



# Create pools and volume groups

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# Create pools and volume groups

## Create pool automatically

Pool creation is initiated automatically when System Manager detects unassigned drives in the storage array. You can use automatic pool creation to easily configure all unassigned drives in the storage array into one pool and to add drives into existing pools.

### Before you begin

You can launch the **Pool Auto-Configuration** dialog box when one of these conditions are true:

- At least one unassigned drive has been detected that can be added to an existing pool with similar drive types.
- Eleven (11) or more unassigned drives have been detected that can be used to create a new pool (if they cannot be added to an existing pool due to dissimilar drive types).

### About this task

Keep in mind the following:

- When you add drives to a storage array, System Manager automatically detects the drives and prompts you to create a single pool or multiple pools based on the drive type and the current configuration.
- If pools were previously defined, System Manager automatically prompts you with the option of adding the compatible drives to an existing pool. When new drives are added to an existing pool, System Manager automatically redistributes the data across the new capacity, which now includes the new drives that you added.
- When configuring an EF600 storage array, make sure each controller has access to an equal number of drives in the first 12 slots and an equal number of drives in the last 12 slots. This configuration helps the controllers use both drive-side PCIe buses more effectively. Currently System Manager allows for drive selection under the Advanced feature when creating a volume group. For pool creation, it is recommended to use all drives in the storage array.

You can launch the **Pool Auto-Configuration** dialog box using any of the following methods:

- When unassigned capacity is detected, the Pool Auto-Configuration recommendation appears on the Home page in the Notification area. Click **View Pool Auto-Configuration** to launch the dialog box.
- You can also launch the **Pool Auto-Configuration** dialog box from the Pools and Volume Groups page as described in the following task.

### Steps

1. Select **Storage › Pools & Volume Groups**.
2. Select **More › Launch pool auto-configuration**.

The results table lists new pools, existing pools with drives added, or both. A new pool is named with a sequential number by default.

Notice that System Manager will do the following:

- Create a single pool if there are a sufficient number of drives with the same drive type (HDD or SSD) and have similar capacity.

- Create multiple pools if the unassigned capacity consists of different drive types.
  - Add the drives to an existing pool if a pool is already defined in the storage array, and you add new drives of the same drive type to the pool.
  - Add the drives of the same drive type to the existing pool, and use the other drive types to create different pools if the new drives are of different drive types.
3. To change the name of a new pool, click the **Edit** icon (the pencil).
  4. To view additional characteristics of the pool, position the cursor over or touch the **Details** icon (the page).

Information about the drive type, security capability, data assurance (DA) capability, shelf loss protection, and drawer loss protection appears.

5. Click **Accept**.

## Create pool manually

You can create a pool manually (from a set of candidates) if the Pool Auto Configuration feature does not provide a pool that meets your needs. A pool provides the logical storage capacity necessary from which you can create individual volumes that can then be used to host your applications.

### Before you begin

- You must have a minimum of 11 drives with the same drive type (HDD or SSD).
- Shelf loss protection requires that the drives comprising the pool are located in at least six different drive shelves and there are no more than two drives in a single drive shelf.
- Drawer loss protection requires that the drives comprising the pool are located in at least five different drawers and the pool includes an equal number of drive shelves from each drawer.
- When configuring an EF600 storage array, make sure each controller has access to an equal number of drives in the first 12 slots and an equal number of drives in the last 12 slots. This configuration helps the controllers use both drive-side PCIe buses more effectively. Currently System Manager allows for drive selection under the Advanced feature when creating a volume group. For pool creation, it is recommended to use all drives in the storage array.

### Steps


1. Select **Storage > Pools & Volume Groups**.
2. Click **Create > Pool**.

The **Create Pool** dialog box appears.

3. Type a name for the pool.
4. **Optional:** If you have more than one type of drive in your storage array, select the drive type that you want to use.

The results table lists all the possible pools that you can create.

