

**Implementing
Fully Automated Storage Tiering
for Virtual Pools (FAST VP™) for
EMC® Symmetrix® VMAX® Family Arrays**

Technical Notes

P/N 300-012-015
REV A07
May, 2013

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Executive summary

Information infrastructures must continuously adapt to changing business requirements. EMC® Symmetrix® Fully Automated Storage Tiering for Virtual Pools (FAST VP™) automates tiered storage strategies, in Virtual Provisioning™ environments, by easily moving workloads between Symmetrix tiers as performance characteristics change over time. FAST VP performs data movements, improving performance, and reducing costs, all while maintaining vital service levels.

Introduction

EMC Symmetrix VMAX® FAST VP automates the identification of active and inactive application data for the purposes of reallocating that data across different performance/capacity tiers within an array. FAST VP proactively monitors workloads at both the LUN level and sub-LUN level to identify busy data that would benefit from being moved to higher-performing drives. FAST VP also identifies less-busy data that could be moved to higher-capacity drives, without affecting existing performance. This promotion/demotion activity is based on policies that associate a storage group to multiple drive technologies, or RAID protection schemes, by way of virtual pools, as well as the performance requirements of the application contained within the storage group. Data movement executed during this activity is performed non-disruptively, without affecting business continuity and data availability.

Audience

This technical note provides an in-depth look at the management interfaces used for the configuration of Fully Automated Storage Tiering for Virtual Pools feature for Symmetrix VMAX Family arrays. The intended audience includes system and storage administrators, customers, EMC staff, and partners who need to understand how to implement and leverage FAST VP.

Fully Automated Storage Tiering

Fully Automated Storage Tiering (FAST™) automates the identification of active and inactive data for the purposes of relocating application data across different performance/capacity tiers within an array.

The primary benefits of FAST include:

- ♦ Improving application performance at the same cost, or providing the same application performance at lower cost. Cost is defined as: acquisition (both hardware and software), space/energy, and management expense.
- ♦ Elimination of manually tiering applications when workload characteristics change over time.
- ♦ Automating the process of identifying data that can benefit from Enterprise Flash Drives (EFDs) or that can be kept on higher-capacity, less-expensive SATA drives without impacting performance.
- ♦ Optimizing and prioritizing business applications, allowing customers to dynamically allocate storage resources within a single array configuration.
- ♦ Delivering greater flexibility in meeting different price/performance ratios throughout the lifecycle of the stored information.

For detailed information on the architectural implementation and the theory of operation of FAST VP, as well as best-practice recommendations, refer to FAST VP for EMC Symmetrix VMAX Theory and Best Practices for Planning and Performance available at <http://support.emc.com>.

Management interface: Unisphere for VMAX

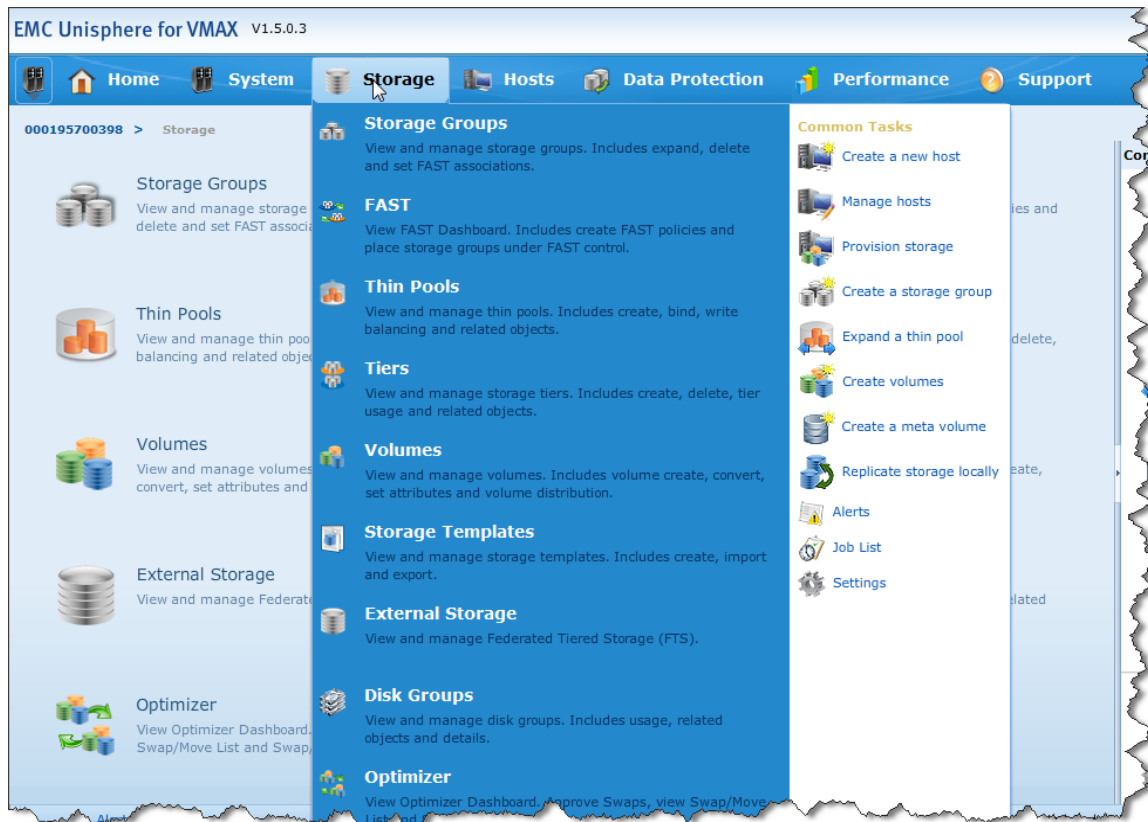
Unisphere® for VMAX provides features and functionality for managing FAST VP in both Open Systems and mainframe environments. All FAST VP managed objects and associations, configuration settings, and time windows may be created and managed.

All tasks related to FAST VP are available under **Storage** in Unisphere for VMAX interface. The primary subsection pages used are:

- ◆ Storage Groups
- ◆ FAST
- ◆ Thin Pools
- ◆ Tiers



These subsection pages are also available by hovering the cursor over **Storage** in the menu bar.



The following sections detail the use of Unisphere for managing and controlling FAST VP.

Examining Symmetrix Virtual Provisioning thin pools

Prior to enabling and configuring the FAST controller, and configuring Symmetrix tiers and FAST policies, it is important to understand the existing configuration of the Symmetrix array. Unisphere can be used to take an inventory of the existing thin pools within the array.

Details on the existing available pools can be seen on the **Thin Pools** subsection page under **Storage**.

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > Thin Pools

Thin Pools

Name	Technology	Configuration	Emulation	Allocated Capacity	Enabled Capacity (GB)
R0_FTS_Pool	N/A	Unprotected	FBA	15 %	1078.13
R1_FC_Pool	FC	2-Way Mir	FBA	8 %	10722.66
R53_EFD_Pool	EFD	RAID-5 (3 + 1)	FBA	3 %	4394.51
R57_FC_Pool	FC	RAID-5 (7 + 1)	FBA	0 %	10722.66
R6_SATA_Pool	SATA	RAID-6 (6 + 2)	FBA	9 %	10239.94

Allocated Capacity Free Capacity

Create Expand View Details Delete

Last Up

The display for each thin pool shows the technology type, location, RAID protection, and emulation. It also shows the usable capacity of the pool, as well as the percentage allocated for the pool.

Note: When using FAST VP, the technology of a thin pool may not be Mixed.

To see more information on an individual thin pool, select the pool, and click **View Details**.

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

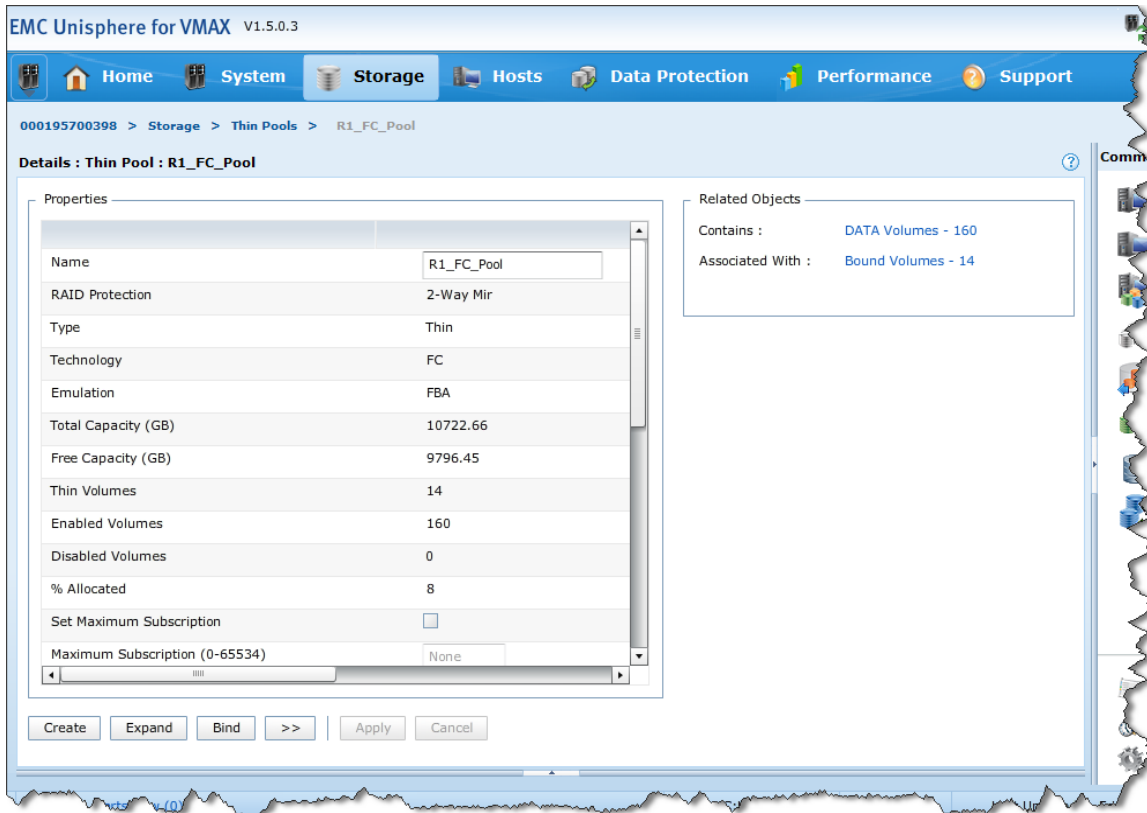
000195700398 > Storage > Thin Pools

Thin Pools

Name	Technology	Configuration	Emulation	Allocated Capacity	Enabled Capacity (GB)
R0_FTS_Pool	N/A	Unprotected	FBA	15 %	1078.13
R1_FC_Pool	FC	2-Way Mir	FBA	8 %	10722.66
R53_EFD_Pool	EFD	RAID-5 (3 + 1)	FBA	3 %	4394.51
R57_FC_Pool	FC	RAID-5 (7 + 1)	FBA	0 %	10722.66
R6_SATA_Pool	SATA	RAID-6 (6 + 2)	FBA	9 %	10239.94

Allocated Capacity Free Capacity

Create Expand View Details Delete



To view additional information on the data devices contained in the pool, or the thin devices bound to the pool, click the relevant, related objects link to the right of the detailed pool information.

Configuring the Symmetrix FAST controller

There are multiple FAST VP settings and parameters that affect the behavior of the FAST controller. These include:

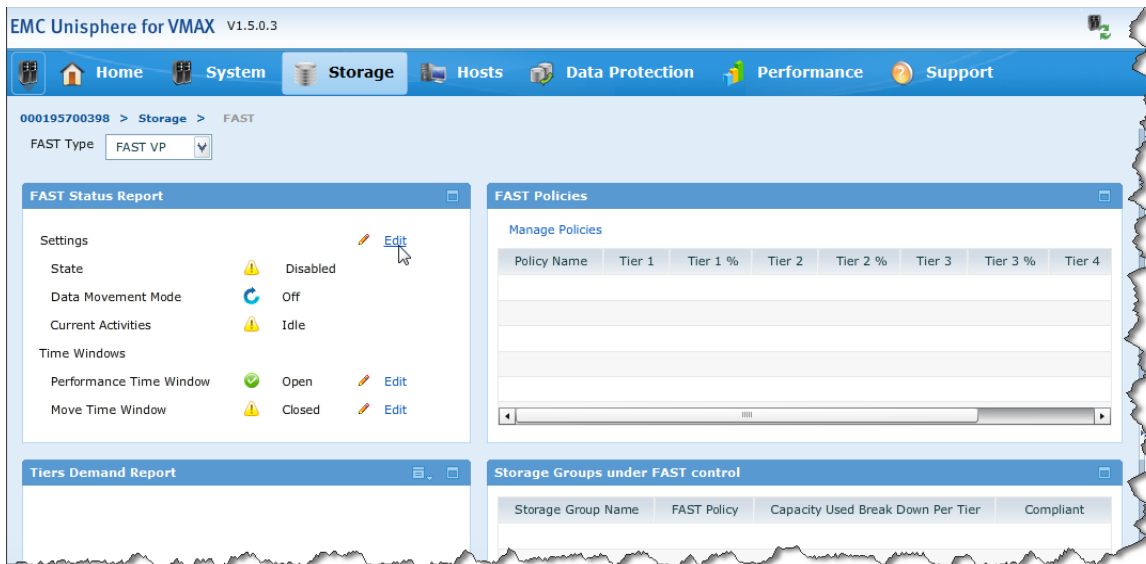
- ◆ FAST VP Data Movement Mode
- ◆ FAST VP Relocation Rate
- ◆ Pool Reserved Capacity (PRC)

- ◆ VP Allocation by FAST Policy
- ◆ Workload Analysis Period
- ◆ Initial Analysis Period
- ◆ Performance Time Window
- ◆ Data Movement Time Window

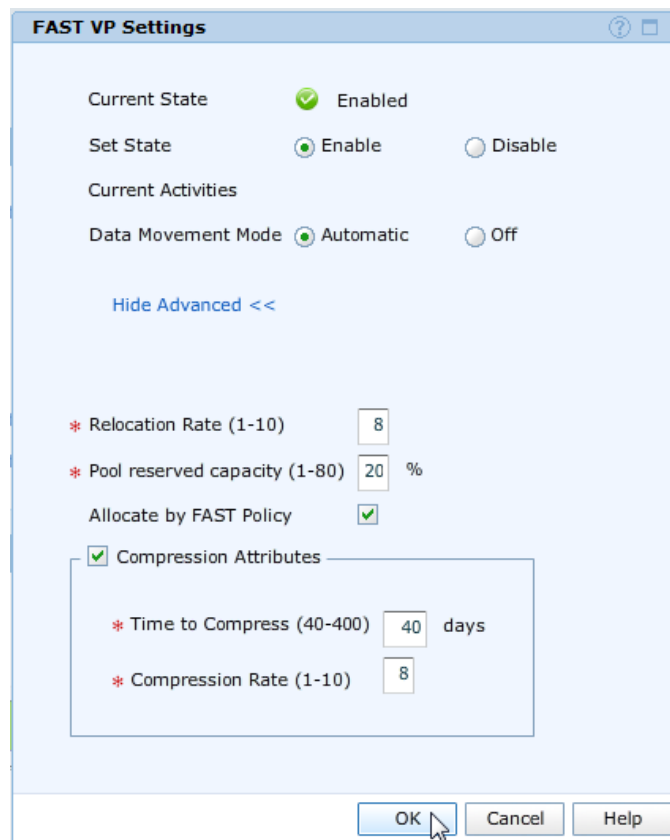
The following sections detail the Unisphere interface to display and modify each of these settings.

