controller configuration, volume ownership is automatically adjusted using the Automatic Load Balancing feature to correct any load balance issues when workloads shift across the controllers. Automatic load balancing provides automated I/O workload balancing and ensures that incoming I/O traffic from the hosts is dynamically managed and balanced across both controllers.
- **Volume assignment** — You can give hosts access to a volume either when you create the volume or at a later time. All host access is managed through a logical unit number (LUN). Hosts detect LUNs that are, in turn, assigned to volumes. If you are assigning a volume to multiple hosts, use clustering software to make sure that the volume is available to all of the hosts.

The host type can have specific limits on how many volumes the host can access. Keep this limitation in mind when you create volumes for use by a particular host.

- **Resource provisioning** — For EF600 or EF300 storage arrays, you can specify that volumes be put in use immediately with no background initialization process. A resource-provisioned volume is a thick volume in an SSD volume group or pool, where drive capacity is allocated (assigned to the volume) when the volume is created, but the drive blocks are deallocated (unmapped).
- **Descriptive name** — You can name a volume whatever name you like, but we recommend making the name descriptive.

During volume creation, each volume is allocated capacity and is assigned a name, segment size (volume

groups only), controller ownership, and volume-to-host assignment. Volume data is automatically load balanced across controllers, as needed.

Capacity for volumes

The drives in your storage array provide the physical storage capacity for your data. Before you can begin storing data, you must configure the allocated capacity into logical components known as pools or volume groups. You use these storage objects to configure, store, maintain, and preserve data on your storage array.

Capacity to create and expand volumes

You can create volumes from either the unassigned capacity or free capacity in a pool or volume group.

- When you create a volume from unassigned capacity, you can create a pool or volume group and the volume at the same time.
- When you create a volume from free capacity, you are creating an additional volume on an already existing pool or volume group. After you expand the volume capacity, you must manually increase the file system size to match. How you do this depends on the file system you are using. See your host operating system documentation for details.



The plugin interface does not provide an option to create thin volumes.

Reported capacity for volumes

The reported capacity of the volume is equal to the amount of physical storage capacity allocated. The entire amount of physical storage capacity must be present. The physically allocated space is equal to the space that is reported to the host.

You normally set the volume's reported capacity to be the maximum capacity to which you think the volume will grow. Volumes provide high and predictable performance for your applications mainly because all of the user capacity is reserved and allocated upon creation.

Capacity limits

The minimum capacity for a volume is 1 MiB, and the maximum capacity is determined by the number and capacity of the drives in the pool or volume group.

When increasing reported capacity for a volume, keep the following guidelines in mind:

- You can specify up to three decimal places (for example, 65.375 GiB).
- Capacity needs to be less than (or equal to) the maximum available in the volume group. When you create a volume, some additional capacity is pre-allocated for Dynamic Segment Size (DSS) migration. DSS migration is a feature of the software that allows you to change the segment size of a volume.
- Volumes larger than 2 TiB are supported by some host operating systems (maximum reported capacity is determined by the host operating system). In fact, some host operating systems support up to 128 TiB volumes. Refer to your host operating system documentation for additional details.

Application-specific workloads

When creating a volume, you select a workload to customize the storage array configuration for a specific application.

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

During volume creation, the system prompts you to answer questions about a workload's use. For example, if you are creating volumes for Microsoft Exchange, you are asked how many mailboxes you need, what your average mailbox capacity requirements are, and how many copies of the database you want. The system uses this information to create an optimal volume configuration for you, which can be edited as needed. Optionally, you can skip this step in the volume creation sequence.

Types of workloads

You can create two types of workloads: application-specific and other.

- **Application-specific** — When you are creating volumes using an application-specific workload, the system may recommend an optimized volume configuration to minimize contention between application workload I/O and other traffic from your application instance. Volume characteristics like I/O type, segment size, controller ownership, and read and write cache are automatically recommended and optimized for workloads that are created for the following application types.
 - Microsoft SQL Server
 - Microsoft Exchange Server
 - Video Surveillance applications
 - VMware ESXi (for volumes to be used with Virtual Machine File System)

You can review the recommended volume configuration and edit, add, or delete the system-recommended volumes and characteristics using the Add/Edit Volumes dialog box.

- **Other (or applications without specific volume creation support)** — Other workloads use a volume configuration that you must manually specify when you want to create a workload that is not associated with a specific application, or if the system does not have built-in optimization for the application you intend to use on the storage array. You must manually specify the volume configuration using the Add/Edit Volumes dialog box.

Application and workload views

To view applications and workloads, launch System Manager. From that interface, you can view information associated with an application-specific workload in a couple of different ways:

- You can select the Applications & Workloads tab in the Volumes tile to view the storage array's volumes grouped by workload and the application type the workload is associated with.
- You can select the Applications & Workloads tab in the Performance tile to view performance metrics (latency, IOPS, and MBs) for logical objects. The objects are grouped by application and associated workload. By collecting this performance data at regular intervals, you can establish baseline measurements and analyze trends, which can help as you investigate problems related to I/O performance.