5. Select the pool candidate that you want to use based on the following characteristics, and then click **Create**.

Characteristic	Use
Free Capacity	<p>Shows the free capacity of the pool candidate in GiB. Select a pool candidate with the capacity for your application's storage needs.</p> <p>Preservation (spare) capacity is also distributed throughout the pool and is not part of the free capacity amount.</p>
Total Drives	<p>Shows the number of drives available in the pool candidate.</p> <p>System Manager automatically reserves as many drives as possible for preservation capacity (for every six drives in a pool, System Manager reserves one drive for preservation capacity).</p> <p>When a drive failure occurs, the preservation capacity is used to hold the reconstructed data.</p>
Secure-Capable	<p>Indicates whether this pool candidate is comprised entirely of secure-capable drives, which can be either Full Disk Encryption (FDE) drives or Federal Information Processing Standard (FIPS) drives.</p> <ul style="list-style-type: none"> <li>• You can protect your pool with Drive Security, but all drives must be secure-capable to use this feature.</li> <li>• If you want to create an FDE-only pool, look for <b>Yes - FDE</b> in the Secure-Capable column. If you want to create a FIPS-only pool, look for <b>Yes - FIPS</b> in the Secure-Capable column.</li> <li>• You can create a pool comprised of drives that may or may not be secure-capable or are a mix of security levels. If the drives in the pool include drives that are not secure-capable, you cannot make the pool secure.</li> </ul>
Enable Security?	<p>Provides the option for enabling the Drive Security feature with secure-capable drives. If the pool is secure-capable and you have created a security key, you can enable security by selecting the check box.</p> <div>  <p>The only way to remove Drive Security after it is enabled is to delete the pool and erase the drives.</p> </div>

Characteristic	Use
DA Capable	<p>Indicates if Data Assurance (DA) is available for this pool candidate. DA checks for and corrects errors that might occur as data is transferred through the controllers down to the drives.</p> <p>If you want to use DA, select a pool that is DA capable. This option is available only when the DA feature has been enabled.</p> <p>A pool can contain drives that are DA-capable or not DA-capable, but all drives must be DA capable for you to use this feature.</p>
Shelf Loss Protection	<p>Shows if shelf loss protection is available.</p> <p>Shelf loss protection guarantees accessibility to the data on the volumes in a pool if a total loss of communication occurs with a single drive shelf.</p>
Drawer Loss Protection	<p>Shows if drawer loss protection is available, which is provided only if you are using a drive shelf that contains drawers.</p> <p>Drawer loss protection guarantees accessibility to the data on the volumes in a pool if a total loss of communication occurs with a single drawer in a drive shelf.</p>

## Create a volume group

You use a volume group to create one or more volumes that are accessible to the host. A volume group is a container for volumes with shared characteristics such as RAID level and capacity.

### About this task

With larger capacity drives and the ability to distribute volumes across controllers, creating more than one volume per volume group is a good way to make use of your storage capacity and to protect your data.

Follow these guidelines when you create a volume group.

- You need at least one unassigned drive.
- Limits exist as to how much drive capacity you can have in a single volume group. These limits vary according to your host type.
- To enable shelf/drawer loss protection, you must create a volume group that uses drives located in at least three shelves or drawers, unless you are using RAID 1, where two shelves/drawers is the minimum.
- When configuring an EF600 storage array, make sure each controller has access to an equal number of drives in the first 12 slots and an equal number of drives in the last 12 slots. This configuration helps the controllers use both drive-side PCIe buses more effectively. Currently System Manager allows for drive

selection under the Advanced feature when creating a volume group. For pool creation, it is recommended to use all drives in the storage array.

Review how your choice of RAID level affects the resulting capacity of the volume group.

- If you select RAID 1, you must add two drives at a time to make sure that a mirrored pair is selected. Mirroring and striping (known as RAID 10 or RAID 1+0) is achieved when four or more drives are selected.
- If you select RAID 5, you must add a minimum of three drives to create the volume group.
- If you select RAID 6, you must add a minimum of five drives to create the volume group.

### Steps

1. Select **Storage › Pools & Volume Groups**.
2. Click **Create › Volume group**.

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

3. Type a name for the volume group.
4. Select the RAID level that best meets your requirements for data storage and protection.

The volume group candidate table appears and displays only the candidates that support the selected RAID level.

5. **Optional:** If you have more than one type of drive in your storage array, select the drive type that you want to use.

The volume group candidate table appears and displays only the candidates that support the selected drive type and RAID level.

6. **Optional:** You can select either the automatic method or manual method to define which drives to use in the volume group. The Automatic method is the default selection.

To select drives manually, click the **Manually select drives (advanced)** link. When clicked, it changes to **Automatically select drives (advanced)**.