FAST controller settings list information

To view the existing FAST controller settings, go to the **FAST** subsection page under **Storage**, and click **Edit** to the right of **Settings**.



The resulting dialog box allows both viewing and editing of some of the related FAST VP settings.



Setting the FAST VP Data Movement Mode

There are two possible values for the Data Movement Mode: Automatic and Off. The default value is Off.

To change the **Data Movement Mode**, click the appropriate radio button, and then click **OK**.

Setting the FAST VP Relocation Rate

The FAST VP Relocation Rate can be set between 1 and 10. The default value is 5.

To set the **Relocation Rate**, type a value between 1 and 10 in the text box to the right of **Relocation Rate**, and click **OK**.

Setting the system-wide FAST VP Pool Reserved Capacity

FAST VP Pool Reserved Capacity (PRC) is specified as a percentage that can be set between 1 and 80. The default value is 10.

To set the system-wide **PRC**, type a value between 1 and 80 in the text box to the right of **Pool Reserved Capacity**, and click **OK**.

Setting VP allocation by FAST policy

VP allocation by FAST policy can be set to enabled or disabled. The default value is disabled.

To enable VP allocation by FAST policy, select the checkbox to the right of **Allocate by FAST Policy**, and click **OK**.

To disable VP allocation by FAST policy, clear the checkbox to the right of **Allocate by FAST policy**, and click **OK**.

Note: All of the preceding parameters may be edited prior to clicking **OK**.

Setting the FAST VP Time to Compress

FAST VP Time to Compress can be set between 40 and 400 days.

To set the time to compress, select the checkbox to the left of **Compression Attributes**. Type a value between 40 and 400 in the text box to the right of **Time to Compress**, and click **OK**.

Setting the FAST VP Compression Rate

The FAST VP Compression Rate can be set between 1 and 10. The default value is 5.

To set the compression rate, select the checkbox to the left of **Compression Attributes**. Type a value between 1 and 10 in the text box to the right of **Compression Rate**, and click **OK**.

Setting the pool-level FAST VP Pool Reserved Capacity

The pool-level FAST VP Pool Reserved Capacity (PRC) can be used to

override the system-wide setting for each individual pool. At the pool-level, the PRC can be set between 1 and 80 percent, or NONE. The default value is NONE.

The value of NONE indicates that the system-wide setting should be used for the pool.

To set or change the PRC at the pool level, select the appropriate thin pool on the **Thin Pools** subsection page, and then click **View Details**.

EMC Unisphere for VMAX V1.5.0.3

Home System Storage Hosts Data Protection Performance Support

000195700398 > Storage > Thin Pools

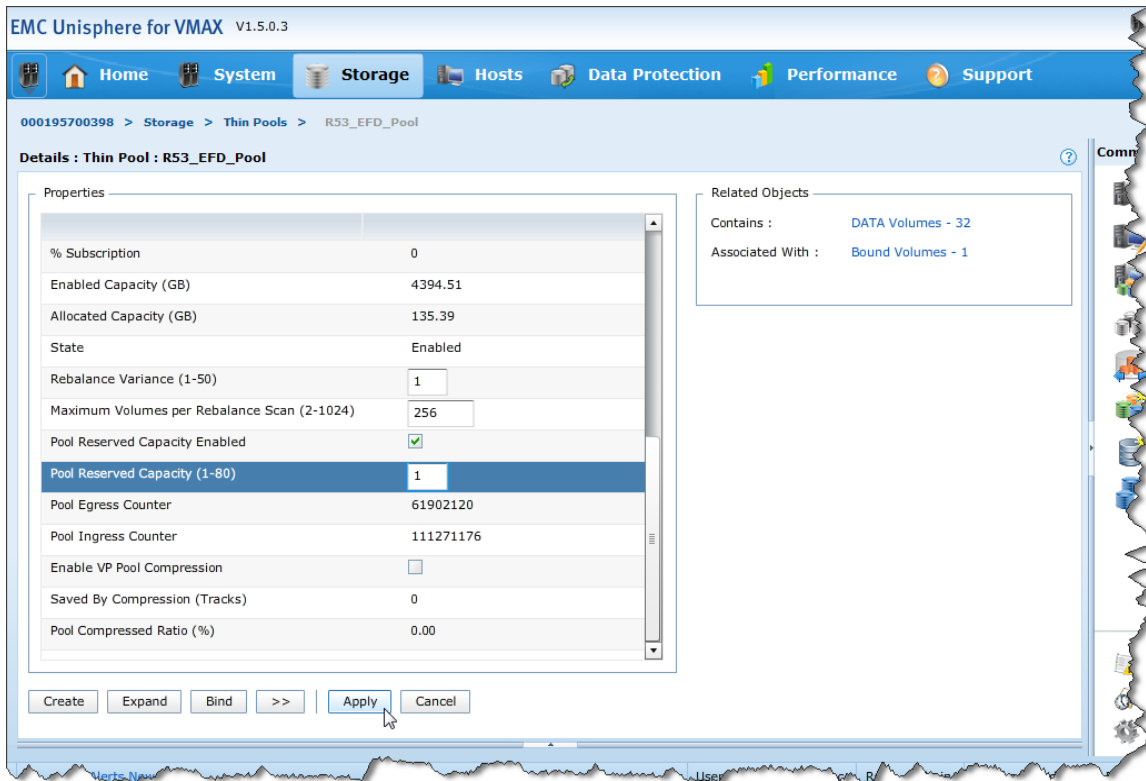
Thin Pools

Name	Technology	Configuration	Emulation	Allocated Capacity	Enabled Capacity (GB)
R0_FTS_Pool	N/A	Unprotected	FBA	15 %	1078.13
R1_FC_Pool	FC	2-Way Mir	FBA	8 %	10722.66
R53_EFD_Pool	EFD	RAID-5 (3 + 1)	FBA	3 %	4394.51
R57_FC_Pool	FC	RAID-5 (7 + 1)	FBA	0 %	10722.66
R6_SATA_Pool	SATA	RAID-6 (6 + 2)	FBA	9 %	10239.94
small_pool	FC	2-Way Mir	FBA	0 %	268.07
VP_Internal	FC	RAID-5 (7 + 1)	FBA	0 %	134.87

Allocated Capacity Free Capacity

Create Expand View Details Delete

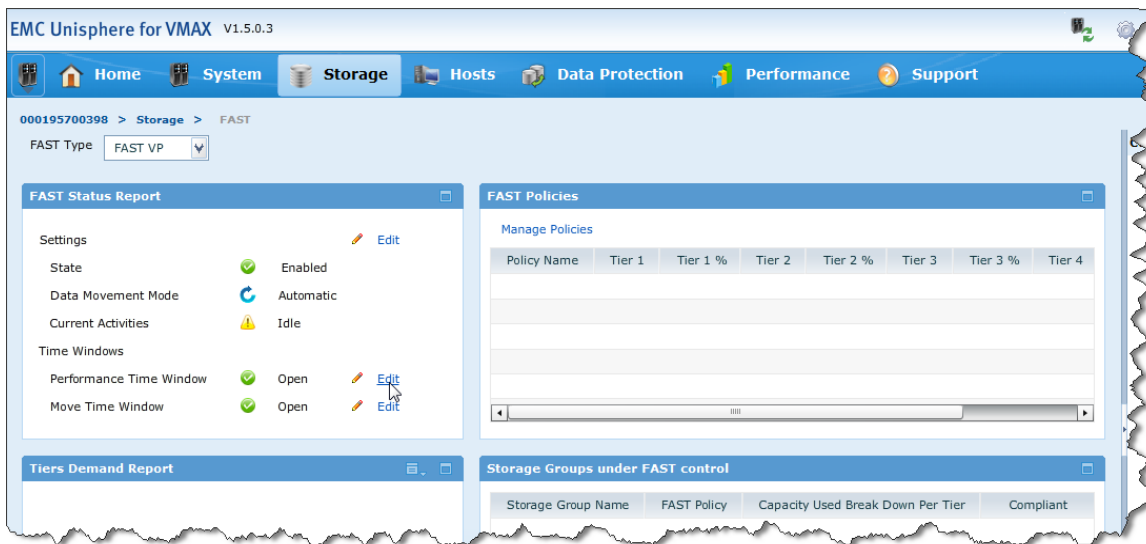
On the resulting object details page, type the desired PRC value, between 1 and 80, in text box to the right of **Pool Reserved Capacity**, and click **Apply**.



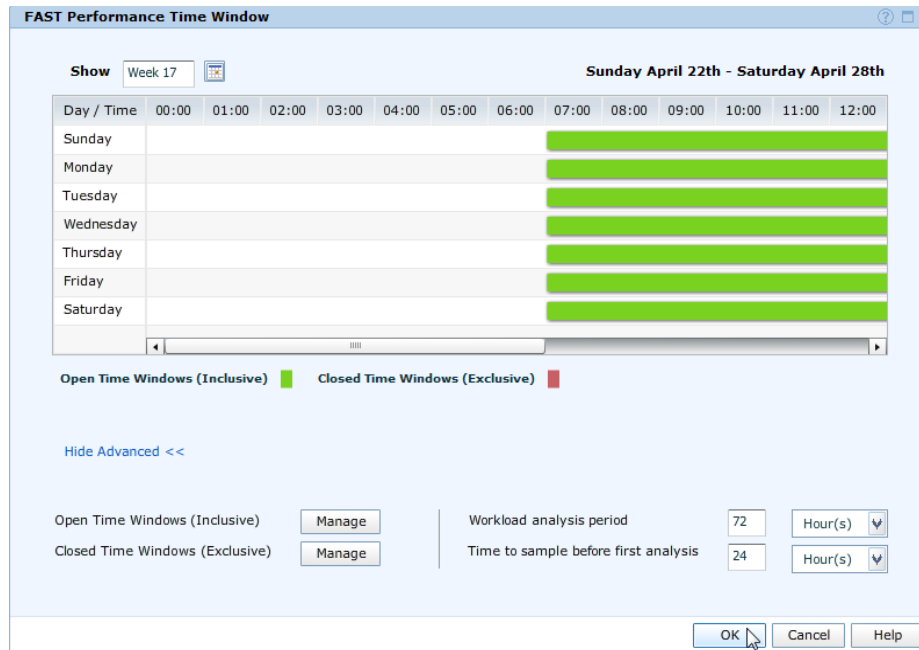
Managing analysis periods

Both the Workload Analysis Period and the Initial Analysis Period can be viewed and edited by either the Performance Time Window or data-movement window management screens.

From the **FAST** subsection page under **Storage**, click **Edit** to the right of either **Performance Time Window** or **Move Time Window**.



In the resulting dialog box, click **Show Advanced** under the time-window display. The analysis period parameters are available in the lower right-most corner.



Setting the Workload Analysis Period

The Workload Analysis Period is shared with Optimizer and FAST. It can be set between two hours and four weeks. The default is 7 days.

To set the Workload Analysis Period, type the desired value in the text box to the right of **Workload analysis period**, select the time unit (hours, days, or weeks), then click **OK**.

Setting the Initial Analysis Period

The Initial Analysis Period, also referred to as the Time to sample before first analysis, is a shared parameter with Optimizer and FAST. It can be set between two hours and four weeks. The default value is eight hours.

To set the Initial Analysis Period, type the desired value in the text box to the right of **Time to sample before first analysis**, select the time unit (hours, days, or weeks), then click **OK**.

Legacy time-window management

Management of the legacy time windows is not available with Unisphere. Unisphere can only manage the enhanced format.

Management of the legacy time windows is available using the SYMCLI

`symoptmz` command.

For the management of FAST VP, it is recommended to use enhanced time-window management.

Note: For information on managing legacy time windows, refer to the EMC Solutions Enabler Symmetrix Array Controls CLI product guide, available at <http://support.emc.com>.

Converting time-window type from legacy to enhanced

Legacy time windows cannot be converted to the enhanced format using Unisphere. To perform the conversion, Solutions Enabler SYMCLI must be used.

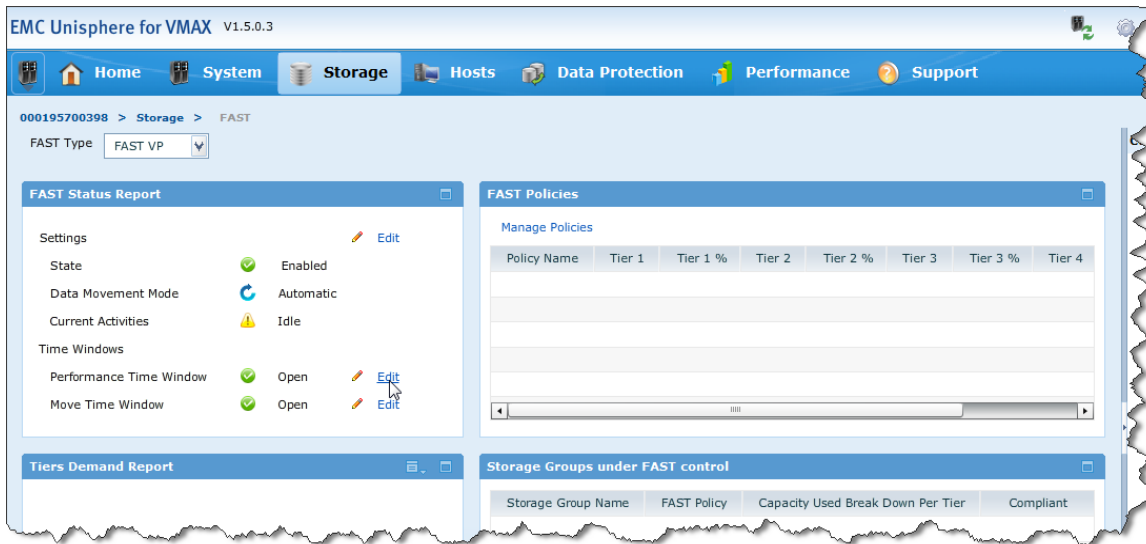
Note: For information on performing this conversion, see “*Converting time-window type from legacy to enhanced*” on page 87 in the SYMCLI management interface section.

Enhanced time-window management

Management of the enhanced time windows is managed through the **FAST** subsection page of Unisphere.

Managing enhanced FAST VP performance time windows

To manage the performance time windows to be used by FAST VP, click **Edit** to the right of **Performance Time Window** in the **FAST Status Report** panel of the **FAST** subsection page.