Create storage

In the Storage Plugin for vCenter, you create storage by first creating a workload for a specific application type. Next, you add storage capacity to the workload by creating volumes with similar underlying volume characteristics.

Step 1: Create workloads

A workload is a storage object that supports an application. You can define one or more workloads, or instances, per application.

About this task

For some applications, the system configures the workload to contain volumes with similar underlying volume characteristics. These volume characteristics are optimized based on the type of application the workload supports. For example, if you create a workload that supports a Microsoft SQL Server application and then subsequently create volumes for that workload, the underlying volume characteristics are optimized to support Microsoft SQL Server.

The system recommends an optimized volume configuration only for the following application types:

- Microsoft SQL Server
- Microsoft Exchange Server
- Video Surveillance
- VMware ESXi (for volumes to be used with Virtual Machine File System)

Steps

1. From the Manage page, select the storage array.
2. Select **Provisioning > Manage Volumes**.
3. Select **Create > Workload**.

The Create Application Workload dialog box appears.

4. Use the drop-down list to select the type of application that you want to create the workload for and then type a workload name.
5. Click **Create**.

Step 2: Create volumes

You create volumes to add storage capacity to an application-specific workload, and to make the created volumes visible to a specific host or host cluster.

About this task

Most application types default to a user-defined volume configuration, while other types have a smart configuration applied at volume creation. For example, if you are creating volumes for a Microsoft Exchange application, you are asked how many mailboxes you need, what your average mailbox capacity requirements are, and how many copies of the database you want. The system uses this information to create an optimal volume configuration for you, which can be edited as needed.

You can create volumes from **Provisioning > Manage Volumes > Create > Volumes** or from **Provisioning >**

Configure Pools and Volume Groups › Create › Volumes. The procedure is the same for either selection.

The process to create a volume is a multi-step procedure.

Step 2a: Select host for a volume

In the first step, you can select a specific host or host cluster for the volume, or you can choose to assign the host later.

Before you begin

Make sure that:

- Valid hosts or host clusters have been defined (go to **Provisioning › Configure Hosts**).
- Host port identifiers have been defined for the host.
- The host connection must support Data Assurance (DA) if you plan to create DA-enabled volumes. If any of the host connections on the controllers in your storage array do not support DA, the associated hosts cannot access data on DA-enabled volumes.

About this task

Keep these guidelines in mind when you assign volumes:

- A host's operating system can have specific limits on how many volumes the host can access. Keep this limitation in mind when you create volumes for use by a particular host.
- You can define one assignment for each volume in the storage array.
- Assigned volumes are shared between controllers in the storage array.
- The same logical unit number (LUN) cannot be used twice by a host or a host cluster to access a volume. You must use a unique LUN.
- If you want to speed the process for creating volumes, you can skip the host assignment step so that newly created volumes are initialized offline.



Assigning a volume to a host will fail if you try to assign a volume to a host cluster that conflicts with an established assignment for a host in the host clusters.

Steps

1. From the Manage page, select the storage array.
2. Select **Provisioning › Manage Volumes**.
3. Select **Create › Volumes**.

The Select Host dialog box appears.

4. From the drop-down list, select a specific host or host cluster to which you want to assign volumes, or choose to assign the host or host cluster at a later time.
5. To continue the volume creation sequence for the selected host or host cluster, click **Next**.

The Select Workload dialog box appears.

Step 2b: Select a workload for a volume

In the second step, you select a workload to customize the storage array configuration for a specific application, such as VMware.

About this task

This task describes how to create volumes for a workload. Typically, a workload contains volumes with similar characteristics, which are optimized based on the type of application the workload supports. You can define a workload in this step or you can select existing workloads.

Keep these guidelines in mind:

- When using an application-specific workload, the system recommends an optimized volume configuration to minimize contention between application workload I/O and other traffic from your application instance. You can review the recommended volume configuration, and then edit, add, or delete the system-recommended volumes and characteristics using the Add/Edit Volumes dialog box (available in the next step).
- When using other application types, you manually specify the volume configuration using the Add/Edit Volumes dialog box (available in the next step).

Steps

1. Do one of the following:
 - Select the **Create volumes for an existing workload** option and then select the workload from the drop-down list.
 - Select the **Create a new workload** option to define a new workload for a supported application or for "Other" applications, and then following these steps:
 - From the drop-down list, select the name of the application you want to create the new workload for. Select one of the "Other" entries if the application you intend to use on this storage array is not listed.
 - Enter a name for the workload you want to create.
2. Click **Next**.
3. If your workload is associated with a supported application type, enter the information requested; otherwise, go to the next step.

Step 2c: Add or edit volumes

In the third step, you define the volume configuration.

Before you begin

- The pools or volume groups must have sufficient free capacity.
- The maximum number of volumes allowed in a volume group is 256.
- The maximum number of volumes allowed in a pool depends on the storage system model:
 - 2,048 volumes (EF600 and E5700 series)
 - 1,024 volumes (EF300)
 - 512 volumes (E2800 series)
- To create a Data Assurance (DA)-enabled volume, the host connection you are planning to use must support DA.