The Manual method lets you select which specific drives comprise the volume group. You can select specific unassigned drives to obtain the capacity that you require. If the storage array contains drives with different media types or different interface types, you can choose only the unconfigured capacity for a single drive type to create the new volume group.




Only experts who understand drive redundancy and optimal drive configurations should use the Manual method.

7. Based on the displayed drive characteristics, select the drives you want to use in the volume group, and then click **Create**.

The drive characteristics displayed depend on whether you selected the automatic method or manual method.

## Automatic method drive characteristics

Characteristic	Use
Free Capacity	Shows the available capacity in GiB. Select a volume group candidate with the capacity for your application's storage needs.
Total Drives	Shows the number of drives available for this volume group. Select a volume group candidate with the number of drives that you want. The more drives that a volume group contains, the less likely it is that multiple drive failures will cause a critical drive failure in a volume group.
Secure-Capable	<p>Indicates whether this volume group candidate is comprised entirely of secure-capable drives, which can be either Full Disk Encryption (FDE) drives or Federal Information Processing Standard (FIPS) drives.</p> <ul style="list-style-type: none"> <li>• You can protect your volume group with Drive Security, but all drives must be secure-capable to use this feature.</li> <li>• If you want to create an FDE-only volume group, look for <b>Yes - FDE</b> in the Secure-Capable column. If you want to create a FIPS-only volume group, look for <b>Yes - FIPS</b> in the Secure-Capable column.</li> <li>• You can create a volume group comprised of drives that might or might not be secure-capable or are a mix of security levels. If the drives in the volume group include drives that are not secure-capable, you cannot make the volume group secure.</li> </ul>
Enable Security?	<p>Provides the option for enabling the Drive Security feature with secure-capable drives. If the volume group is secure-capable and you have set up a security key, you can enable Drive Security by selecting the check box.</p> <div>  <p>The only way to remove Drive Security after it is enabled is to delete the volume group and erase the drives.</p> </div>



Characteristic	Use
DA Capable	<p>Indicates if Data Assurance (DA) is available for this group. Data Assurance (DA) checks for and corrects errors that might occur as data is transferred through the controllers down to the drives.</p> <p>If you want to use DA, select a volume group that is DA capable. This option is available only when the DA feature has been enabled.</p> <p>A volume group can contain drives that are DA-capable or not DA-capable, but all drives must be DA capable for you to use this feature.</p>
Shelf Loss Protection	<p>Shows if shelf loss protection is available. Shelf loss protection guarantees accessibility to the data on the volumes in a volume group if a total loss of communication to a shelf occurs.</p>
Drawer Loss Protection	<p>Shows if drawer loss protection is available, which is provided only if you are using a drive shelf that contains drawers. Drawer loss protection guarantees accessibility to the data on the volumes in a volume group if a total loss of communication occurs with a single drawer in a drive shelf.</p>

## Manual method drive characteristics

Characteristic	Use
Media Type	<p>Indicates the media type. The following media types are supported:</p> <ul style="list-style-type: none"><li>• Hard drive</li><li>• Solid State Disk (SSD) All drives in a volume group must be of the same media type (either all SSDs or all hard drives). Volume groups cannot have a mixture of media types or interface types.</li></ul>
Drive Capacity	<p>Indicates the drive capacity.</p> <ul style="list-style-type: none"><li>• Whenever possible, select drives that have a capacity equal to the capacities of the current drives in the volume group.</li><li>• If you must add unassigned drives with a smaller capacity, be aware that the usable capacity of each drive currently in the volume group is reduced. Therefore, the drive capacity is the same across the volume group.</li><li>• If you must add unassigned drives with a larger capacity, be aware that the usable capacity of the unassigned drives that you add is reduced so that they match the current capacities of the drives in the volume group.</li></ul>
Tray	Indicates the tray location of the drive.
Slot	Indicates the slot location of the drive.
Speed (rpm)	Indicates the speed of the drive.
Logical sector size	Indicates the sector size and format.