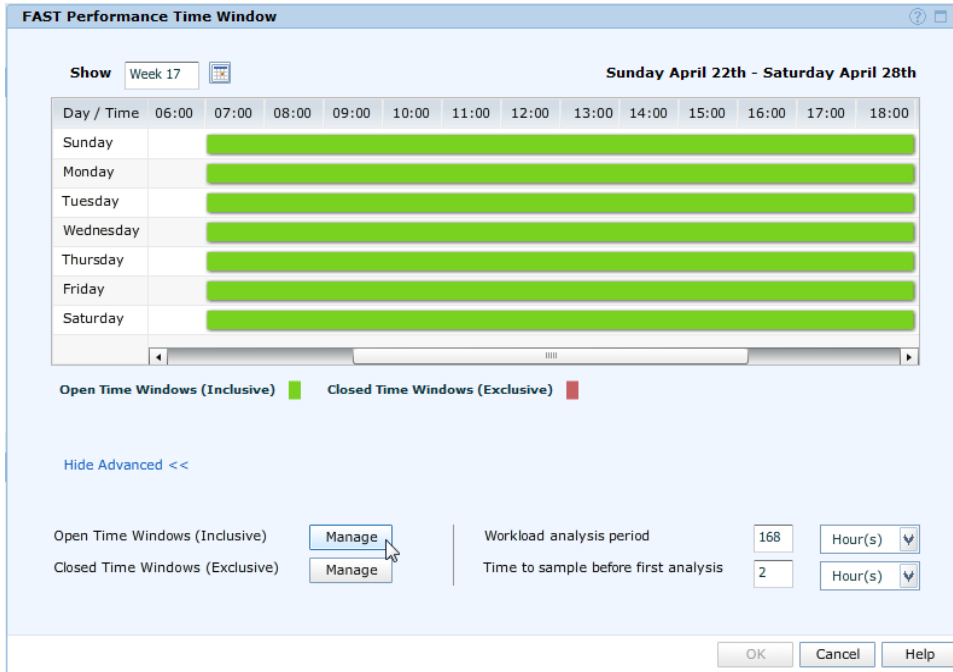
The resulting dialog box shows a graphical summary of the currently defined performance windows. A green bar indicates an inclusive time window has been defined. A red bar indicates when an exclusive time window has been defined, and white space where no time window exists.

Note: The time window is reported as closed for any exclusive time-window definition, as well as where no explicit time window exists.

To manage the inclusive and exclusive time windows, click **Show Advanced** in the lower left-most corner of the dialog box.

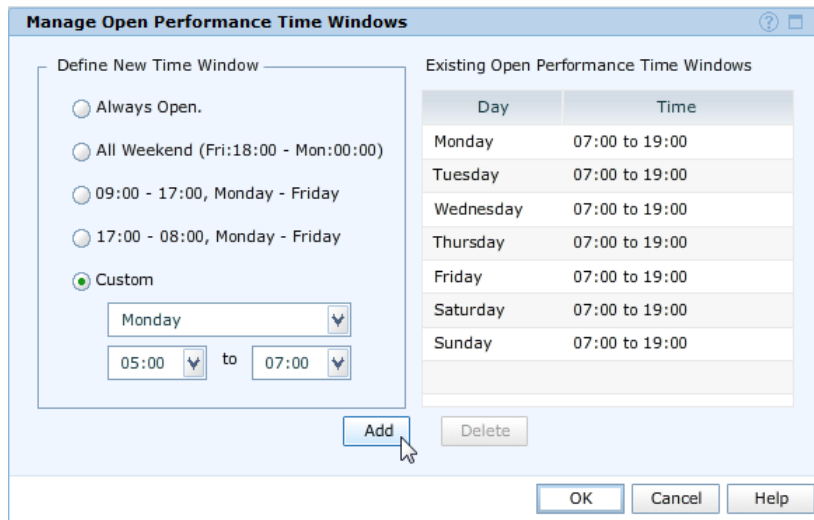
Editing inclusive performance time windows

To edit inclusive time windows, click **Manage** to the right of **Open Time Windows (Inclusive)**.

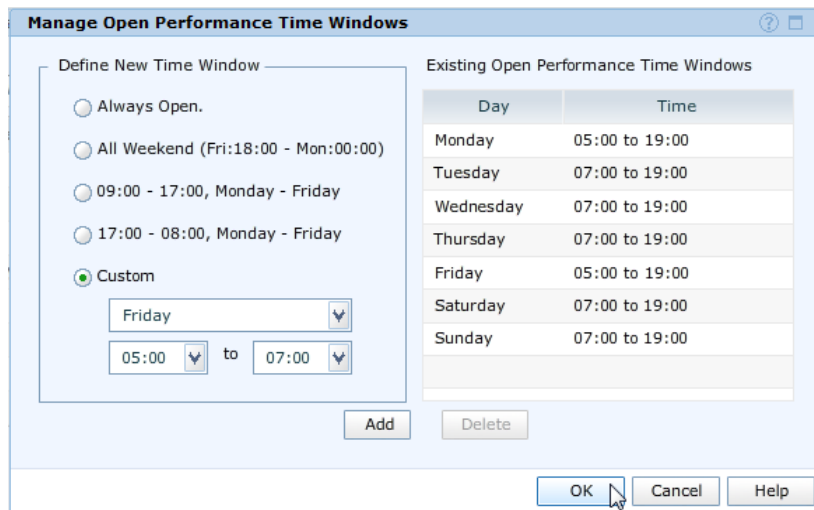


The resulting dialog box shows a text summary of the existing inclusive windows for each day of the week. It also provides several defaults for defining new windows and a custom option.

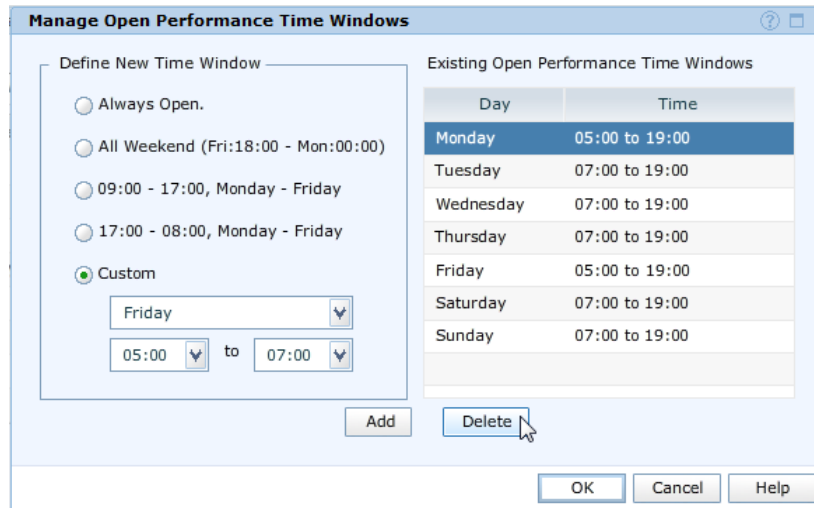
Select the desired option by choosing the appropriate radio button. If **Custom** is selected, choose the appropriate day of the week from the drop-down list, and then the desired start time and end time. To create the window, click **Add**.



When all edits have been made, click **OK** to commit the changes.

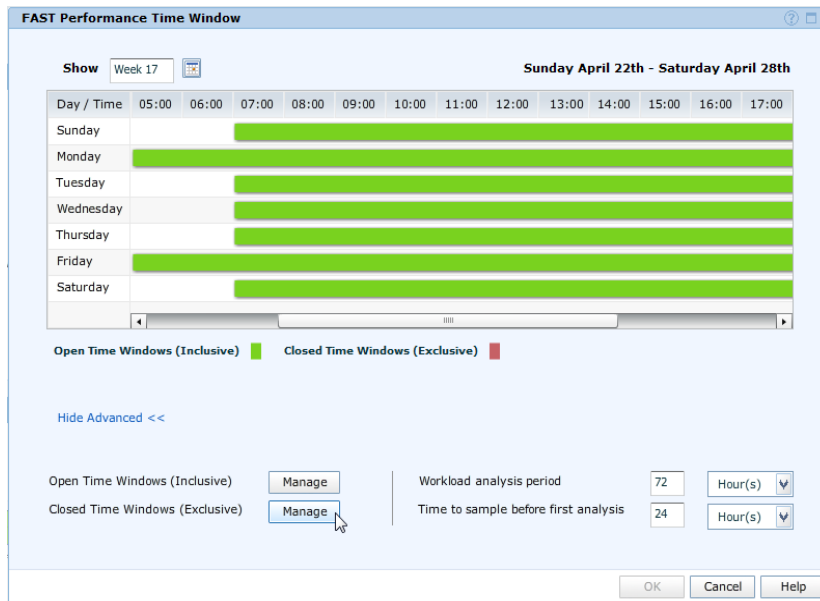


To delete an existing window, select the appropriate entry on the right-most side of the dialog box, and then click **Delete**.



Editing exclusive performance time windows

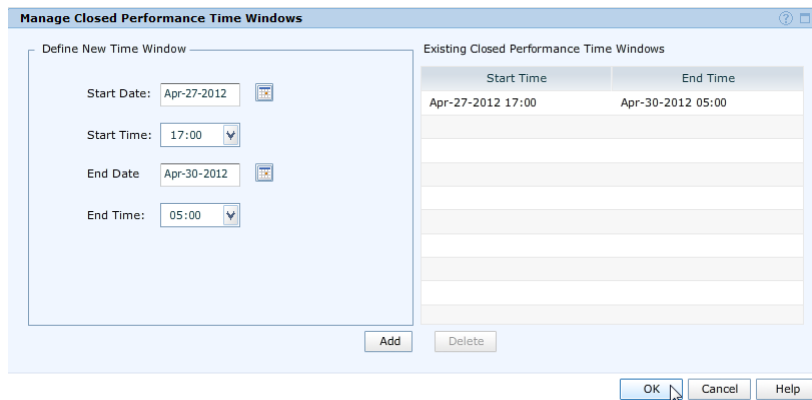
To edit exclusive time windows, click **Manage** to the right of **Closed Time Windows (Exclusive)**.



The resulting dialog box shows a text summary of the existing exclusive windows.

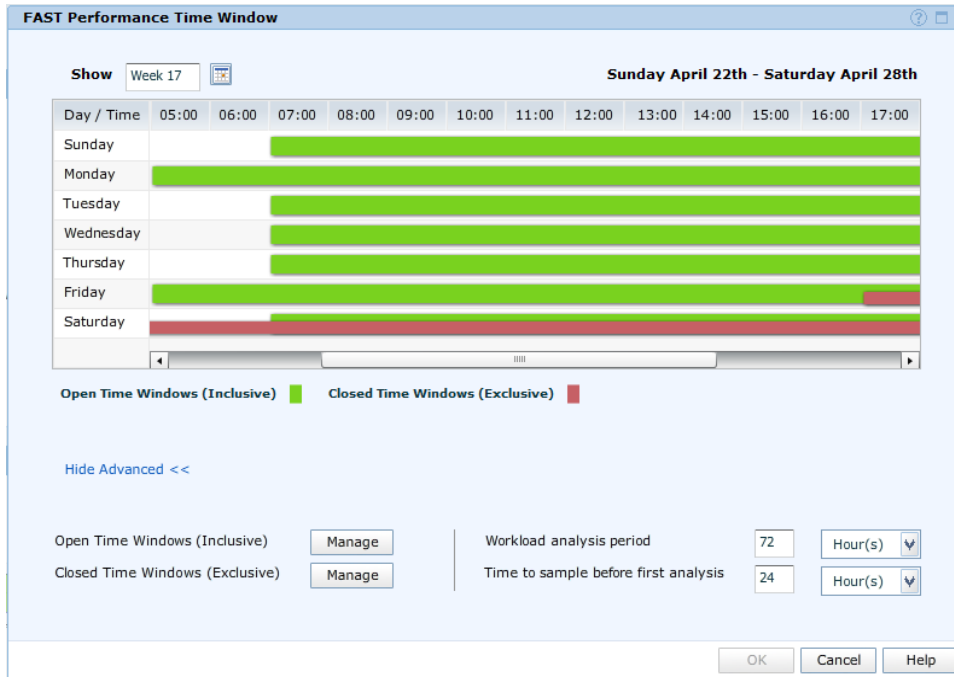
Select the desired start date and time, and end date and time, using the available drop-down lists and calendar icons. To create the window, click **Add**.

When all exclusive windows have been created, click **OK**.



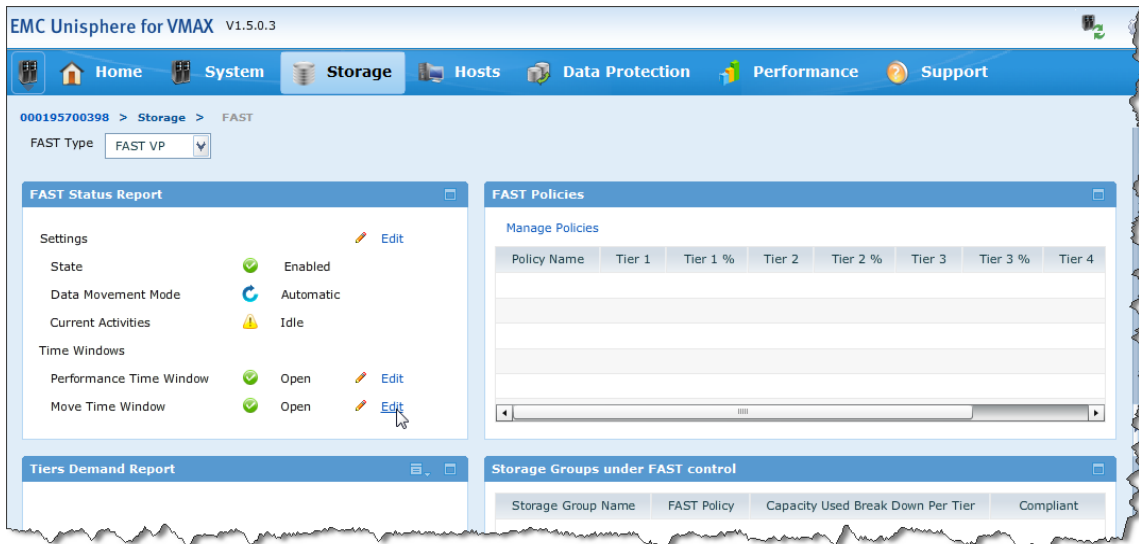
Performance Time Window summary

After all windows have been edited, the performance time-window display looks like this.



Managing enhanced FAST VP data-movement time windows

To manage the data movement time windows used by FAST VP, click **Edit** to the right of **Move Time Window** in the **FAST Status Report** panel of the **FAST** subsection page.