- If you want to create a DA-enabled volume, select a pool or volume group that is DA capable (look for **Yes** next to "DA" in the pool and volume group candidates table).
- DA capabilities are presented at the pool and volume group level. DA protection checks for and corrects errors that might occur as data is transferred through the controllers down to the drives. Selecting a DA-capable pool or volume group for the new volume ensures that any errors are detected and corrected.
- If any of the host connections on the controllers in your storage array do not support DA, the associated hosts cannot access data on DA-enabled volumes.
- To create a secure-enabled volume, a security key must be created for the storage array.
 - If you want to create a secure-enabled volume, select a pool or volume group that is secure capable (look for Yes next to "Secure-capable" in the pool and volume group candidates table).
 - Drive security capabilities are presented at the pool and volume group level. Secure-capable drives prevent unauthorized access to the data on a drive that is physically removed from the storage array. A secure-enabled drive encrypts data during writes and decrypts data during reads using a unique encryption key.
 - A pool or volume group can contain both secure-capable and non-secure-capable drives, but all drives must be secure-capable to use their encryption capabilities.
- To create a resource-provisioned volume, all drives must be NVMe drives with the Deallocated or Unwritten Logical Block Error (DULBE) option.

About this task

You create volumes from eligible pools or volume groups, which are shown in the Add/Edit Volumes dialog box. For each eligible pool and volume group, the number of drives available and the total free capacity appears.

For some application-specific workloads, each eligible pool or volume group shows the proposed capacity based on the suggested volume configuration and shows the remaining free capacity in GiB. For other workloads, the proposed capacity appears as you add volumes to a pool or volume group and specify the reported capacity.

Steps

1. Choose one of these actions based on whether you selected Other or an application-specific workload in the previous step:
 - **Other** — Click **Add new volume** in each pool or volume group that you want to use to create one or more volumes.

Field Details

| Field | Description |
|--|--|
| Volume Name | A volume is assigned a default name during the volume creation sequence. You can either accept the default name or provide a more descriptive one indicating the type of data stored in the volume. |
| Reported Capacity | <p>Define the capacity of the new volume and the capacity units to use (MiB, GiB, or TiB). For Thick volumes, the minimum capacity is 1 MiB, and the maximum capacity is determined by the number and capacity of the drives in the pool or volume group.</p> <p>Keep in mind that storage capacity is also required for copy services (snapshot images, snapshot volumes, volume copies, and remote mirrors); therefore, do not allocate all of the capacity to standard volumes.</p> <p>Capacity in a pool is allocated in 4GiB increments. Any capacity that is not a multiple of 4GiB is allocated but not usable. To make sure that the entire capacity is usable, specify the capacity in 4GiB increments. If unusable capacity exists, the only way to regain it is to increase the capacity of the volume.</p> |
| Volume Block Size (EF300 and EF600 only) | <p>Shows the block sizes that can be created for the volume:</p> <ul style="list-style-type: none">• 512 – 512 bytes• 4K – 4,096 bytes |

| Field | Description |
|----------------|--|
| Segment Size | <p>Shows the setting for segment sizing, which only appears for volumes in a volume group. You can change the segment size to optimize performance.</p> <p>Allowed segment size transitions — The system determines the segment size transitions that are allowed. Segment sizes that are inappropriate transitions from the current segment size are unavailable on the drop-down list. Allowed transitions usually are double or half of the current segment size. For example, if the current volume segment size is 32 KiB, a new volume segment size of either 16 KiB or 64 KiB is allowed.</p> <p>SSD Cache-enabled volumes — You can specify a 4-KiB segment size for SSD Cache-enabled volumes. Make sure you select the 4-KiB segment size only for SSD Cache-enabled volumes that handle small-block I/O operations (for example, 16 KiB I/O block sizes or smaller). Performance might be impacted if you select 4 KiB as the segment size for SSD Cache-enabled volumes that handle large block sequential operations.</p> <p>Amount of time to change segment size — The amount of time to change a volume's segment size depends on these variables:</p> <ul style="list-style-type: none"> • The I/O load from the host • The modification priority of the volume • The number of drives in the volume group • The number of drive channels • The processing power of the storage array controllers <p>When you change the segment size for a volume, I/O performance is affected, but your data remains available.</p> |
| Secure-capable | <p>Yes appears next to “Secure-capable” only if the drives in the pool or volume group are secure-capable.</p> <p>Drive Security prevents unauthorized access to the data on a drive that is physically removed from the storage array. This option is available only when the Drive Security feature has been enabled, and a security key is set up for the storage array.</p> <p>A pool or volume group can contain both secure-capable and non-secure-capable drives, but all drives must be secure-capable to use their encryption capabilities.</p> |
| DA | <p>Yes appears next to “DA” only if the drives in the pool or volume group support Data Assurance (DA).</p> <p>DA increases data integrity across the entire storage system. DA enables the storage array to check for errors that might occur as data is transferred through the controllers down to the drives. Using DA for the new volume ensures that any errors are detected.</p> |

| Field | Description |
|---|--|
| Resource provisioned (EF300 and EF600 only) | Yes appears next to “Resource provisioned” only if the drives support this option. Resource Provisioning is a feature available in the EF300 and EF600 storage arrays, which allows volumes to be put in use immediately with no background initialization process. |

- **Application-specific workload** — Either click **Next** to accept the system-recommended volumes and characteristics for the selected workload, or click **Edit Volumes** to change, add, or delete the system-recommended volumes and characteristics for the selected workload.

