NetApp

Manage pools, volume groups, and SSD Cache

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Change configuration settings for a pool

You can edit the settings for a pool, including its name, capacity alerts settings, modification priorities, and preservation capacity.

About this task

This task describes how to change configuration settings for a pool.

(i)	You cannot change the RAID level of a pool. System Manager automatically configures pools as RAID 6.

Steps

1. Select **Storage › Pools & Volume Groups**.

2. Select the pool that you want to edit, and then click **View/Edit Settings**.

   The **Pool Settings** dialog box appears.

3. Select the **Settings** tab, and then edit the pool settings as appropriate.

Field Details

Setting	Description
Name	You can change the user-supplied name of the pool. Specifying a name for a pool is required.
Capacity alerts	You can send alert notifications when the free capacity in a pool reaches or exceeds a specified threshold. When the data stored in the pool exceeds the specified threshold, System Manager sends a message, allowing you time to add more storage space or to delete unnecessary objects. Alerts are shown in the Notifications area on the Dashboard and can be sent from the server to administrators by email and SNMP trap messages. You can define the following capacity alerts: • **Critical alert** — This critical alert notifies you when the free capacity in the pool reaches or exceeds the specified threshold. Use the spinner controls to adjust the threshold percentage. Select the check box to disable this notification. • **Early alert** — This early alert notifies you when the free capacity in a pool is reaching a specified threshold. Use the spinner controls to adjust the threshold percentage. Select the check box to disable this notification.
Modification priorities	You can specify the priority levels for modification operations in a pool relative to system performance. A higher priority for modification operations in a pool causes an operation to complete faster, but can slow the host I/O performance. A lower priority causes operations to take longer, but host I/O performance is less affected. You can choose from five priority levels: lowest, low, medium, high, and highest. The higher the priority level, the larger is the impact on host I/O and system performance. • **Critical reconstruction priority** — This slider bar determines the priority of a data reconstruction operation when multiple drive failures result in a condition where some data has no redundancy and an additional drive failure might result in loss of data. • **Degraded reconstruction priority** — This slider bar determines the priority of the data reconstruction operation when a drive failure has occurred, but the data still has redundancy and an additional drive failure does not result in loss of data. • **Background operation priority** — This slider bar determines the priority of the pool background operations that occur while the pool is in an optimal state. These operations include Dynamic Volume Expansion (DVE), Instant Availability Format (IAF), and migrating data to a replaced or added drive.

Setting	Description
Preservation capacity ("Reserve capacity" for the EF600)	**Preservation capacity**: You can define the number of drives to determine the capacity that is reserved on the pool to support potential drive failures. When a drive failure occurs, the preservation capacity is used to hold the reconstructed data. Pools use preservation capacity during the data reconstruction process instead of hot spare drives, which are used in volume groups. Use the spinner controls to adjust the number of drives. Based on the number of drives, the preservation capacity in the pool appears next to the spinner box. Keep the following information in mind about preservation capacity. • Because preservation capacity is subtracted from the total free capacity of a pool, the amount of capacity that you reserve affects how much free capacity is available to create volumes. If you specify 0 for the preservation capacity, all of the free capacity on the pool is used for volume creation. • If you decrease the preservation capacity, you increase the capacity that can be used for pool volumes. **Additional optimization capacity** (EF600 arrays only): When a pool is created, a recommended optimization capacity is generated that provides a balance of available capacity versus performance and drive wear life. You can adjust this balance by moving the slider to the right for better performance and drive wear life at the expense of increased available capacity, or by moving it to the left for increased available capacity at the expense of better performance and drive wear life. SSD drives will have longer life and better maximum write performance when a portion of their capacity is unallocated. For drives associated with a pool, unallocated capacity is comprised of a pool's preservation capacity, the free capacity (capacity not used by volumes), and a portion of the usable capacity set aside as additional optimization capacity. The additional optimization capacity ensures a minimum level of optimization capacity by reducing the usable capacity, and as such, is not available for volume creation.

4. Click **Save**.

Change SSD Cache settings

You can edit the name of the SSD Cache and view its status, maximum and current capacity, Drive Security and Data Assurance status, and its associated volumes and drives.