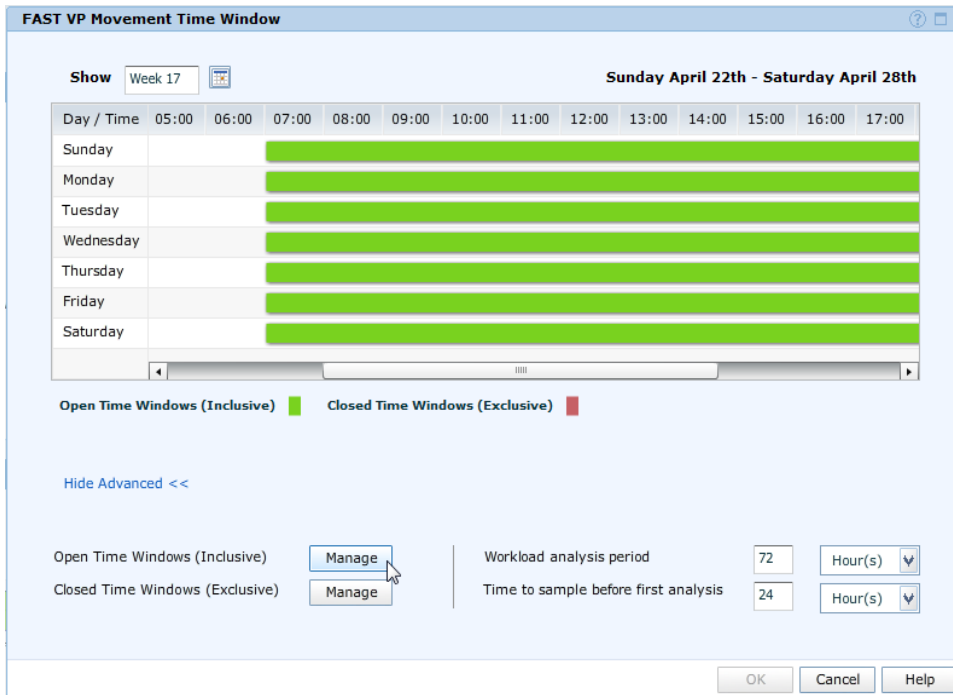
The resulting dialog box shows a graphical summary of the currently defined performance window. A green bar indicates an inclusive time window has been defined. A red bar indicates when an exclusive time window has been defined, and white space where no time window exists.

Note: The time window is reported as closed for any exclusive time-window definition, as well as where no explicit time window exists.

To manage the inclusive and exclusive time windows, click **Show Advanced** in the lower left-most corner of the dialog box.

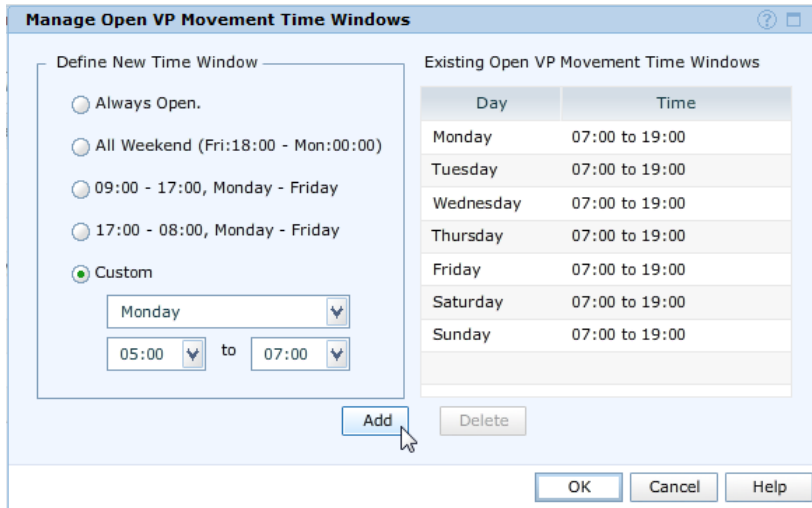
Editing inclusive movement time windows

To edit inclusive movement time windows, click **Manage** to the right of **Open Time Windows (Inclusive)**.

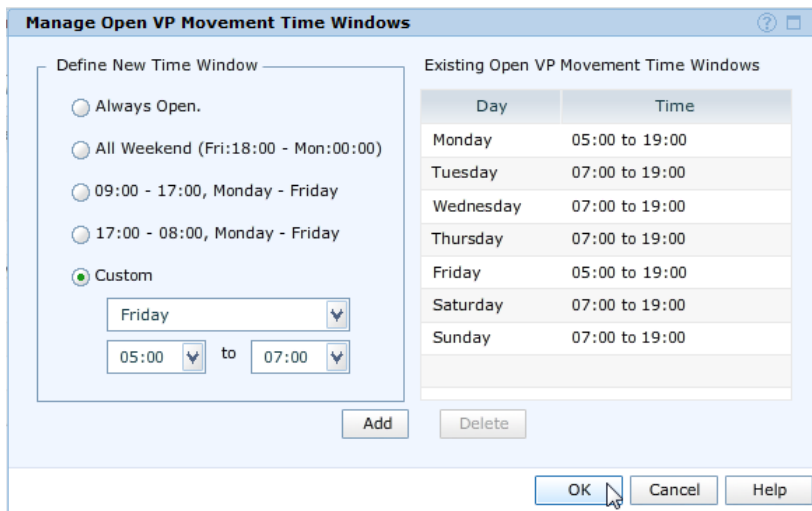


The resulting dialog box shows a text summary of the existing inclusive windows for each day of the week. It also provides several defaults for defining new windows, as well as a custom option.

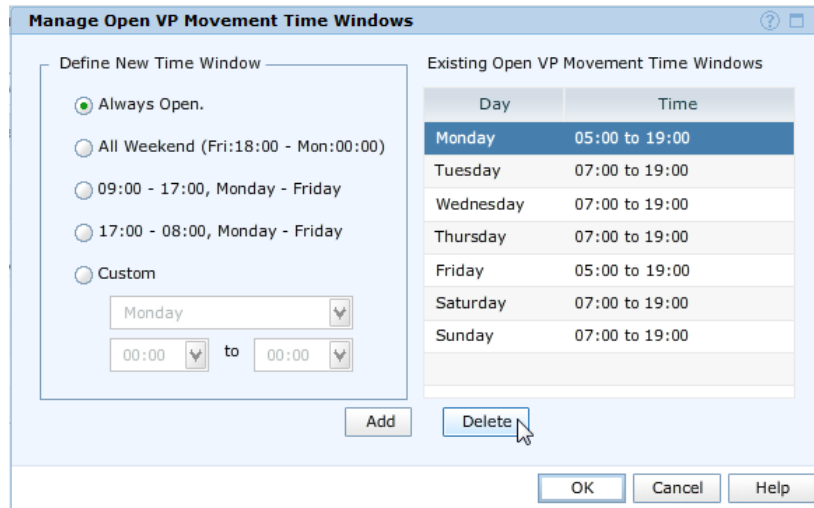
Choose the desired option by selecting the appropriate radio button. If **Custom** is selected, choose the appropriate day of the week from the drop-down list, and then the desired start time and end time. To create the window, click **Add**.



When all edits have been made, click **OK** to commit the changes.

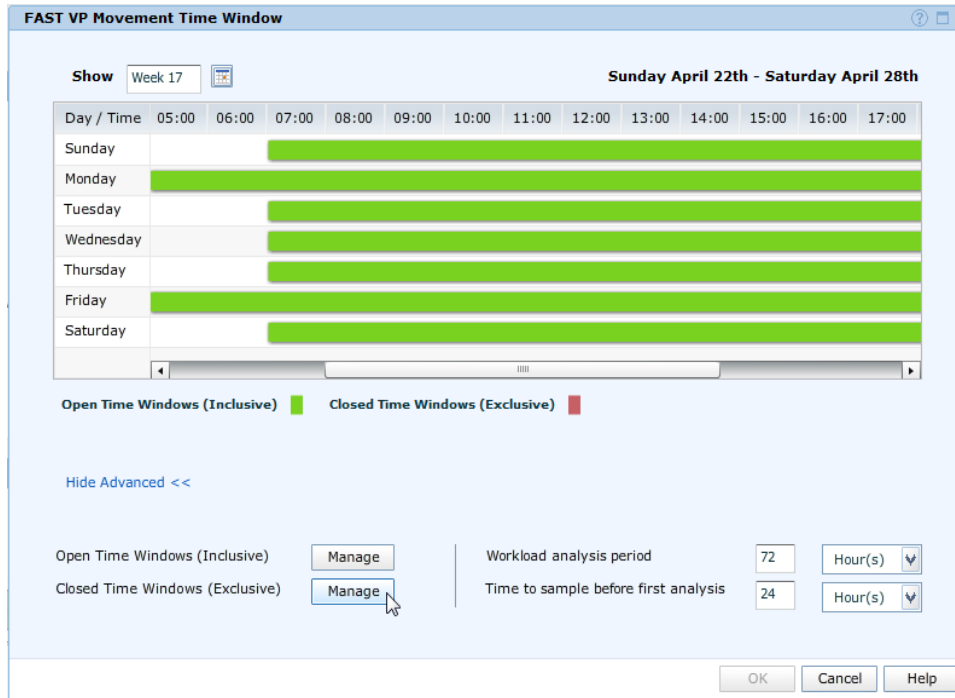


To delete an existing window, select the appropriate entry on the right-most side of the dialog box, and then click **Delete**.



Editing exclusive movement time windows

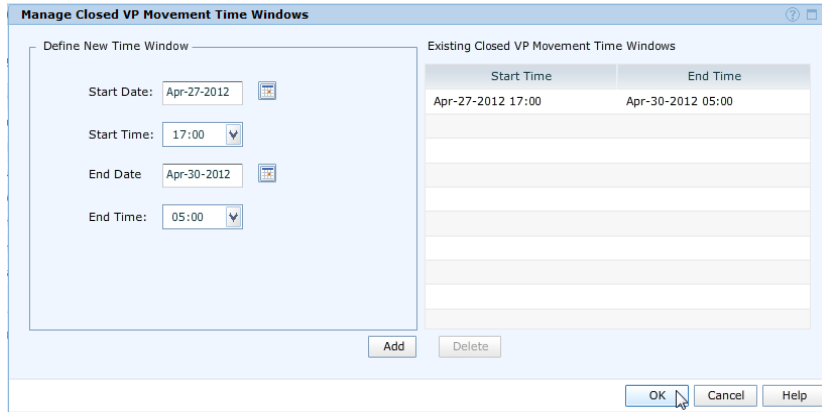
To edit exclusive time windows, click **Manage** to the right of **Closed Time Windows (Exclusive)**.



The resulting dialog box shows a text summary of the existing exclusive windows.

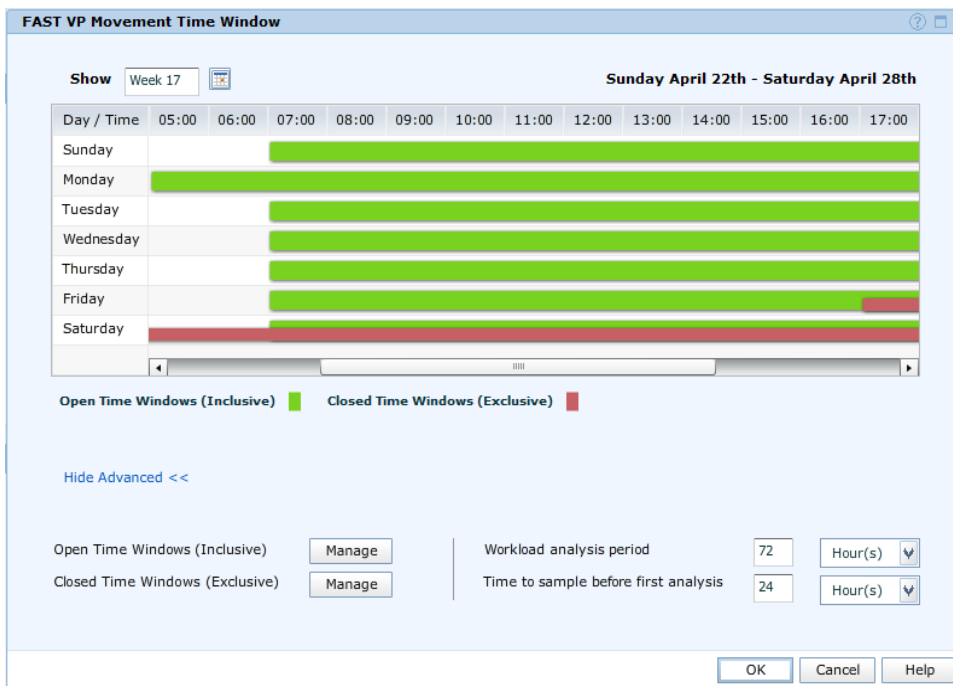
Select the desired start date and time, and end date and time, using the available drop-down lists and calendar icons. To create the window, click **Add**.

When all exclusive windows have been created, click **OK**.



Movement Time Window summary

After all windows have been edited, the Movement Time Window display looks like this.



Creating FAST managed objects

There are three managed objects related to the use of FAST VP in the Symmetrix VMAX Family arrays. These are:

- ◆ Symmetrix VP tiers
- ◆ FAST policies
- ◆ Storage groups

When created, storage groups can be associated with a FAST policy, which in turn associates the devices in the storage group with up to three VP tiers. The FAST policy also defines the upper usage limit for the storage group in each tier.

The following sections detail the Unisphere interfaces used to create each of the managed objects, and the methods for associating them. Information is also shown for removing these associations, and removing each of the objects.

Creating a Symmetrix VP tier

A Symmetrix VP tier may contain between one and four Virtual Provisioning thin pools. When creating a VP tier the following information must be known:

- ◆ The tier name
- ◆ The desired protection type of the tier
- ◆ The drive technology, or location, to be used for the tier
- ◆ The thin pools to be added to the tier

Once you decide on information, the tier can be created.

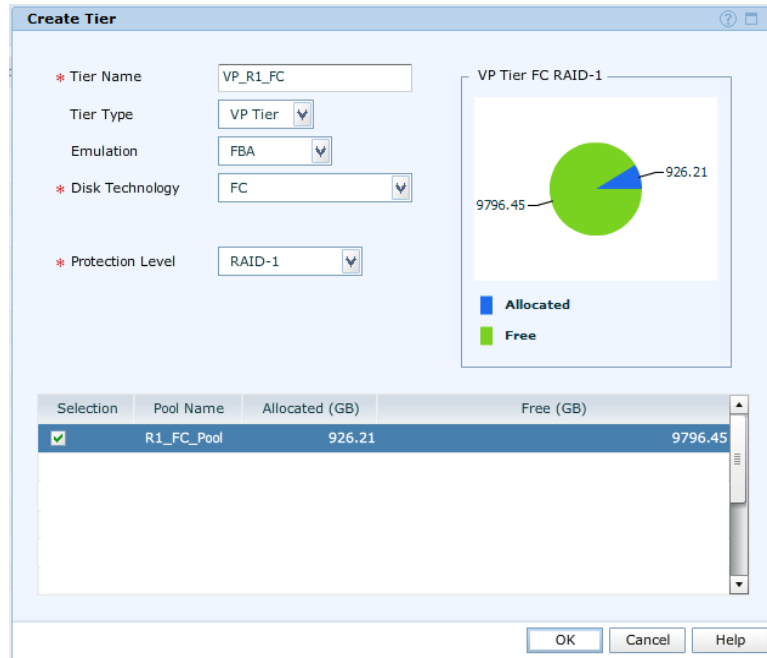
Creating an internal tier

To create an internal tier, go to the **Tiers** subsection page under **Storage**, and click **Create**.