Field Details

| Field | Description |
|--|---|
| Volume Name | A volume is assigned a default name during the volume creation sequence. You can either accept the default name or provide a more descriptive one indicating the type of data stored in the volume. |
| Reported Capacity | <p>Define the capacity of the new volume and the capacity units to use (MiB, GiB, or TiB). For Thick volumes, the minimum capacity is 1 MiB, and the maximum capacity is determined by the number and capacity of the drives in the pool or volume group.</p> <p>Keep in mind that storage capacity is also required for copy services (snapshot images, snapshot volumes, volume copies, and remote mirrors); therefore, do not allocate all of the capacity to standard volumes.</p> <p>Capacity in a pool is allocated in 4-GiB increments. Any capacity that is not a multiple of 4 GiB is allocated but not usable. To make sure that the entire capacity is usable, specify the capacity in 4-GiB increments. If unusable capacity exists, the only way to regain it is to increase the capacity of the volume.</p> |
| Volume Type | Volume type indicates the type of volume that was created for an application- specific workload. |
| Volume Block Size (EF300 and EF600 only) | <p>Shows the block sizes that can be created for the volume:</p> <ul style="list-style-type: none">• 512 — 512 bytes• 4K — 4,096 bytes |

| Field | Description |
|----------------|--|
| Segment Size | <p>Shows the setting for segment sizing, which only appears for volumes in a volume group. You can change the segment size to optimize performance.</p> <p>Allowed segment size transitions — The system determines the segment size transitions that are allowed. Segment sizes that are inappropriate transitions from the current segment size are unavailable on the drop-down list. Allowed transitions usually are double or half of the current segment size. For example, if the current volume segment size is 32 KiB, a new volume segment size of either 16 KiB or 64 KiB is allowed.</p> <p>SSD Cache-enabled volumes — You can specify a 4-KiB segment size for SSD Cache-enabled volumes. Make sure you select the 4-KiB segment size only for SSD Cache-enabled volumes that handle small-block I/O operations (for example, 16 KiB I/O block sizes or smaller). Performance might be impacted if you select 4 KiB as the segment size for SSD Cache-enabled volumes that handle large block sequential operations.</p> <p>Amount of time to change segment size — The amount of time to change a volume's segment size depends on these variables:</p> <ul style="list-style-type: none"> • The I/O load from the host • The modification priority of the volume • The number of drives in the volume group • The number of drive channels • The processing power of the storage array controllers <p>When you change the segment size for a volume, I/O performance is affected, but your data remains available.</p> |
| Secure-capable | <p>Yes appears next to “Secure-capable” only if the drives in the pool or volume group are secure-capable.</p> <p>Drive security prevents unauthorized access to the data on a drive that is physically removed from the storage array. This option is available only when the drive security feature has been enabled, and a security key is set up for the storage array.</p> <p>A pool or volume group can contain both secure-capable and non-secure-capable drives, but all drives must be secure-capable to use their encryption capabilities.</p> |
| DA | <p>Yes appears next to “DA” only if the drives in the pool or volume group support Data Assurance (DA).</p> <p>DA increases data integrity across the entire storage system. DA enables the storage array to check for errors that might occur as data is transferred through the controllers down to the drives. Using DA for the new volume ensures that any errors are detected.</p> |

| Field | Description |
|---|--|
| Resource provisioned (EF300 and EF600 only) | Yes appears next to “Resource Provisioned” only if the drives support this option. Resource Provisioning is a feature available in the EF300 and EF600 storage arrays, which allows volumes to be put in use immediately with no background initialization process. |

2. To continue the volume creation sequence for the selected application, click **Next**.

Step 2d: Review volume configuration

In the last step, you review a summary of the volumes you intend to create and make any necessary changes.

Steps

1. Review the volumes you want to create. To make changes, click **Back**.
2. When you are satisfied with your volume configuration, click **Finish**.

After you finish

- In the vSphere Client, create datastores for the volumes.
- Perform any operating system modifications necessary on the application host so that the applications can use the volume.
- Run either the host-based `hot_add` utility or an operating system-specific utility (available from a third-party vendor), and then run the `SMdevices` utility to correlate volume names with host storage array names.

The `hot_add` utility and the `SMdevices` utility are included as part of the `SMutils` package. The `SMutils` package is a collection of utilities to verify what the host sees from the storage array. It is included as part of the SANtricity software installation.