Steps

1. Select **Storage › Pools & Volume Groups**.

2. Select the SSD Cache that you want to edit, and then click **View/Edit Settings**.

   The **SSD Cache Settings** dialog box appears.

3. Review or edit the SSD Cache settings as appropriate.

   Field Details

Setting	Description
Name	Displays the name of the SSD Cache, which you can change. A name for the SSD Cache is required.
Characteristics	Shows the status for the SSD Cache. Possible statuses include: • Optimal • Unknown • Degraded • Failed (A failed state results in a critical MEL event.) • Suspended
Capacities	Shows the current capacity and maximum capacity allowed for the SSD Cache. The maximum capacity allowed for the SSD Cache depends on the controller's primary cache size: • Up to 1 GiB • 1 GiB to 2 GiB • 2 GiB to 4 GiB • More than 4 GiB
Security and DA	Shows the Drive Security and Data Assurance status for the SSD Cache. • **Secure-capable** — Indicates whether the SSD Cache is comprised entirely of secure-capable drives. A secure-capable drive is a self-encrypting drive that can protect its data from unauthorized access. • **Secure-enabled** — Indicates whether security is enabled on the SSD Cache. • **DA capable** — Indicates whether the SSD Cache is comprised entirely of DA-capable drives. A DA-capable drive can check for and correct errors that might occur as data is communicated between the host and storage array.
Associated objects	Shows the volumes and drives associated with the SSD Cache.

4. Click **Save**.

Change configuration settings for a volume group

You can edit the settings for a volume group, including its name and RAID level.

Before you begin

If you are changing the RAID level to accommodate the performance needs of the applications that are accessing the volume group, be sure to meet the following prerequisites:

- The volume group must be in Optimal status.
- You must have enough capacity in the volume group to convert to the new RAID level.

Steps

1. Select **Storage › Pools & Volume Groups**.

2. Select the volume group that you want to edit, and then click **View/Edit Settings**.

   The **Volume Group Settings** dialog box appears.

3. Select the **Settings** tab, and then edit the volume group settings as appropriate.

Field Details

Setting	Description
Name	You can change the user-supplied name of the volume group. Specifying a name for a volume group is required.
RAID level	Select the new RAID level from the drop-down menu. • **RAID 0 striping**. Offers high performance, but does not provide any data redundancy. If a single drive fails in the volume group, all of the associated volumes fail, and all data is lost. A striping RAID group combines two or more drives into one large, logical drive. • **RAID 1 mirroring**. Offers high performance and the best data availability, and is suitable for storing sensitive data on a corporate or personal level. Protects your data by automatically mirroring the contents of one drive to the second drive in the mirrored pair. It provides protection in the event of a single drive failure. • **RAID 10 striping/mirroring**. Provides a combination of RAID 0 (striping) and RAID 1 (mirroring), and is achieved when four or more drives are selected. RAID 10 is suitable for high volume transaction applications, such as a database, that require high performance and fault tolerance. • **RAID 5**. Optimal for multi-user environments (such as database or file system storage) where typical I/O size is small and there is a high proportion of read activity. • **RAID 6**. Optimal for environments requiring redundancy protection beyond RAID 5, but not requiring high write performance. RAID 3 can be assigned only to volume groups using the command line interface (CLI). When you change the RAID level, you cannot cancel this operation after it begins. During the change, your data remains available.
Optimization capacity (EF600 arrays only)	When a volume group is created, a recommended optimization capacity is generated that provides a balance of available capacity versus performance and drive wear life. You can adjust this balance by moving the slider to the right for better performance and drive wear life at the expense of increased available capacity, or by moving it to the left for increased available capacity at the expense of better performance and drive wear life. SSD drives will have longer life and better maximum write performance when a portion of their capacity is unallocated. For drives associated with a volume group, unallocated capacity is comprised of a group's free capacity (capacity not used by volumes) and a portion of the usable capacity set aside as additional optimization capacity. The additional optimization capacity ensures a minimum level of optimization capacity by reducing the usable capacity, and as such, is not available for volume creation.

4. Click **Save**.

   A confirmation dialog box appears if capacity is reduced, volume redundancy is lost, or shelf/drawer loss protection is lost as a result of the RAID level change. Select **Yes** to continue; otherwise click **No**.