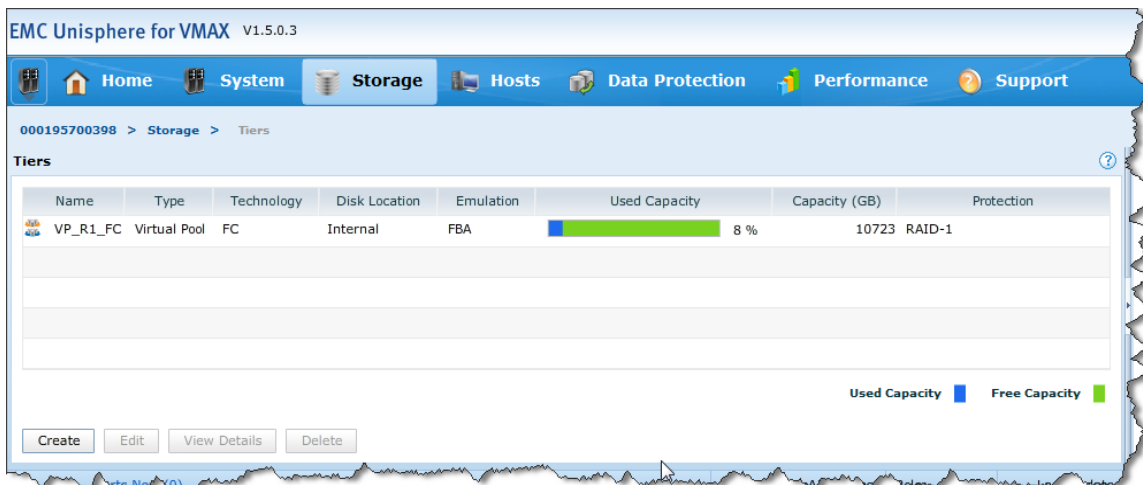
In the resulting dialog box, you may fill out the fields as desired, however, make sure that you specify the location as **Internal** and the tier type as **VP Tier**.

The list of available pools is filtered as the emulation, disk technology, and protection level is specified.

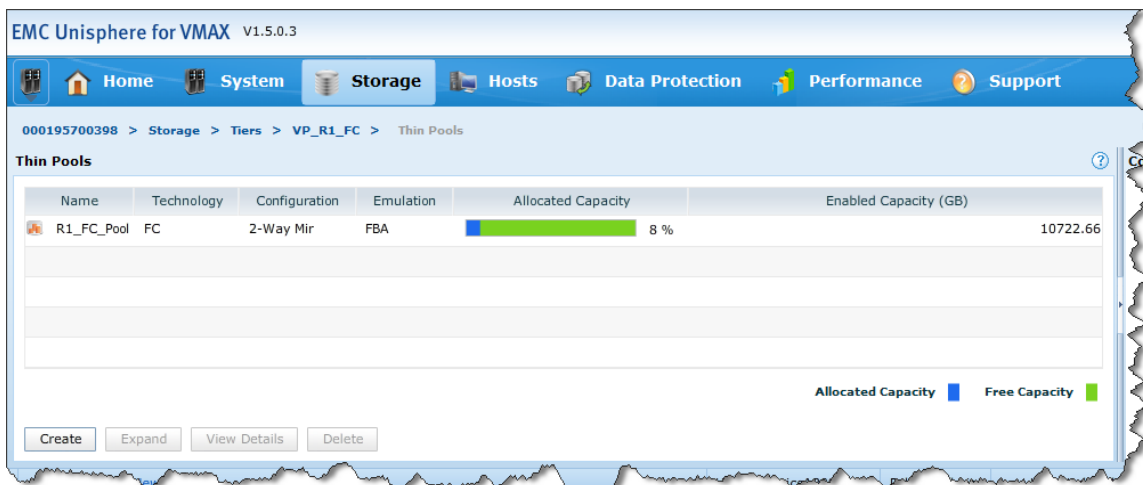


After selecting the pool, or pools, to be added to the tier, click **OK** to create the tier on the array. In this case, a tier containing the R1_FC_Pool pool, which contains RAID 1 data devices configured on Fiber Channel (FC) drives, is created. The Symmetrix tier name was chosen to indicate the RAID protection type (RAID 1), the drive type (FC), and the fact that it is a VP tier, VP_R1_FC.

Once created, the information on the Symmetrix tier can be seen on the Tiers subsection page.



The thin pool information for the tier can be viewed by double-clicking the tier name, then clicking the **Thin Pools** related object link.

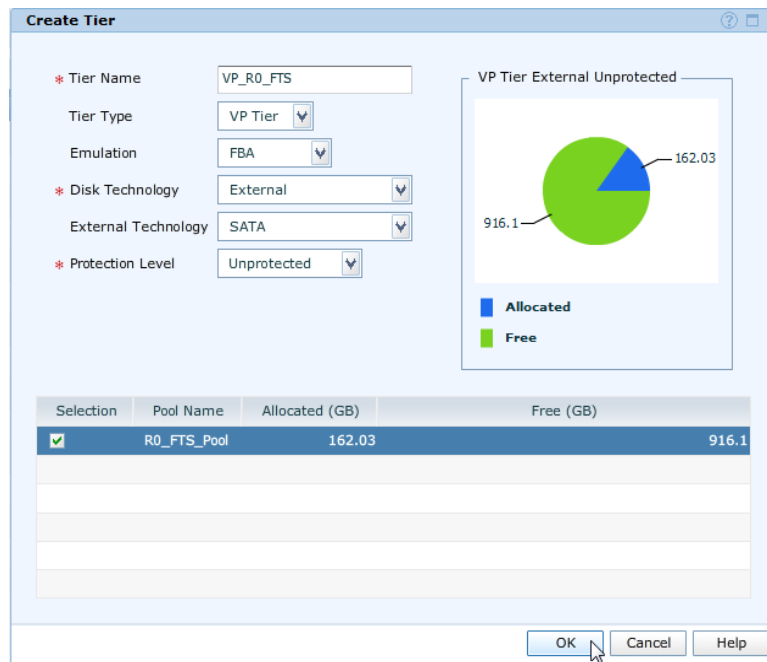


Creating an external tier

To create an external tier, click **Create** on the **Tiers** subsection page under **Storage**.

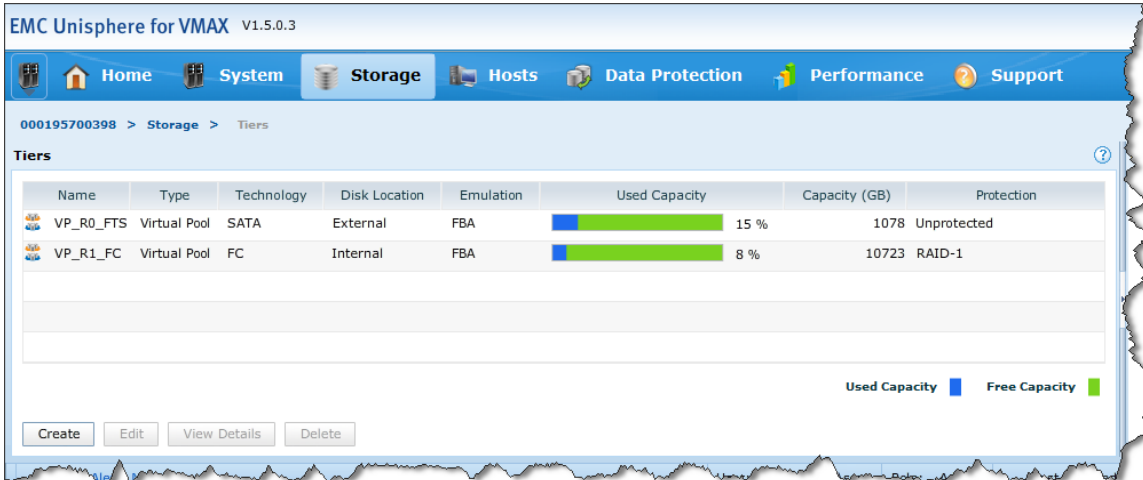
In the resulting dialog box, you may complete the fields as desired, however, make sure that you specify the disk technology as **External**. The list of available external pools is displayed.

Note: When the disk technology field is set to external, an external technology field will be displayed. Choose the appropriate technology based on the performance expectations for the external tier.

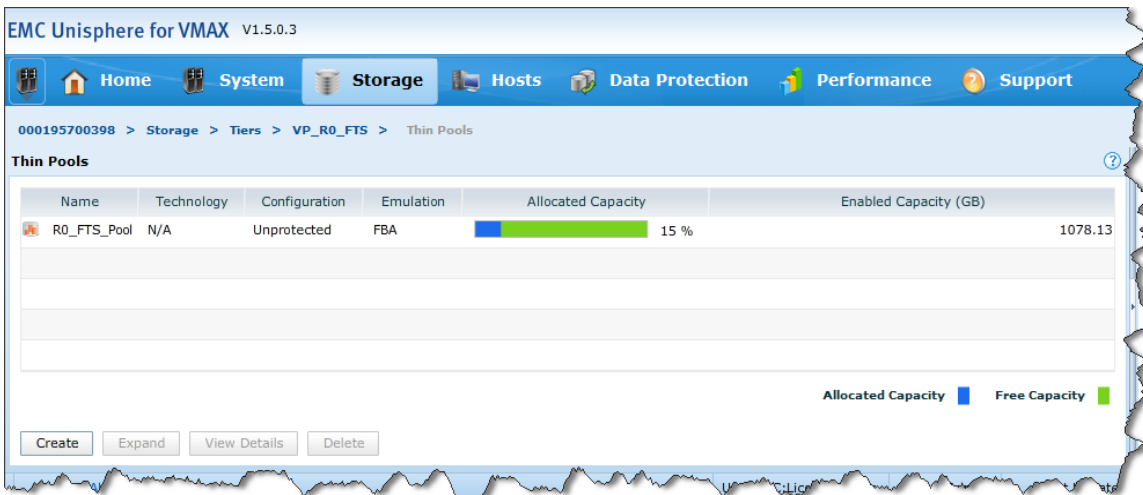


After selecting the pool, or pools, to be added to the tier, click **OK** to create the tier on the array. In this case, a tier containing the R0_FTS_Pool pool, which contains locally unprotected data devices configured on an external array, is created. The Symmetrix tier name was chosen to indicate the RAID protection type (RAID 0), the location (FTS), and the fact that it is a VP tier, VP_R0_FTS.

Once created, the information on the Symmetrix tier can be seen on the Tiers subsection page.



The thin pool information for the tier can be viewed by double-clicking the tier name, then clicking the **Thin Pools** related object link.



Modifying an external tier

It is possible to change the technology type associated with an external tier in order to change the performance expectations of that tier. However, to do so leads to the tier's ranking being changed in any policy it is included in.

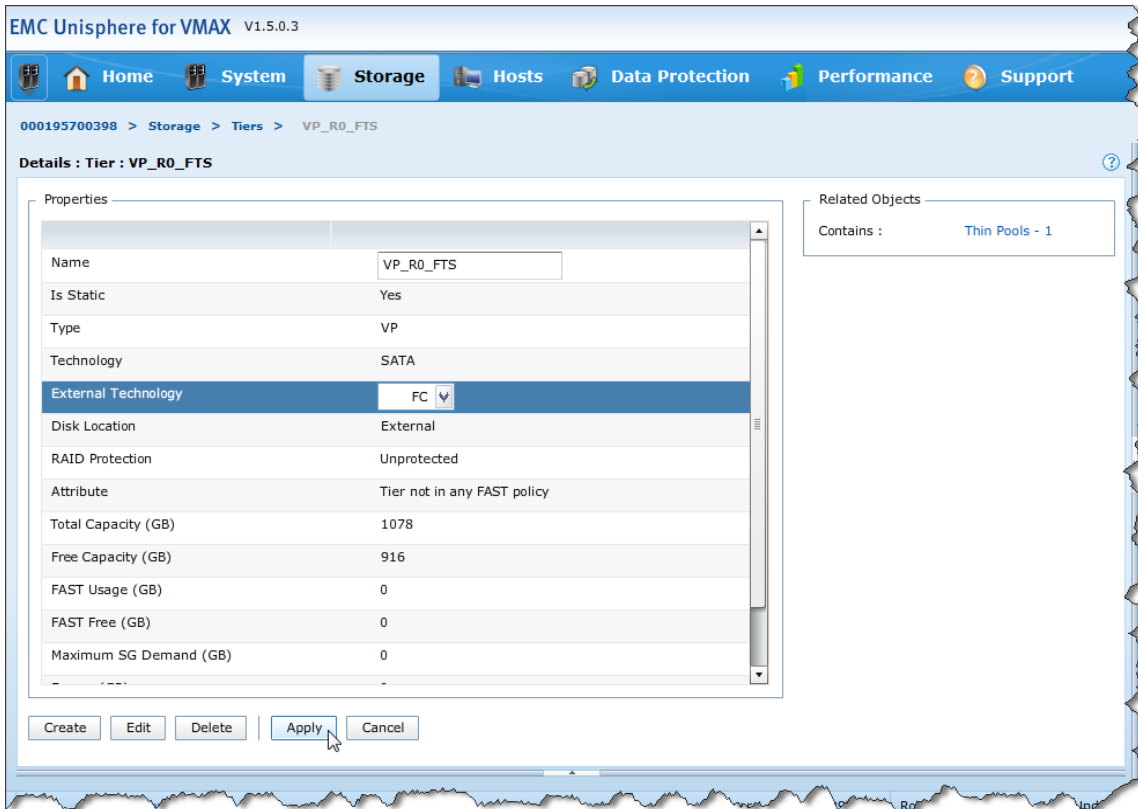
To change the technology type of an external tier, in this example to FC, highlight the tier, and click **View Details**.

The screenshot shows the EMC Unisphere for VMAX V1.5.0.3 interface. The navigation bar includes Home, System, Storage, Hosts, Data Protection, Performance, and Support. The breadcrumb trail is 000195700398 > Storage > Tiers. The Tiers page displays a table with the following data:

Name	Type	Technology	Disk Location	Emulation	Used Capacity	Capacity (GB)	Protection
VP_R0_FTS	Virtual Pool	SATA	External	FBA	15 %	1078	Unprotected
VP_R1_FC	Virtual Pool	FC	Internal	FBA	8 %	10723	RAID-1

At the bottom of the table, there are buttons for Create, Edit, View Details, and Delete. A legend indicates that blue represents Used Capacity and green represents Free Capacity.

On the **Tiers** subsection page, change the value using the drop-down list to the right of **External Technology**, then click **Apply**.



Note: The technology type of an external tier may be changed in order to raise or lower the performance expectations of the tier.

Symmetrix tier list information

After additional VP tiers have been created, information on all the VP tiers in the Symmetrix array can be viewed on the Tiers subsection page.