Increase capacity of a volume

You can resize a volume to increase its reported capacity.

Before you begin

Make sure that:

- Enough free capacity is available in the volume’s associated pool or volume group.
- The volume is Optimal and not in any state of modification.
- No hot spare drives are in use in the volume. (Applies only to volumes in volume groups.)

About this task

This task describes how to increase the reported capacity (the capacity reported to hosts) of a volume by using the free capacity that is available in the pool or volume group. Be sure to consider any future capacity requirements that you might have for other volumes in this pool or volume group.



Increasing the capacity of a volume is supported only on certain operating systems. If you increase the volume capacity on a host operating system that is unsupported, the expanded capacity is unusable, and you cannot restore the original volume capacity.

Steps

1. From the **Manage** page, select the storage array that contains the volumes you want to resize.
2. Select **Provisioning > Manage Volumes**.
3. Select the volume for which you want to increase capacity, and then select **Increase Capacity**.

The Confirm Increase Capacity dialog box appears.

4. Select **Yes** to continue.

The Increase Reported Capacity dialog box appears. This dialog box displays the volume's current reported capacity and the free capacity available in the volume's associated pool or volume group.

5. Use the **Increase reported capacity by adding...** box to add capacity to the current available reported capacity. You can change the capacity value to display in either mebibytes (MiB), gibibytes (GiB), or tebibytes (TiB).
6. Click **Increase**.

The volume's capacity is increased based on your selection. Be aware that this operation can be lengthy and could affect system performance.

After you finish

After you expand the volume capacity, you must manually increase the file system size to match. How you do this depends on the file system you are using. See your host operating system documentation for details.

Change settings for a volume

You can change a volume's settings such as its name, host assignment, segment size, modification priority, caching, and so on.

Before you begin

Make sure that the volume you want to change is in Optimal status.

Steps

1. From the Manage page, select the storage array that contains the volumes you want to change.
2. Select **Provisioning > Manage Volumes**.
3. Select the volume that you want to change, and then select **View/Edit Settings**.

The Volume Settings dialog box appears. The configuration settings for the volume you selected appear in this dialog box.

4. Select the **Basic** tab to change the volume's name and host assignment.

Field Details

| Setting | Description |
|---------------------|---|
| Name | Displays the name of the volume. Change the name of a volume when the current name is no longer meaningful or applicable. |
| Capacities | Displays the reported and allocated capacity for the selected volume. |
| Pool / Volume group | Displays the name and RAID level of the pool or volume group. Indicates whether the pool or volume group is secure-capable and secure-enabled. |
| Host | <p>Displays the volume assignment. You assign a volume to a host or host cluster so it can be accessed for I/O operations. This assignment grants a host or host cluster access to a particular volume or to a number of volumes in a storage array.</p> <ul style="list-style-type: none">• Assigned to — Identifies the host or host cluster that has access to the selected volume.• LUN — A logical unit number (LUN) is the number assigned to the address space that a host uses to access a volume. The volume is presented to the host as capacity in the form of a LUN. Each host has its own LUN address space. Therefore, the same LUN can be used by different hosts to access different volumes. <p>For NVMe interfaces, this column displays Namespace ID. A namespace is NVM storage that is formatted for block access. It is analogous to a logical unit in SCSI, which relates to a volume in the storage array. The namespace ID is the NVMe controller's unique identifier for the namespace, and can be set to a value between 1 and 255. It is analogous to a logical unit number (LUN) in SCSI.</p> |
| Identifiers | <p>Displays the identifiers for the selected volume.</p> <ul style="list-style-type: none">• World-wide identifier (WWID). A unique hexadecimal identifier for the volume.• Extended unique identifier (EUI). An EUI-64 identifier for the volume.• Subsystem identifier (SSID). The storage array subsystem identifier of a volume. |