Results

If you change the RAID level for a volume group, System Manager changes the RAID levels of every volume that comprises the volume group. Performance might be slightly affected during the operation.

View SSD Cache statistics

You can view statistics for the SSD Cache, such as reads, writes, cache hits, cache allocation percentage, and cache utilization percentage.

About this task

> ⓘ   This feature is not available on the EF600 storage system.

The nominal statistics, which are a subset of the detailed statistics, are shown on the **View SSD Cache Statistics** dialog box. You can view detailed statistics for the SSD Cache only when you export all SSD statistics to a `.csv` file.

As you review and interpret the statistics, keep in mind that some interpretations are derived by looking at a combination of statistics.

Steps

1. Select **Storage › Pools & Volume Groups**.

2. Select the SSD Cache for which you want to view statistics, and then click **More › View SSD Cache statistics**.

   The **View SSD Cache Statistics** dialog box appears and displays the nominal statistics for the selected SSD cache.

Field Details

Settings	Description
Reads	Shows the total number of host reads from the SSD Cache-enabled volumes. The greater the ratio of Reads to Writes, the better is the operation of the cache.
Writes	The total number of host writes to the SSD Cache-enabled volumes. The greater the ratio of Reads to Writes, the better is the operation of the cache.
Cache hits	Shows the number of cache hits.
Cache hits %	Shows the percentage of cache hits. This number is derived from Cache Hits / (reads + writes). The cache hit percentage should be greater than 50 percent for effective SSD Cache operation.
Cache allocation %	Shows the percentage of SSD Cache storage that is allocated, expressed as a percentage of the SSD Cache storage that is available to this controller and is derived from allocated bytes / available bytes.
Cache utilization %	Shows the percentage of SSD Cache storage that contains data from enabled volumes, expressed as a percentage of SSD Cache storage that is allocated. This amount represents the utilization or density of the SSD Cache. Derived from allocated bytes / available bytes.
Export All	Exports all SSD Cache statistics to a CSV format. The exported file contains all available statistics for the SSD Cache (both nominal and detailed).

3. Click **Cancel** to close the dialog box.

Check volume redundancy

Under the guidance of technical support or as instructed by the Recovery Guru, you can check the redundancy on a volume in a pool or volume group to determine whether the data on that volume is consistent. Redundancy data is used to quickly reconstruct information on a replacement drive if one of the drives in the pool or volume group fails.

Before you begin

- The status of the pool or volume group must be Optimal.
- The pool or volume group must have no volume modification operations in progress.
- You can check redundancy on any RAID level except on RAID 0, because RAID 0 has no data redundancy. (Pools are configured only as RAID 6.)

(i) Check volume redundancy only when instructed to do so by the Recovery Guru and under the guidance of technical support.

About this task

You can perform this check only on one pool or volume group at a time. A volume redundancy check performs the following actions:

- Scans the data blocks in a RAID 3 volume, a RAID 5 volume, or a RAID 6 volume, and checks the redundancy information for each block. (RAID 3 can only be assigned to volume groups using the command line interface.)
- Compares the data blocks on RAID 1 mirrored drives.
- Returns redundancy errors if the controller firmware determines that the data is inconsistent.

(i) Immediately running a redundancy check on the same pool or volume group might cause an error. To avoid this problem, wait one to two minutes before running another redundancy check on the same pool or volume group.

Steps

1. Select **Storage › Pools & Volume Groups**.
2. Select **Uncommon Tasks › Check volume redundancy**.

   The **Check Redundancy** dialog box appears.

3. Select the volumes you want to check, and then type `check` to confirm you want to perform this operation.
4. Click **Check**.

   The check volume redundancy operation starts. The volumes in the pool or volume group are sequentially scanned, starting from the top of the table in the dialog box. These actions occur as each volume is scanned:

   - The volume is selected in the volume table.
   - The status of the redundancy check is shown in the Status column.
   - The check stops on any media or parity error encountered, and then reports the error.