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > Tiers

Tiers

Name	Type	Technology	Disk Location	Emulation	Used Capacity	Capacity (GB)	Protection
VP_R0_FTS	Virtual Pool	SATA	External	FBA	15 %	1078	Unprotected
VP_R1_FC	Virtual Pool	FC	Internal	FBA	8 %	10723	RAID-1
VP_R53_EFD	Virtual Pool	EFD	Internal	FBA	3 %	4395	RAID-5(3+1)
VP_R6_SATA	Virtual Pool	SATA	Internal	FBA	9 %	10240	RAID-6(6+2)

Used Capacity Free Capacity

Create Edit View Details Delete

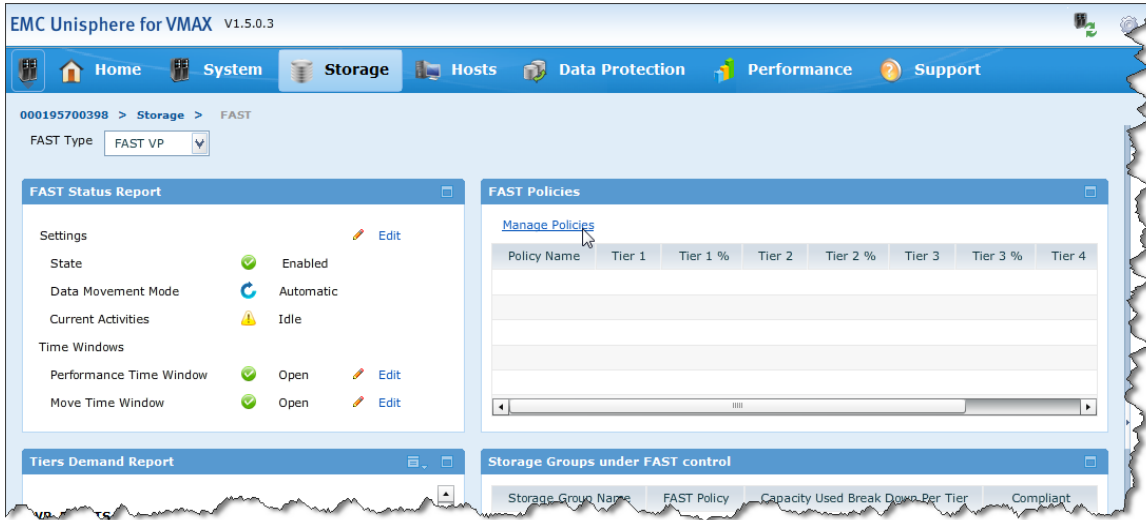
Creating a Symmetrix FAST policy

A FAST policy defines the upper usage limits for up to three tiers for any storage groups associated with the policy.

When creating a FAST policy, the following information must be known:

- ◆ The FAST policy name
- ◆ The VP tiers (maximum of three) to be used in the policy
- ◆ The upper usage limits for each of the VP tiers being added

Once you decide on the information, the FAST policy can be created by first clicking **Manage Policies** on the **FAST** subsection page under **Storage**.



Then click **Create** on the **Manage Policies** related objects page.



In this example, a policy called System_Optimization is created. This policy allows up to 100 percent of the logical capacity of any associated storage groups to be moved to any of the tiers within the policy (in this case, an EFD tier, a FC tier, and a SATA tier).

The policy is created when you click **OK**.

Once created, the information on the policy can be seen on the Manage Policies page.

Policy Name	Tier 1	Tier 1 %	Tier 2	Tier 2 %	Tier 3	Tier 3 %	Tier4	Tier4 %	# Associated Storage Groups
System_Optimization	VP_R53_EFD	100	VP_R1_FC	100	VP_R6_SATA	100	N/A	0	0

FAST policy list information

After additional policies have been created, information on all FAST policies in the Symmetrix array can be viewed on either the Manage Policies page or the FAST subsection page.

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > FAST > Manage Policies

FAST Policies

Policy Name	Tier 1	Tier 1 %	Tier 2	Tier 2 %	Tier 3	Tier 3 %	Tier4	Tier4 %	# Associated Storage Grou
Custom	VP_R53_EFD	10	VP_R1_FC	20	VP_R0_FTS	100	VP_R6_SATA	100	
No_EFD	VP_R1_FC	50	VP_R0_FTS	100	VP_R6_SATA	100	N/A	0	
System_Optimization	VP_R53_EFD	100	VP_R1_FC	100	VP_R6_SATA	100	N/A	0	

Create View Details Delete Associate Storage Groups

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > FAST

FAST Type: FAST VP

FAST Status Report

Settings

State: ✔ Enabled [Edit](#)

Data Movement Mode: ↻ Automatic

Current Activities: ⚠ Idle

Time Windows

Performance Time Window: ✔ Open [Edit](#)

Move Time Window: ✔ Open [Edit](#)

FAST Policies

Manage Policies

Policy Name	Tier 1	Tier 1 %	Tier 2	Tier 2 %	Tier 3	Tier 4
Custom	VP_R53_EFD	10	VP_R1_FC	20	VP_R0_FTS	VP_R6_SATA
No_EFD	VP_R1_FC	50	VP_R0_FTS	100	VP_R6_SATA	
System_Optimization	VP_R53_EFD	100	VP_R1_FC	100	VP_R6_SATA	

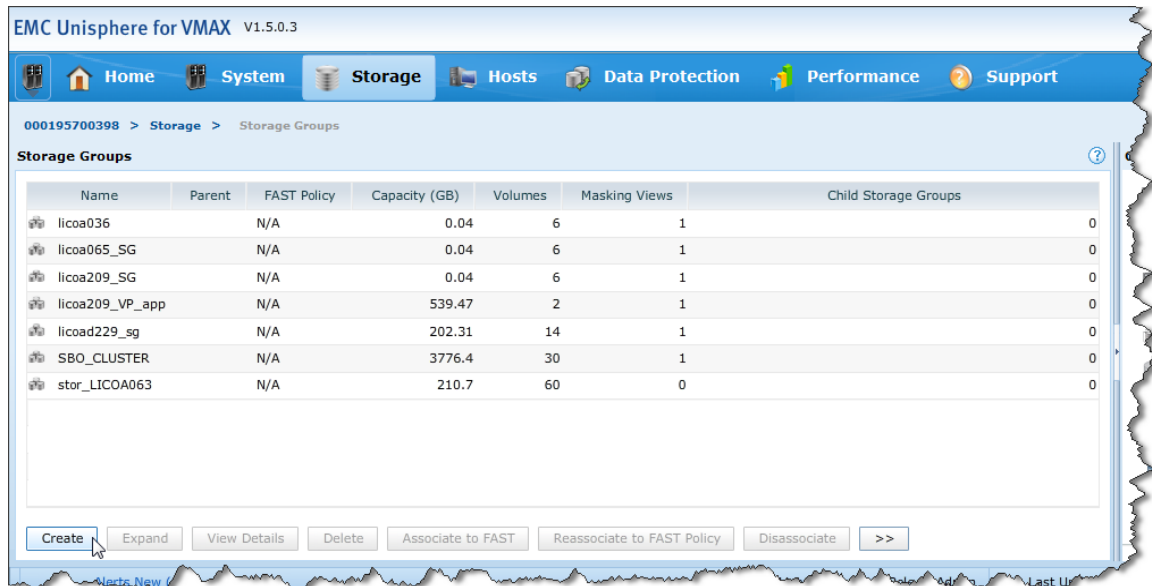
Tiers Demand Report Storage Groups under FAST control

Creating a Symmetrix storage group

A storage group logically combines Symmetrix devices to be managed together. When creating a storage group, the following information must be known:

- ♦ The storage group name

- ◆ The Symmetrix devices to be added to the group
- Once you decide on the information, the storage group is created by clicking **Create** on the **Storage Groups** subsection page under **Storage**.



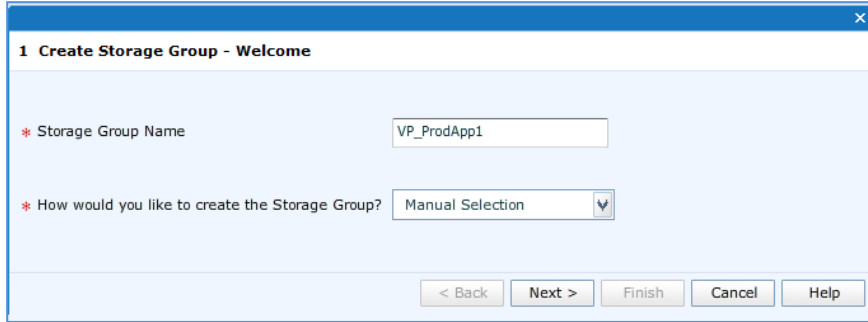
This launches the storage group creation wizard.

On the first page of the wizard, enter a storage group, and choose the method by which the devices to be added are to be selected.

Choices for device selection include:

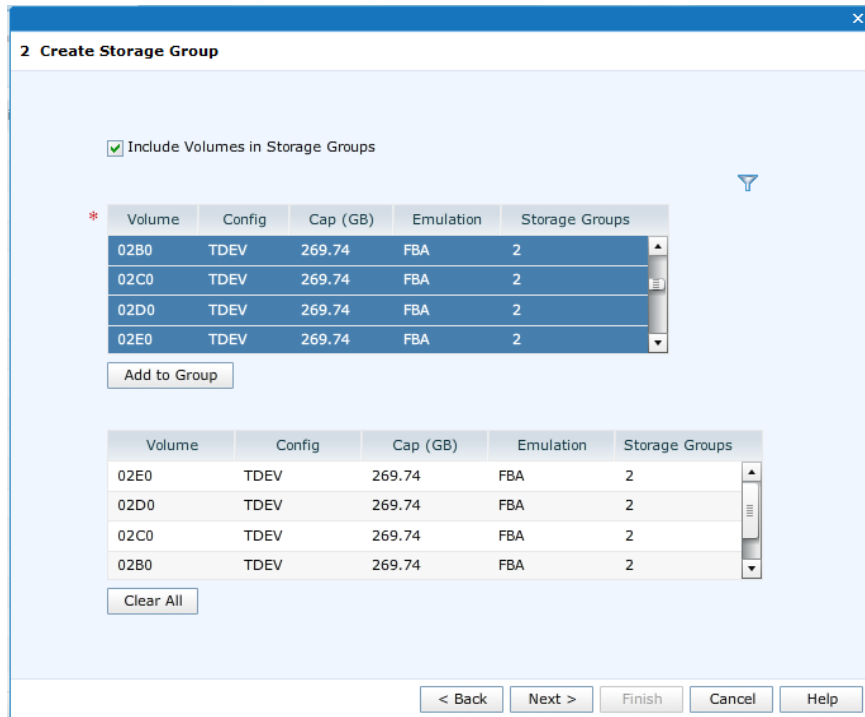
- ◆ Regular Volumes
- ◆ Virtual Volumes
- ◆ Template
- ◆ Manual Selection
- ◆ Cascaded Storage Group

The first two selections result in new devices being created and added to the group. The Template option allows storage to be selected or created based on a user-defined template. The Manual Selection option allows already existing devices to be chosen and added to the group. Selecting Cascaded Storage Group allows the addition of child storage groups, containing devices, to the parent storage group.

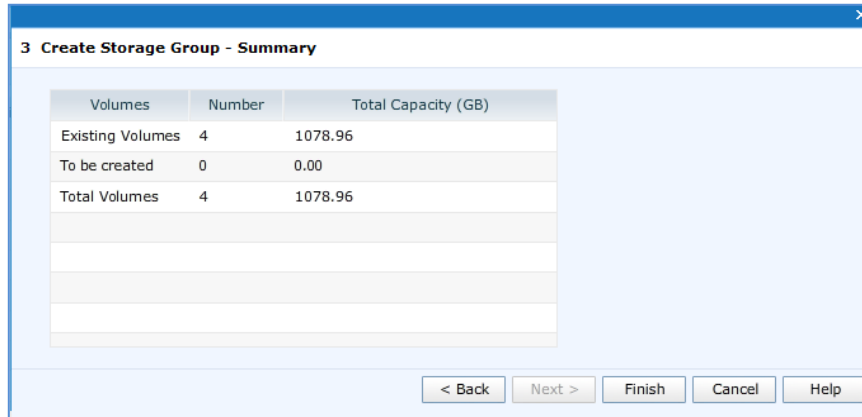


After choosing the selection method, in this case Manual Selection, click **Next**.

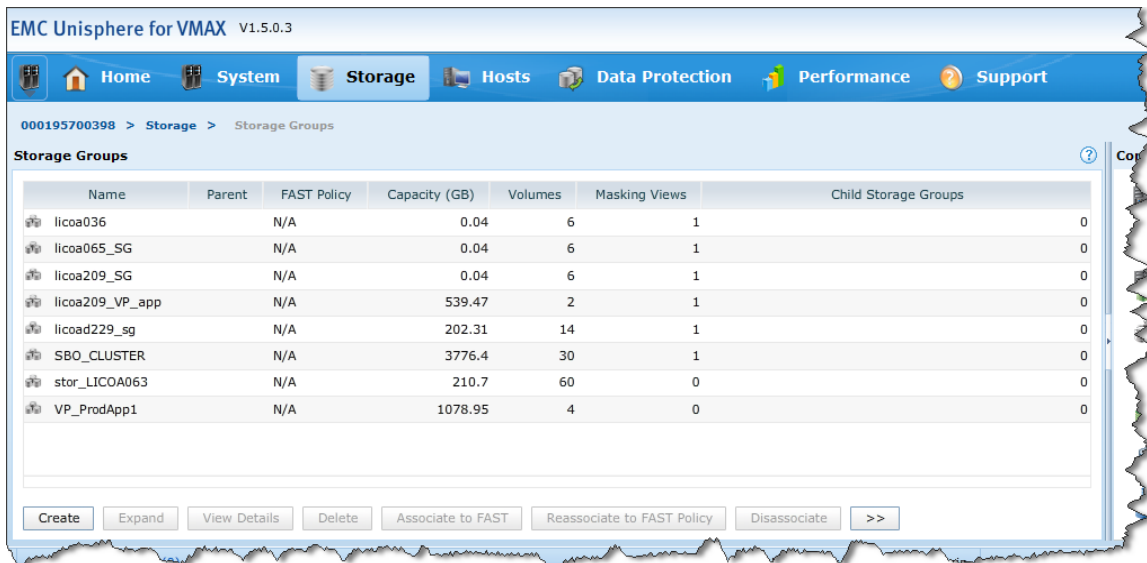
On the second screen of the wizard, after selecting the appropriate devices, click **Add to Group**, and then click **Next**.



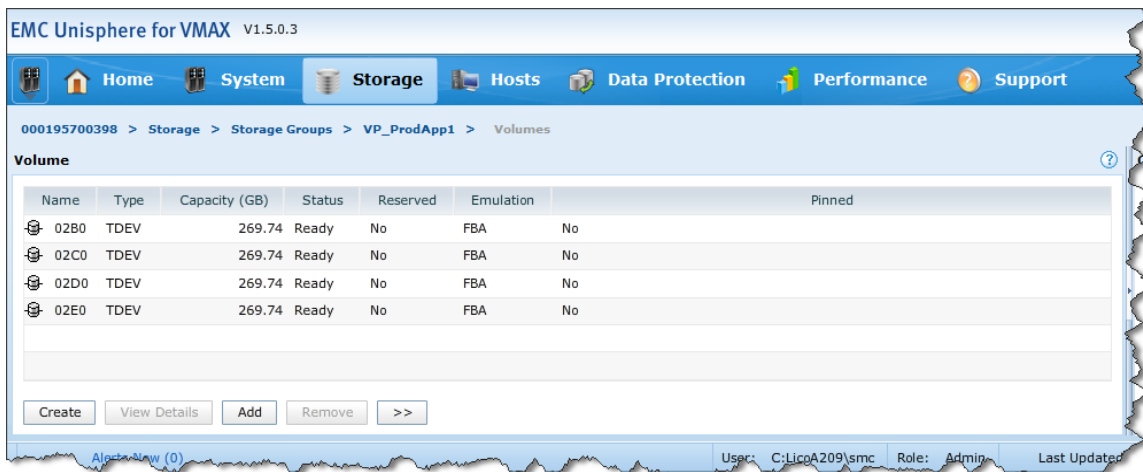
The final screen of the wizard provides a summary of the group being created and the devices being added. Click **Finish** to create the group.