5. Select the **Advanced** tab to change additional configuration settings for a volume in a pool or in a volume group.

Field Details

| Setting | Description |
|------------------------------------|---|
| Application & workload information | <p>During volume creation, you can create application-specific workloads or other workloads. If applicable, the workload name, application type, and volume type appears for the selected volume.</p> <p>You can change the workload name if desired.</p> |
| Quality of Service settings | <p>Permanently disable data assurance — This setting appears only if the volume is Data Assurance (DA)-enabled. DA checks for and corrects errors that might occur as data is transferred through the controllers down to the drives. Use this option to permanently disable DA on the selected volume. When disabled, DA cannot be re-enabled on this volume.</p> <p>Enable pre-read redundancy check — This setting appears only if the volume is a thick volume. Pre-read redundancy checks determine whether the data on a volume is consistent any time a read is performed. A volume that has this feature enabled returns read errors if the data is determined to be inconsistent by the controller firmware.</p> |
| Controller ownership | <p>Defines the controller that is designated to be the owning, or primary, controller of the volume.</p> <p>Controller ownership is very important and should be planned carefully. Controllers should be balanced as closely as possible for total I/Os.</p> |
| Segment sizing | <p>Shows the setting for segment sizing, which appears only for volumes in a volume group. You can change the segment size to optimize performance.</p> <p>Allowed segment size transitions — The system determines the segment size transitions that are allowed. Segment sizes that are inappropriate transitions from the current segment size are unavailable on the drop-down list. Allowed transitions usually are double or half of the current segment size. For example, if the current volume segment size is 32 KiB, a new volume segment size of either 16 KiB or 64 KiB is allowed.</p> <p>SSD Cache-enabled volumes — You can specify a 4-KiB segment size for SSD Cache-enabled volumes. Make sure you select the 4-KiB segment size only for SSD Cache-enabled volumes that handle small-block I/O operations (for example, 16 KiB I/O block sizes or smaller). Performance might be impacted if you select 4 KiB as the segment size for SSD Cache-enabled volumes that handle large block sequential operations.</p> <p>Amount of time to change segment size. The amount of time to change a volume's segment size depends on these variables:</p> <ul style="list-style-type: none"> • The I/O load from the host • The modification priority of the volume • The number of drives in the volume group • The number of drive channels • The processing power of the storage array controllers <p>When you change the segment size for a volume, I/O performance is affected, but your data remains available.</p> |

| Setting | Description |
|-----------------------|--|
| Modification priority | <p>Shows the setting for modification priority, which only appears for volumes in a volume group.</p> <p>The modification priority defines how much processing time is allocated for volume modification operations relative to system performance. You can increase the volume modification priority, although this might affect system performance.</p> <p>Move the slider bars to select a priority level.</p> <p>Modification priority rates — The lowest priority rate benefits system performance, but the modification operation takes longer. The highest priority rate benefits the modification operation, but system performance might be compromised.</p> |
| Caching | Shows the caching setting, which you can change to impact the overall I/O performance of a volume. |
| SSD Cache | <p>(This feature is not available on the EF600 or EF300 storage system.)</p> <p>Shows the SSD Cache setting, which you can enable on compatible volumes as a way to improve read-only performance. Volumes are compatible if they share the same drive security and data assurance capabilities.</p> <p>The SSD Cache feature uses a single or multiple solid-state disks (SSDs) to implement a read cache. Application performance is improved because of the faster read times for SSDs. Because the read cache is in the storage array, caching is shared across all applications using the storage array.</p> <p>Simply select the volume that you want to cache, and then caching is automatic and dynamic.</p> |

6. Click **Save**.

Result

The volume settings are changed based on your selections.

Add volumes to workload

You can add unassigned volumes to an existing or new workload.

About this task

Volumes are not associated with a workload if they have been created using the command line interface (CLI) or if they have been migrated (imported/exported) from a different storage array.

Steps

1. From the Manage page, select the storage array that contains the volumes you want to add.
2. Select **Provisioning > Manage Volumes**.
3. Select the **Applications & Workloads** tab.

The Applications & Workloads view appears.

4. Select **Add to Workload**.

The Select Workload dialog box appears.

5. Do one of the following actions:

- **Add volumes to an existing workload** — Select this option to add volumes to an existing workload. Use the drop-down list to select a workload. The workload's associated application type is assigned to the volumes you add to this workload.
- **Add volumes to a new workload** — Select this option to define a new workload for an application type and add volumes to the new workload.

6. Select **Next** to continue with the add to workload sequence.

The Select Volumes dialog box appears.

7. Select the volumes you want to add to the workload.

8. Review the volumes that you want to add to the selected workload.

9. When you are satisfied with your workload configuration, click **Finish**.

Change workload settings

You can change the name for a workload and view its associated application type.

Steps

1. From the Manage page, select the storage array that contains the workload you want to change.
2. Select **Provisioning > Manage Volumes**.
3. Select the **Applications & Workloads** tab.

The Applications & Workloads view appears.

4. Select the workload that you want to change, and then select **View/Edit Settings**.

The Applications & Workloads Settings dialog box appears.

5. (Optional) Change the user-supplied name of the workload.

6. Click **Save**.

Initialize volumes

A volume is automatically initialized when it is first created. However, the Recovery Guru might advise that you manually initialize a volume to recover from certain failure conditions.

Use this option only under the guidance of technical support. You can select one or more volumes to initialize.

Before you begin

- All I/O operations have been stopped.
- Any devices or file systems on the volumes you want to initialize must be unmounted.

- The volume is in Optimal status and no modification operations are in progress on the volume.*Attention:
*You cannot cancel the operation after it starts. All volume data is erased. Do not try this operation unless the Recovery Guru advises you to do so. Contact technical support before you begin this procedure.

About this task

When you initialize a volume, the volume keeps its WWN, host assignments, allocated capacity, and reserved capacity settings. It also keeps the same Data Assurance (DA) settings and security settings.

The following types of volumes cannot be initialized:

- Base volume of a snapshot volume
- Primary volume in a mirror relationship
- Secondary volume in a mirror relationship
- Source volume in a volume copy
- Target volume in a volume copy
- Volume that already has an initialization in progress

This procedure applies only to standard volumes created from pools or volume groups.