More about the status of the redundancy check

Status	Description
Pending	This is the first volume to be scanned, and you have not clicked Start to start the redundancy check. or The redundancy check operation is being performed on other volumes in the pool or volume group.
Checking	The volume is undergoing the redundancy check.
Passed	The volume passed the redundancy check. No inconsistencies were detected in the redundancy information.
Failed	The volume failed the redundancy check. Inconsistencies were detected in the redundancy information.
Media error	The drive media is defective and is unreadable. Follow the instructions displayed in the Recovery Guru.
Parity error	The parity is not what it should be for a given portion of the data. A parity error is potentially serious and could cause a permanent loss of data.

5. Click **Done** after the last volume in the pool or volume group has been checked.

Delete pool or volume group

You can delete a pool or volume group to create more unassigned capacity, which you can reconfigure to meet your application storage needs.

Before you begin

- You must have backed up the data on all of the volumes in the pool or volume group.
- You must have stopped all input/output (I/O).
- You must unmount any file systems on the volumes.
- You must have deleted any mirror relationships in the pool or volume group.
- You must have stopped any volume copy operation in progress for the pool or volume group.
- The pool or volume group must not be participating in an asynchronous mirroring operation.
- The drives in the volume group must not have a persistent reservation.

Steps

1. Select **Storage › Pools & Volume Groups**.

2. Select one pool or volume group from the list.

   You can select only one pool or volume group at a time. Scroll down the list to see additional pools or volume groups.

3. Select **Uncommon Tasks › Delete** and confirm.

Results

System Manager performs the following actions:

- Deletes all of the data in the pool or volume group.
- Deletes all the drives associated with the pool or volume group.
- Unassigns the associated drives, which allows you to reuse them in new or existing pools or volume groups.

Consolidate free capacity for a volume group

Use the Consolidate Free Capacity option to consolidate existing free extents on a selected volume group. By performing this action, you can create additional volumes from the maximum amount of free capacity in a volume group.

Before you begin

- The volume group must contain at least one free capacity area.
- All of the volumes in the volume group must be online and in Optimal status.
- Volume modification operations must not be in progress, such as changing the segment size of a volume.

About this task

You cannot cancel the operation after it begins. Your data remains accessible during the consolidation operation.

You can launch the **Consolidate Free Capacity** dialog box using any of the following methods:

- When at least one free capacity area is detected for a volume group, the **Consolidate free capacity** recommendation appears on the Home page in the Notification area. Click the **Consoildate free capacity** link to launch the dialog box.
- You can also launch the Consoildate Free Capacity dialog box from the Pools & Volume Groups page as described in the following task.

More about free capacity areas

A free capacity area is the free capacity that can result from deleting a volume or from not using all available free capacity during volume creation. When you create a volume in a volume group that has one or more free capacity areas, the volume's capacity is limited to the largest free capacity area in that volume group. For example, if a volume group has a total of 15 GiB free capacity, and the largest free capacity area is 10 GiB, the largest volume you can create is 10 GiB.

You consolidate free capacity on a volume group to improve write performance. Your volume group's free capacity will become fragmented over time as the host writes, modifies, and deletes files. Eventually, the available capacity will not be located in a single contiguous block, but will be scattered in small fragments across the volume group. This causes further file fragmentation, since the host must write new files as fragments to fit them into the available ranges of free clusters.

By consolidating free capacity on a selected volume group, you will notice improved file system performance whenever the host writes new files. The consolidation process will also help prevent new files from being fragmented in the future.

Steps

1. Select **Storage › Pools & Volume Groups**.

2. Select the volume group with free capacity that you want to consolidate, and then select **Uncommon Tasks › Consolidate volume group free capacity**.

   The **Consolidate Free Capacity** dialog box appears.

3. Type `consolidate` to confirm you want to perform this operation.

4. Click **Consolidate**.

Results

System Manager begins consolidating (defragmenting) the volume group's free capacity areas into one contiguous amount for subsequent storage configuration tasks.

After you finish

Select **Home › View Operations in Progress** to view the progress of the Consolidate Free Capacity operation. This operation can be lengthy and could affect system performance.

Export/Import volume groups

Volume group migration lets you export a volume group so that you can import the volume group to a different storage array.

The Export/Import function is not supported in the SANtricity System Manager user interface. You must use the Command Line Interface (CLI) to export/import a volume group to a different storage array.