Information on the created storage group can be displayed on the Storage Groups subsection page.



To verify that the correct devices were added to the storage group, double-click the storage group name, and click the **Volumes** related object link.



Storage group list information

After additional storage groups have been created, information on all storage groups in the Symmetrix array can be viewed on the Storage Groups subsection page.

Information provided in this display includes:

- ◆ The names of all created storage groups
- ◆ The number of devices in each storage group
- ◆ The name of the FAST policy the group is associated with (if any)
- ◆ The number of masking views the storage group is included in

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > Storage Groups

Storage Groups

Name	Parent	FAST Policy	Capacity (GB)	Volumes	Masking Views	Child Storage Groups
licoa036		N/A	0.04	6	1	0
licoa065_SG		N/A	0.04	6	1	0
licoa209_SG		N/A	0.04	6	1	0
licoa209_VP_app		N/A	539.47	2	1	0
licoad229_sg		N/A	202.31	14	1	0
SBO_CLUSTER		N/A	3776.4	30	1	0
stor_LICOA063		N/A	210.7	60	0	0
VP_Development		N/A	539.47	2	0	0
VP_ProdApp1		N/A	1078.95	4	0	0
VP_ProdApp2		N/A	1078.95	4	0	0

Alerts New (0) User: C:\LicoA209\smc Role: Admin Last Update

Associating a storage group with a FAST VP policy

Associating a storage group with a FAST VP policy brings the devices in the storage group under FAST VP control. All devices in the storage group are considered candidates to have data moved between the tiers included in the policy the storage group is associated with.

When creating a FAST policy association, the following information must be known:

- ◆ The FAST policy name
- ◆ The storage group name

Once you decide on the information, the association is performed by first selecting the appropriate storage group on the **Storage Groups** subsection page, then clicking **Associate to FAST**.

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > Storage Groups

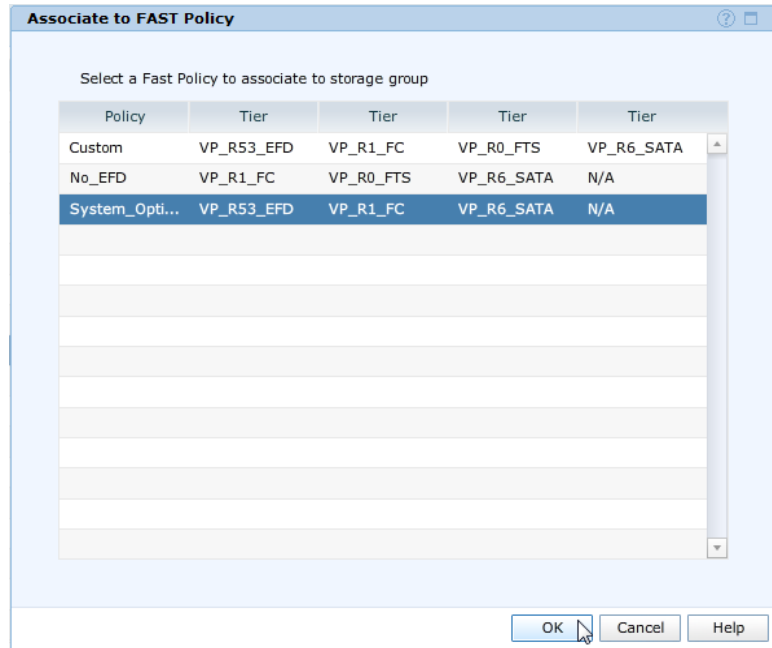
Storage Groups

Name	Parent	FAST Policy	Capacity (GB)	Volumes	Masking Views	Child Storage Groups
licoa036		N/A	0.04	6	1	0
licoa065_SG		N/A	0.04	6	1	0
licoa209_SG		N/A	0.04	6	1	0
licoa209_VP_app		N/A	539.47	2	1	0
licoad229_sg		N/A	202.31	14	1	0
SBO_CLUSTER		N/A	3776.4	30	1	0
stor_LICOA063		N/A	210.7	60	0	0
VP_Development		N/A	539.47	2	0	0
VP_ProdApp1		N/A	1078.95	4	0	0
VP_ProdApp2		N/A	1078.95	4	0	0

Create Expand View Details Delete Associate to FAST Reassociate to FAST Policy Disassociate >>

Alerts New (0) User: C:\LicoA209\smc Role: Admin Last Updated:

In the resulting dialog box, choose the desired FAST policy, and click **OK**.



Note: Storage groups are associated to the policy with a default value of 2. The following section describes how to modify a storage group priority within a FAST policy.

To verify the successful association of the storage group to the FAST policy, return to the **Storage Groups** subsection page.

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > Storage Groups

Storage Groups

Name	Parent	FAST Policy	Capacity (GB)	Volumes	Masking Views	Child Storage Groups
licoa036		N/A	0.04	6	1	0
licoa065_SG		N/A	0.04	6	1	0
licoa209_SG		N/A	0.04	6	1	0
licoa209_VP_app		N/A	539.47	2	1	0
licoad229_sg		N/A	202.31	14	1	0
SBO_CLUSTER		N/A	3776.4	30	1	0
stor_LICOA063		N/A	210.7	60	0	0
VP_Development		N/A	539.47	2	0	0
VP_ProdApp1		System_Optimization	1078.95	4	0	0
VP_ProdApp2		N/A	1078.95	4	0	0

Alerts New (0) User: C:\LicoA209\smc Role: Admin Last Updated

When additional associations have been made, all storage group associations can be viewed on the Storage Groups subsection page.

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > Storage Groups

Storage Groups

Name	Parent	FAST Policy	Capacity (GB)	Volumes	Masking Views	Child Storage Groups
licoa036		N/A	0.04	6	1	0
licoa065_SG		N/A	0.04	6	1	0
licoa209_SG		N/A	0.04	6	1	0
licoa209_VP_app		N/A	539.47	2	1	0
licoad229_sg		N/A	202.31	14	1	0
SBO_CLUSTER		N/A	3776.4	30	1	0
stor_LICOA063		N/A	210.7	60	0	0
VP_Development		No_EFD	539.47	2	0	0
VP_ProdApp1		System_Optimization	1078.95	4	0	0
VP_ProdApp2		Custom	1078.95	4	0	0

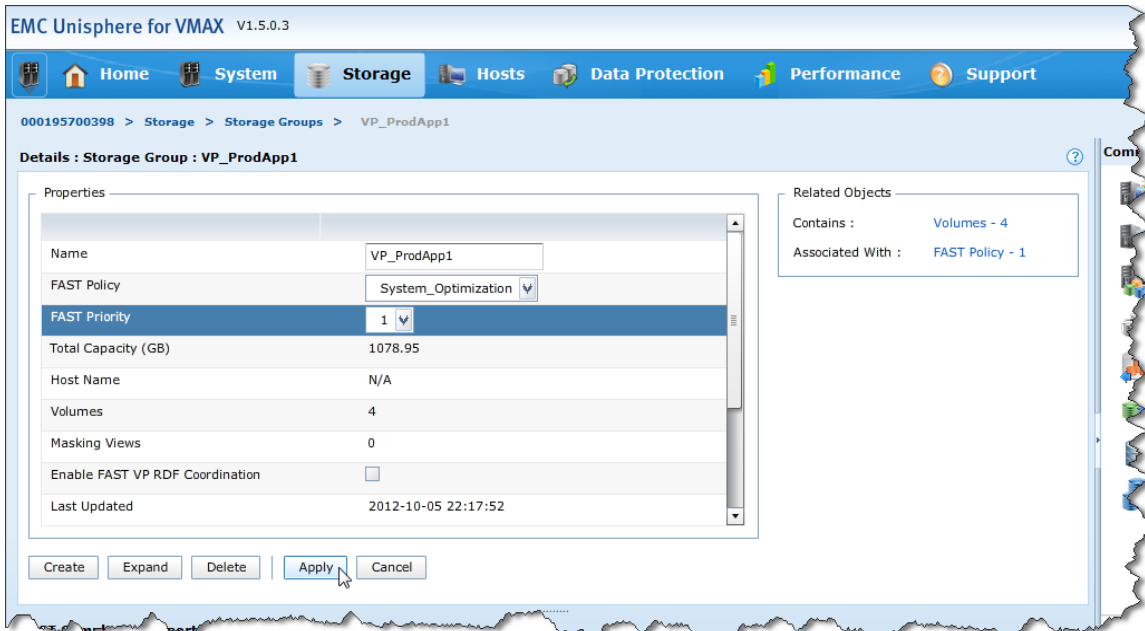
Create Expand View Details Delete Associate to FAST Reassociate to FAST Policy Disassociate >>

Alerts New (0) User: C:\LicoA209\smc Role: Admin Last Updated: F

Modifying a storage group's priority in a FAST policy

When a storage group is associated to a FAST policy in Unisphere, it is added with a default priority of 2. After the association is complete, the priority can be raised to 1 or lowered to 3.

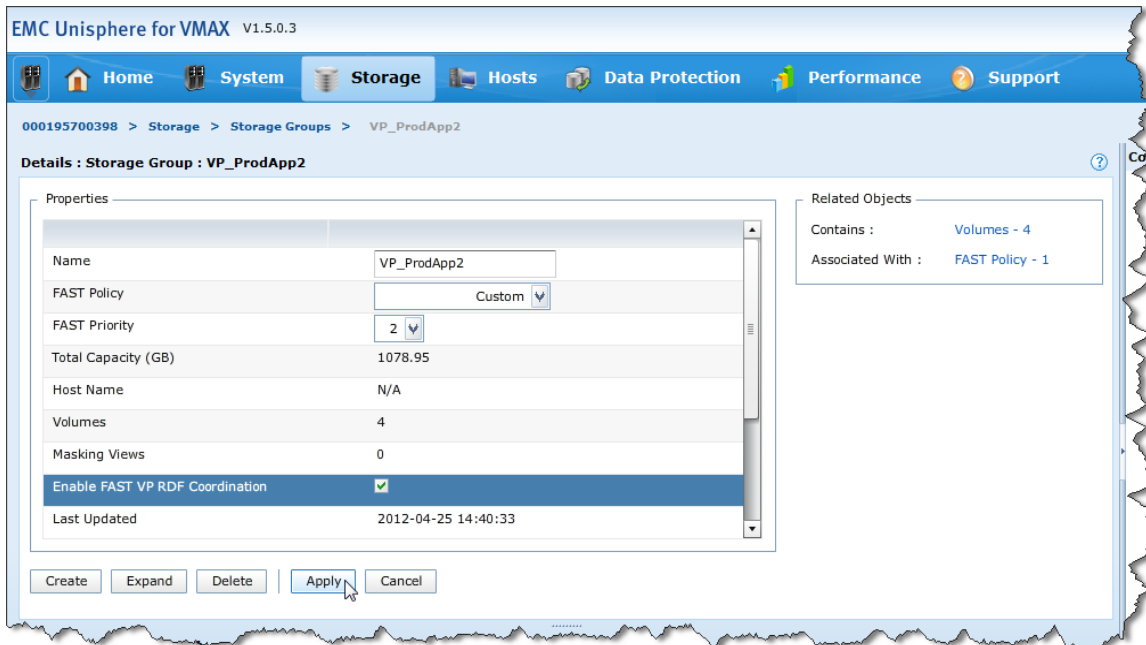
To modify the storage group's priority, double-click the storage group's name on the **Storage Group** subsection page. Change the value using the drop-down list to the right of **FAST Priority**, then click **Apply**.



Enabling/disabling SRDF coordination

By default, SRDF® coordination is disabled for any storage group associated with a FAST policy. SRDF coordination may be enabled, however, after the group has been associated.

To enable SRDF coordination during association, double-click the storage group's name on the **Storage Group** subsection page. Select the checkbox to the right of **Enable FAST VP RDF Coordination**, and then click **Apply**.



Reassociating a storage group to a different FAST VP policy

To move a storage group from one FAST policy to another, select the storage group on the **Storage Groups** subsection page, and then click **Reassociate to FAST Policy**.

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > Storage Groups

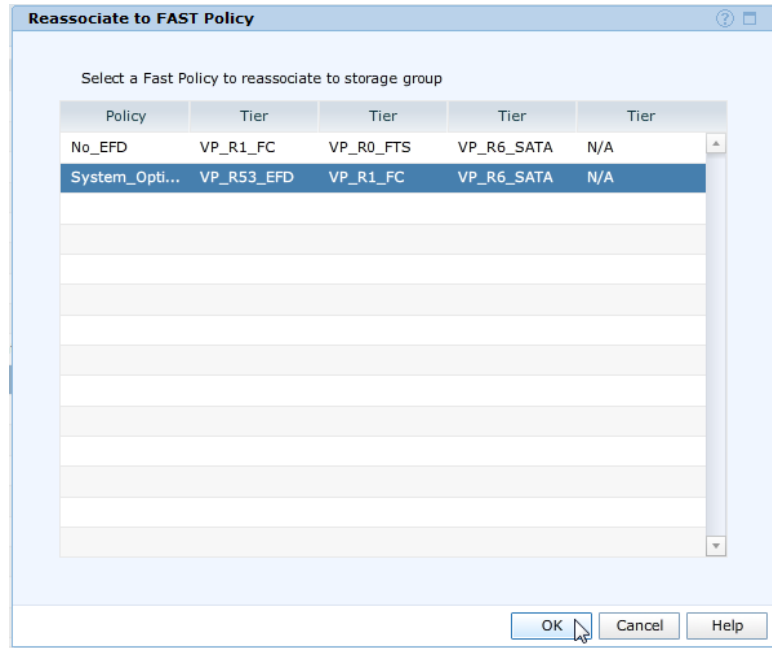
Storage Groups

Name	Parent	FAST Policy	Capacity (GB)	Volumes	Masking Views	Child Storage Groups
licoa036		N/A	0.04	6	1	0
licoa065_SG		N/A	0.04	6	1	0
licoa209_SG		N/A	0.04	6	1	0
licoa209_VP_app		N/A	539.47	2	1	0
licoad229_sg		N/A	202.31	14	1	0
SBO_CLUSTER		N/A	3776.4	30	1	0
stor_LICOA063		N/A	210.7	60	0	0
VP_Development		No_EFD	539.47	2	0	0
VP_ProdApp1		System_Optimization	1078.95	4	0	0
VP_ProdApp2		Custom	1078.95	4	0	0

Create Expand View Details Delete Associate to FAST Reassociate to FAST Policy Disassociate >>

Alerts New (0) User: C:LicoA209\smc Role: Admin Last Updated

In the resulting dialog box, choose the new policy the group is to be associated with, and click **OK**.