Steps

1. From the Manage page, select the storage array that contains the volumes you want to initialize.
2. Select **Provisioning > Manage Volumes**.
3. Select any volume, and then select **More > Initialize volumes**.

The Initialize Volumes dialog box appears. All volumes on the storage array appear in this dialog box.

4. Select one or more volumes that you want to initialize and confirm that you want to perform the operation.

Results

The system performs the following actions:

- Erases all data from the volumes that were initialized.
- Clears the block indices, which causes unwritten blocks to be read as if they are zero-filled (the volume appears to be completely empty).

This operation can be lengthy and could affect system performance.

Redistribute volumes

You redistribute volumes to move volumes back to their preferred controller owners. Typically, multipath drivers move volumes from their preferred controller owner when a problem occurs along the data path between the host and storage array.

Before you begin

- The volumes you want to redistribute are not in use, or I/O errors will occur.
- A multipath driver is installed on all hosts using the volumes you want to redistribute, or I/O errors will occur. If you want to redistribute volumes without a multipath driver on the hosts, all I/O activity to the volumes while the redistribution operation is in progress must be stopped to prevent application errors.

About this task

Most host multipath drivers attempt to access each volume on a path to its preferred controller owner. However, if this preferred path becomes unavailable, the multipath driver on the host fails over to an alternate path. This failover might cause the volume ownership to change to the alternate controller. After you have resolved the condition that caused the failover, some hosts might automatically move the volume ownership back to the preferred controller owner, but in some cases, you might need to manually redistribute the volumes.

Steps

1. From the Manage page, select the storage array that contains the volumes you want to redistribute.
2. Select **Provisioning > Manage Volumes**.
3. Select **More > Redistribute volumes**.

The Redistribute Volumes dialog box appears. All volumes on the storage array whose preferred controller owner does not match its current owner appear in this dialog box.

4. Select one or more volumes that you want to redistribute, and confirm that you want to perform the operation.

Result

The system moves the selected volumes to their preferred controller owners or you might see a Redistribute Volumes Unnecessary dialog box.

Change controller ownership of a volume

You can change the preferred controller ownership of a volume, so that I/O for host applications is directed through the new path.

Before you begin

If you do not use a multipath driver, any host applications that are currently using the volume must be shut down. This action prevents application errors when the I/O path changes.

About this task

You can change controller ownership for one or more volumes in a pool or volume group.

Steps

1. From the Manage page, select the storage array that contains the volumes for which you want to change the controller ownership.
2. Select **Provisioning > Manage Volumes**.
3. Select any volume, and then select **More > Change ownership**.

The Change Volume Ownership dialog box appears. All volumes on the storage array appear in this dialog box.

4. Use the **Preferred Owner** drop-down list to change the preferred controller for each volume that you want to change, and confirm that you want to perform the operation.

Results

- The system changes the controller ownership of the volume. I/O to the volume is now directed through this I/O path.

- The volume might not use the new I/O path until the multipath driver reconfigures to recognize the new path.

This action usually takes less than five minutes.

Change cache settings for a volume

You can change read cache and write cache settings to impact the overall I/O performance of a volume.

About this task

Keep these guidelines in mind when you change cache settings for a volume:

- After opening the Change Cache Settings dialog box, you might see an icon shown next to the selected cache properties. This icon indicates that the controller has temporarily suspended caching operations. This action might occur when a new battery is charging, when a controller has been removed, or if a mismatch in cache sizes has been detected by the controller. After the condition has cleared, the cache properties selected in the dialog box become active. If the selected cache properties do not become active, contact technical support.
- You can change the cache settings for a single volume or for multiple volumes on a storage array. You can change the cache settings for all volumes at the same time.

Steps

1. From the Manage page, select the storage array that contains the volumes for which you want to change cache settings.
2. Select **Provisioning > Manage Volumes**.
3. Select any volume, and then select **More > Change cache settings**.

The Change Cache Settings dialog box appears. All volumes on the storage array appear in this dialog box.

4. Select the **Basic** tab to change the settings for read caching and write caching.

Field Details

| Cache setting | Description |
|----------------------|---|
| Read Caching | The read cache is a buffer that stores data that has been read from the drives. The data for a read operation might already be in the cache from a previous operation, which eliminates the need to access the drives. The data stays in the read cache until it is flushed. |
| Write Caching | The write cache is a buffer that stores data from the host that has not yet been written to the drives. The data stays in the write cache until it is written to the drives. Write caching can increase I/O performance. Cache is automatically flushed after the Write caching is disabled for a volume. |

5. Select the **Advanced** tab to change the advanced settings for thick volumes. The advanced cache settings are available only for thick volumes.