Characteristic	Use
Secure-Capable	<p>Indicates whether this volume group candidate is comprised entirely of secure-capable drives, which can be either Full Disk Encryption (FDE) drives or Federal Information Processing Standard (FIPS) drives.</p> <ul style="list-style-type: none"> <li>• You can protect your volume group with Drive Security, but all drives must be secure-capable to use this feature.</li> <li>• If you want to create an FDE-only volume group, look for <b>Yes - FDE</b> in the Secure-Capable column. If you want to create a FIPS-only volume group, look for <b>Yes - FIPS</b> in the Secure-Capable column.</li> <li>• You can create a volume group comprised of drives that might or might not be secure-capable or are a mix of security levels. If the drives in the volume group include drives that are not secure-capable, you cannot make the volume group secure.</li> </ul>
DA Capable	<p>Indicates if Data Assurance (DA) is available for this group. Data Assurance (DA) checks for and corrects errors that might occur as data is communicated through the controllers down to the drives.</p> <p>If you want to use DA, select a volume group that is DA capable. This option is available only when the DA feature has been enabled.</p> <p>A volume group can contain drives that are DA-capable or not DA-capable, but all drives must be DA capable for you to use this feature.</p>

## Create SSD Cache

To dynamically accelerate system performance, you can use the SSD Cache feature to cache the most frequently accessed data ("hot" data) onto lower latency Solid State Drives (SSDs). SSD Cache is used exclusively for host reads.

### Before you begin

Your storage array must contain some SSD drives.



SSD Cache is not available on the EF600 storage system.

### About this task

When you create SSD Cache, you can use a single drive or multiple drives. Because the read cache is in the storage array, caching is shared across all applications using the storage array. You select the volumes that you want to cache, and then caching is automatic and dynamic.

Follow these guidelines when you create SSD Cache.

- You can enable security on the SSD Cache only when you are creating it, not later.
- Only one SSD Cache is supported per storage array.
- The maximum usable SSD Cache capacity on a storage array is dependent on the controller’s primary cache capacity.
- SSD Cache is not supported on snapshot images.
- If you import or export volumes that are SSD Cache enabled or disabled, the cached data is not imported or exported.
- Any volume assigned to use a controller’s SSD Cache is not eligible for an automatic load balance transfer.
- If the associated volumes are secure-enabled, create a secure-enabled SSD Cache.


**Steps**

1. Select **Storage > Pools & Volume Groups**.
2. Click **Create > SSD Cache**.

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

3. Type a name for the SSD Cache.
4. Select the SSD Cache candidate that you want to use based on the following characteristics.

Characteristic	Use
Capacity	<p>Shows the available capacity in GiB. Select the capacity for your application’s storage needs.</p> <p>The maximum capacity for SSD Cache depends on the controller’s primary cache capacity. If you allocate more than the maximum amount to SSD Cache, then any extra capacity is unusable.</p> <p>SSD Cache capacity counts towards your overall allocated capacity.</p>
Total drives	<p>Shows the number of drives available for this SSD cache. Select the SSD candidate with the number of drives that you want.</p>

Characteristic	Use
Secure-capable	<p>Indicates whether the SSD Cache candidate is comprised entirely of secure-capable drives, which can be either Full Disk Encryption (FDE) drives or Federal Information Processing Standard (FIPS) drives.</p> <p>If you want to create a secure-enabled SSD Cache, look for <b>Yes - FDE</b> or <b>Yes - FIPS</b> in the Secure-capable column.</p>
Enable security?	<p>Provides the option for enabling the Drive Security feature with secure-capable drives. If you want to create a secure-enabled SSD Cache, select the Enable Security check box.</p> <div>  <p>Once enabled, security cannot be disabled. You can enable security on the SSD Cache only when you are creating it, not later.</p> </div>
DA capable	<p>Indicates if Data Assurance (DA) is available for this SSD Cache candidate. Data Assurance (DA) checks for and corrects errors that might occur as data is transferred through the controllers down to the drives.</p> <p>If you want to use DA, select an SSD Cache candidate that is DA capable. This option is available only when the DA feature has been enabled.</p> <p>SSD Cache can contain both DA-capable and non-DA-capable drives, but all drives must be DA-capable for you to use DA.</p>

- Associate the SSD Cache with the volumes for which you want to implement SSD read caching. To enable SSD Cache on compatible volumes immediately, select the **Enable SSD Cache on existing compatible volumes that are mapped to hosts** check box.

Volumes are compatible if they share the same Drive Security and DA capabilities.

- Click **Create**.

## Add capacity to a pool or volume group

You can add drives to expand the free capacity in an existing pool or volume group. The expansion causes additional free capacity to be included in the pool or volume group. You can use this free capacity to create additional volumes. The data in the volumes remains accessible during this operation.

## Before you begin

- Drives must be in an Optimal status.
- Drives must have the same drive type (HDD or SSD).
- The pool or volume group must be in an Optimal status.
- If the pool or volume group contains all secure-capable drives, add only drives that are secure-capable to continue to use the encryption abilities of the secure-capable drives.

Secure-capable drives can be either Full Disk Encryption (FDE) drives or Federal Information Processing Standard (FIPS) drives.

## About this task

For pools, you can add a maximum of 60 drives at a time or up to 60 drives through multiples of 5. For volume groups, you can add a maximum of two drives at a time. If you need to add more than the maximum number of drives, repeat the procedure. (A pool cannot contain more drives than the maximum limit for a storage array.)



With the addition of drives, your preservation capacity may need to be increased. You should consider increasing your reserved capacity after an expansion operation.



Avoid using drives that are Data Assurance (DA) capable to add capacity to a pool or volume group that is not DA capable. The pool or volume group cannot take advantage of the capabilities of the DA-capable drive. Consider using drives that are not DA capable in this situation.

## Steps

1. Select **Storage > Pools & Volume Groups**.
2. Select the pool or volume group to which you want to add drives, and then click **Add Capacity**.

The **Add Capacity** dialog box appears. Only the unassigned drives that are compatible with the pool or volume group appear.

3. Under **Select drives to add capacity...**, select one or more drives that you want to add to the existing pool or volume group.

The controller firmware arranges the unassigned drives with the best options listed at the top. The total free capacity that is added to the pool or volume group appears below the list in **Total capacity selected**.

## Field Details

Field	Description
Shelf	Indicates the shelf location of the drive.
Bay	Indicates the bay location of the drive.
Capacity (GiB)	<p>Indicates the drive capacity.</p> <ul style="list-style-type: none"><li>• Whenever possible, select drives that have a capacity equal to the capacities of the current drives in the pool or volume group.</li><li>• If you must add unassigned drives with a smaller capacity, be aware that the usable capacity of each drive currently in the pool or volume group is reduced. Therefore, the drive capacity is the same across the pool or volume group.</li><li>• If you must add unassigned drives with a larger capacity, be aware that the usable capacity of the unassigned drives that you add is reduced so that they match the current capacities of the drives in the pool or volume group.</li></ul>
Secure-Capable	<p>Indicates whether the drive is secure-capable.</p> <ul style="list-style-type: none"><li>• You can protect your pool or volume group with the Drive Security feature, but all drives must be secure-capable to use this feature.</li><li>• You can mix secure-capable and non-secure-capable drives, but the encryption abilities of the secure-capable drives cannot be used.</li><li>• Secure-capable drives can be either Full Disk Encryption (FDE) drives or Federal Information Processing Standard (FIPS) drives.</li></ul>
DA Capable	<p>Indicates whether the drive is Data Assurance (DA) capable.</p> <ul style="list-style-type: none"><li>• Using drives that are not Data Assurance (DA) capable to add capacity to a DA-capable pool or volume group is not recommended. The pool or volume group no longer has DA capabilities, and you no longer have the option to enable DA on newly created volumes within the pool or volume group.</li><li>• Using drives that are Data Assurance (DA) capable to add capacity to a pool or volume group that is non DA-capable is not recommended, because that pool or volume group cannot take advantage of the capabilities of the DA-capable drive (the drive attributes do not match). Consider using drives that are not DA-capable in this situation.</li></ul>
DULBE capable	<p>Indicates whether the drive has the option for Deallocated or Unwritten Logical Block Error (DULBE). DULBE is an option on NVMe drives that allows an EF600 storage array to deallocate blocks that are part of a volume. Deallocating blocks on a drive can greatly reduce the time it takes to initialize volumes. In addition, hosts can deallocate logical blocks in the volume using the NVMe Dataset Management command.</p>

4. Click **Add**.

If you are adding drives to a pool or volume group, a confirmation dialog box appears if you selected a drive that causes the pool or volume group to no longer have one or more of the following attributes:

- Shelf loss protection
- Drawer loss protection
- Full Disk Encryption capability
- Data Assurance capability
- DULBE capability

To continue, click **Yes**; otherwise click **Cancel**.

### **Results**

After you add the unassigned drives to a pool or volume group, the data in each volume of the pool or volume group is redistributed to include the additional drives.



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