Field Details

| Setting | Description |
|--|---|
| Dynamic Read Cache Prefetch | Dynamic Cache Read Prefetch allows the controller to copy additional sequential data blocks into the cache while it is reading data blocks from a drive to the cache. This caching increases the chance that future requests for data can be filled from the cache. Dynamic cache read prefetch is important for multimedia applications that use sequential I/O. The rate and amount of data that is prefetched into cache is self-adjusting based on the rate and request size of the host reads. Random access does not cause data to be prefetched into cache. This feature does not apply when read caching is disabled. |
| Write Caching without Batteries | <p>The Write Caching without Batteries setting enables write caching to continue even when the batteries are missing, failed, discharged completely, or not fully charged. Choosing write caching without batteries is not typically recommended, because data might be lost if power is lost. Typically, write caching is turned off temporarily by the controller until the batteries are charged or a failed battery is replaced.</p> <p>CAUTION: Possible loss of data — If you select this option and do not have a universal power supply for protection, you could lose data. In addition, you could lose data if you do not have controller batteries and you enable the Write caching without batteries option.</p> |
| Write Caching with Mirroring | Write Caching with Mirroring occurs when the data written to the cache memory of one controller is also written to the cache memory of the other controller. Therefore, if one controller fails, the other can complete all outstanding write operations. Write cache mirroring is available only if write caching is enabled and two controllers are present. Write caching with mirroring is the default setting at volume creation. |

6. Click **Save** to change the cache settings.

Change media scan settings for a volume

A media scan is a background operation that scans all data and redundancy information in the volume. Use this option to enable or disable the media scan settings for one or more volumes, or to change the scan duration.

Before you begin

Understand the following:

- Media scans run continuously at a constant rate based on the capacity to be scanned and the scan duration. Background scans may be temporarily suspended by a higher priority background task (e.g. reconstruction), but will resume at the same constant rate.
- A volume is scanned only when the media scan option is enabled for the storage array and for that volume. If redundancy check is also enabled for that volume, redundancy information in the volume will be checked for consistency with data, provided that the volume has redundancy. Media scan with redundancy check is enabled by default for each volume when it is created.

- If an unrecoverable medium error is encountered during the scan, data will be repaired using redundancy information, if available.

For example, redundancy information is available in optimal RAID 5 volumes, or in RAID 6 volumes that are optimal or only have one drive failed. If the unrecoverable error cannot be repaired using redundancy information, the data block will be added to the unreadable sector log. Both correctable and uncorrectable medium errors are reported to the event log.

- If the redundancy check finds an inconsistency between data and the redundancy information, it is reported to the event log.

About this task

Media scans detect and repair media errors on disk blocks that are infrequently read by applications. This can prevent data loss in the event of a drive failure, as data for failed drives is reconstructed using redundancy information and data from other drives in the volume group or pool.

You can perform the following actions:

- Enable or disable background media scans for the entire storage array
- Change the scan duration for the entire storage array
- Enable or disable media scan for one or more volumes
- Enable or disable the redundancy check for one or more volumes

Steps

1. From the Manage page, select the storage array that contains the volumes for which you want to change media scan settings.
2. Select **Provisioning > Manage Volumes**.
3. Select any volume, and then select **More > Change media scan settings**.

The Change Drive Media Scan Settings dialog box appears. All volumes on the storage array appear in this dialog box.

4. To enable the media scan, select the **Scan media over the course of...** check box. Disabling the media scan check box suspends all media scan settings.
5. Specify the number of days over which you want the media scan to run.
6. Select the **Media Scan** check box for each volume you want to perform a media scan on. The system enables the Redundancy Check option for each volume on which you choose to run a media scan. If there are individual volumes for which you do not want to perform a redundancy check, deselect the **Redundancy Check** check box.
7. Click **Save**.

Result

The system applies changes to background media scans based on your selection.

Delete volume

You can delete one or more volumes to increase the free capacity of a pool or volume group.

Before you begin

On the volumes that you plan to delete, make sure that:

- All data is backed up.
- All Input/Output (I/O) is stopped.
- Any devices and file systems are unmounted.

About this task

Typically, you delete volumes if the volumes were created with the wrong parameters or capacity, or it no longer meets storage configuration needs. Deleting a volume increases the free capacity in the pool or volume group.



Deleting a volume causes loss of all data on those volumes.

Be aware that you **cannot** delete a volume that has one of these conditions:

- The volume is initializing.
- The volume is reconstructing.
- The volume is part of a volume group that contains a drive that is undergoing a copyback operation.
- The volume is undergoing a modification operation, such as a change of segment size, unless the volume is now in Failed status.
- The volume is holding any type of persistent reservation.
- The volume is a source volume or a target volume in a Copy Volume that has a status of Pending, In Progress, or Failed.



When a volume exceeds a given size (currently 128 TB), the delete operation is performed in the background and the freed space might not be immediately available.

Steps

1. From the **Manage** page, select the storage array that contains the volumes you want to delete.
2. Select **Provisioning > Manage Volumes**.
3. Click **Delete**.

The Delete Volumes dialog box appears.

4. Select one or more volumes that you want to delete, and then confirm that you want to perform the operation.
5. Click **Delete**.

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