To verify the successful reassociation of the storage group to the FAST policy, go to the **Storage Groups** subsection page under **Storage**.

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

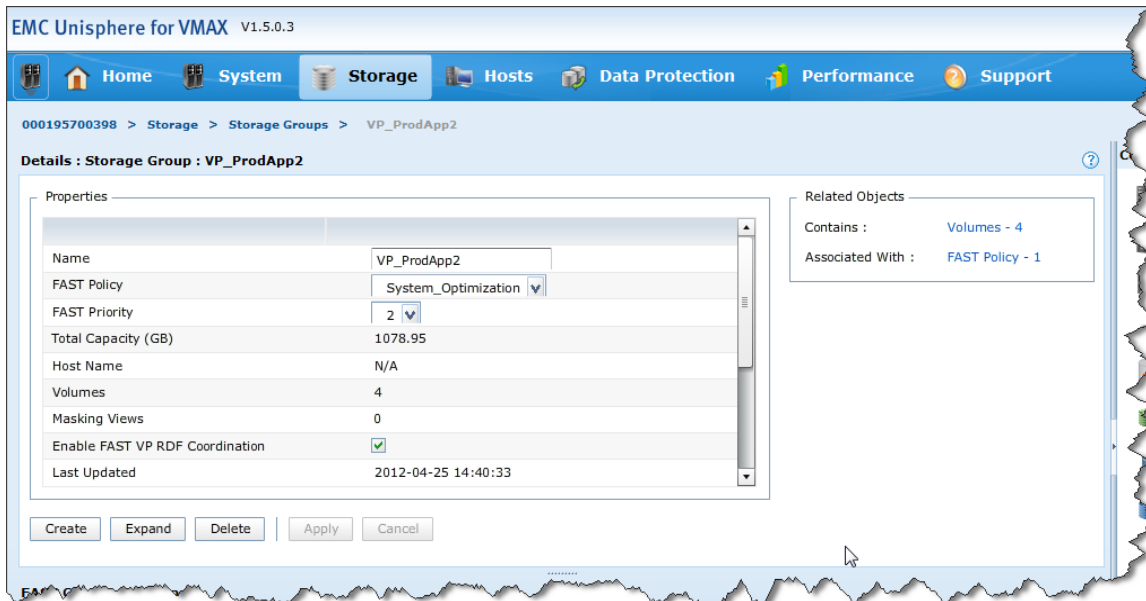
000195700398 > Storage > Storage Groups

Storage Groups

Name	Parent	FAST Policy	Capacity (GB)	Volumes	Masking Views	Child Storage Groups
licoa036		N/A	0.04	6	1	0
licoa065_SG		N/A	0.04	6	1	0
licoa209_SG		N/A	0.04	6	1	0
licoa209_VP_app		N/A	539.47	2	1	0
licoad229_sg		N/A	202.31	14	1	0
SBO_CLUSTER		N/A	3776.4	30	1	0
stor_LICOA063		N/A	210.7	60	0	0
VP_Development		No_EFD	539.47	2	0	0
VP_ProdApp1		System_Optimization	1078.95	4	0	0
VP_ProdApp2		System_Optimization	1078.95	4	0	0

Alerts New (0) C:\licoa209\smc Role: Admin Last Updated:

By viewing the details of the reassociated storage group, you can confirm that the priority and SRDF coordination attributes remained the same during the reassociation.

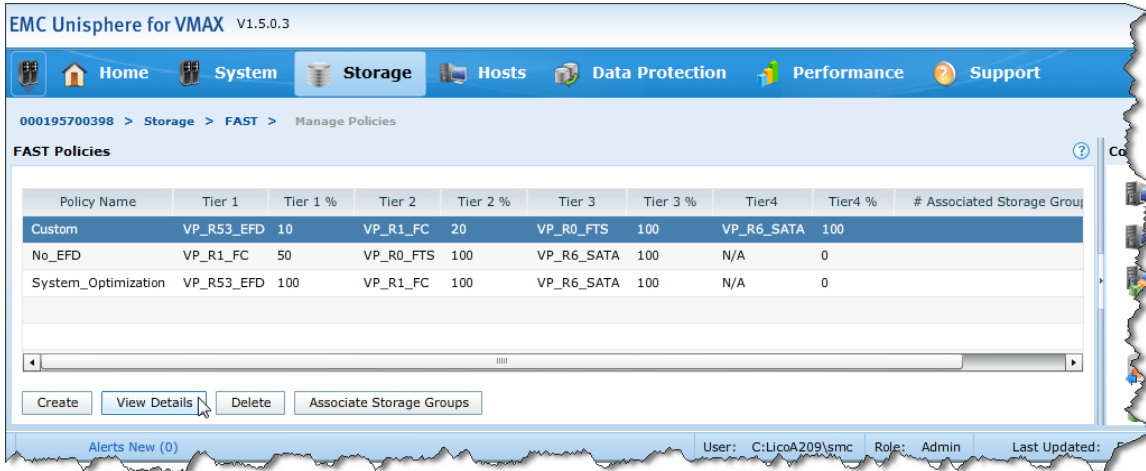


Modifying a Symmetrix tier in a FAST policy

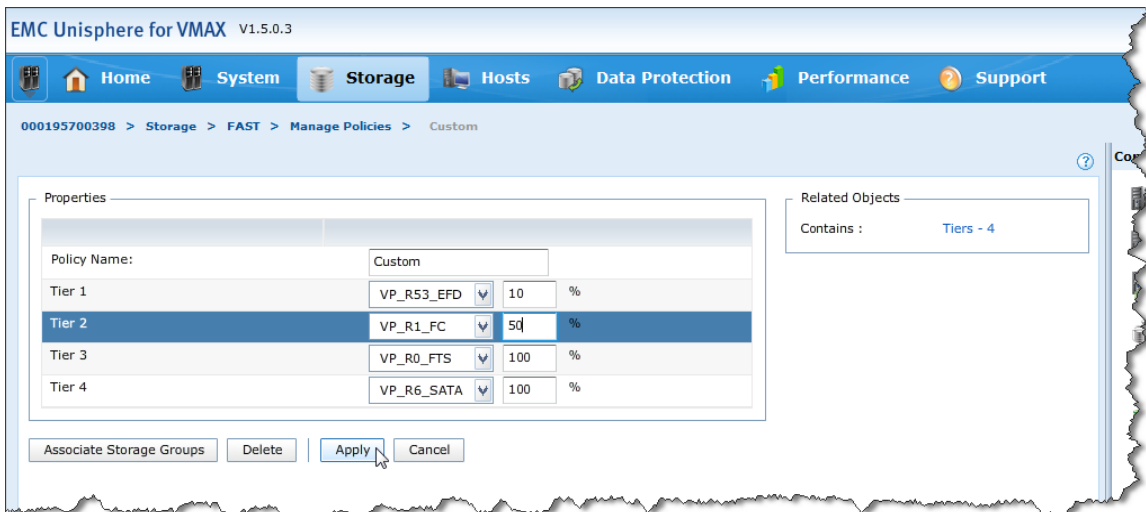
After some time, it may be determined that the upper usage limit of a particular tier within a FAST policy needs to be adjusted. This can be done dynamically in Unisphere.

If any storage groups are associated with the policy being modified, the change in the usage limit cannot cause the sum of the usage limits for all tiers in the policy to fall below 100 percent. In this case, the Custom policy is modified.

To modify the usage limit for a Symmetrix tier within a policy, select the policy on the **Manage Policies** page, and click **View Details**.



On the resulting page, edit the percent value for the desired tier, and click **Apply**.



In this case the percentage of capacity allowed on the V_R1_FC tier was increased from 20 percent to 50 percent.

Verify the change on the **Manage Policies** page.

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > FAST > Manage Policies

FAST Policies

Policy Name	Tier 1	Tier 1 %	Tier 2	Tier 2 %	Tier 3	Tier 3 %	Tier 4	Tier 4 %	# Associated Storage Groups
Custom	VP_R53_EFD	10	VP_R1_FC	50	VP_R0_FTS	100	VP_R6_SATA	100	
No_EFD	VP_R1_FC	50	VP_R0_FTS	100	VP_R6_SATA	100	N/A	0	
System_Optimization	VP_R53_EFD	100	VP_R1_FC	100	VP_R6_SATA	100	N/A	0	

Create View Details Delete Associate Storage Groups

Alerts: None (0) User: C:\icoA709\spm Role: Admin Last Updated:

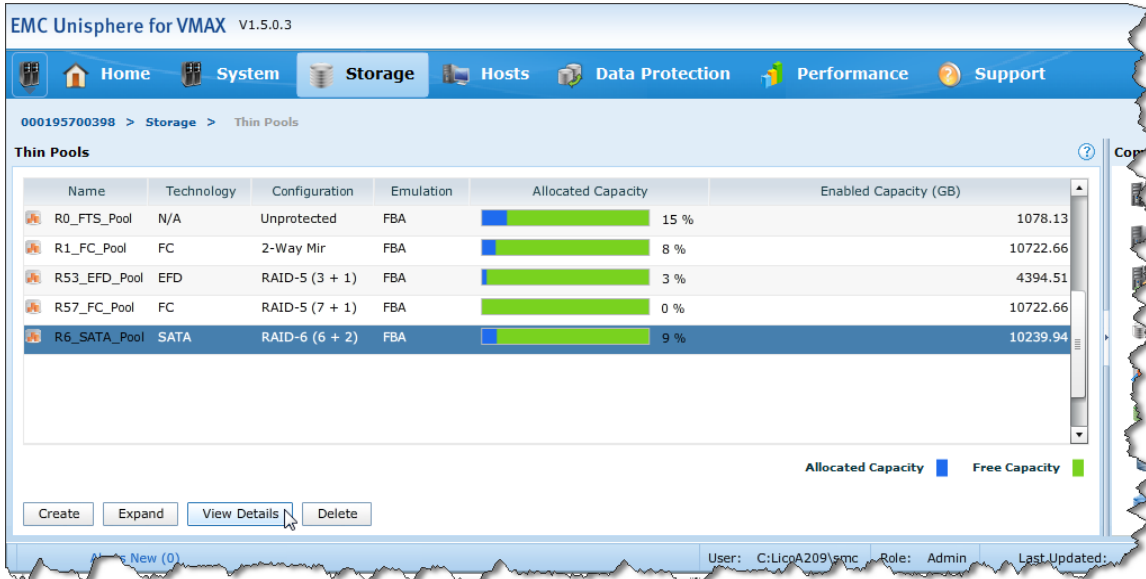
Enabling FAST VP compression

In order for FAST VP to automatically compress data, a FAST policy must include at least one tier that contains a thin pool that has been enabled for compression. Also, the FAST VP Time to Compress parameter should be set to a value in the range of 40 to 400 days.

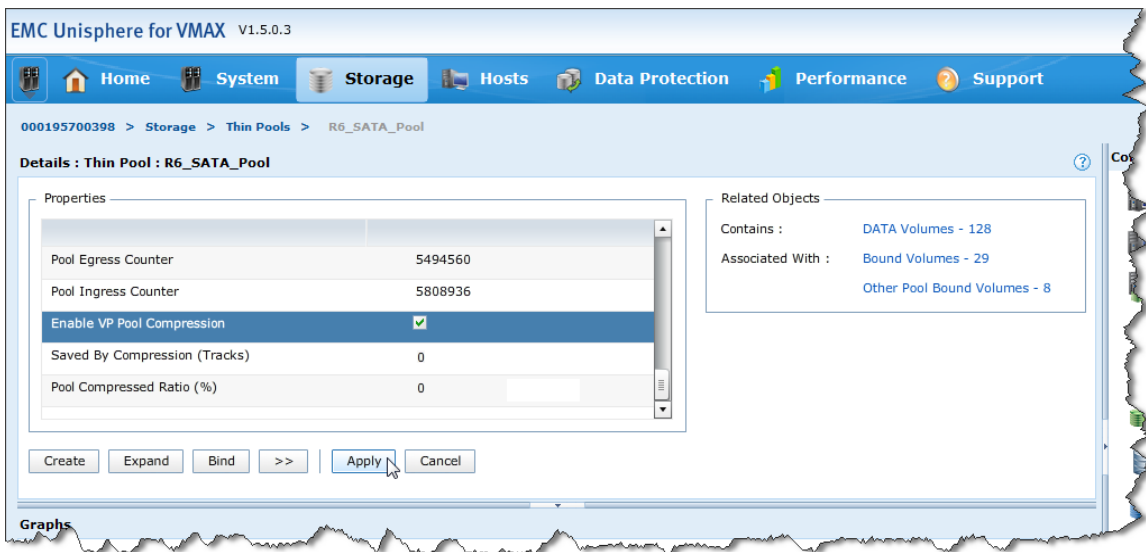
The following sections show how to enable compression on a pool, as well as identifying policies that are compression capable.

Enabling compression on a thin pool

To enable compression on a thin pool, select a pool on the **Thin Pools** subsection page, and click **View Details**.

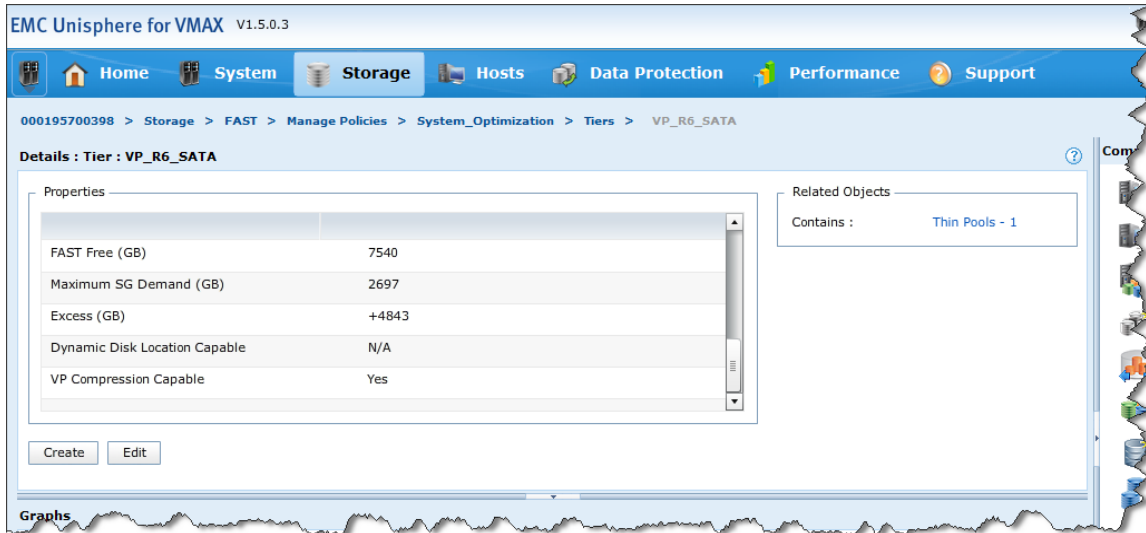


Under **Properties**, select the checkbox to the right of **Enable VP Pool Compression**, and click **Apply**.



Viewing a compression capable policy

To see if a tier in a policy is capable of compressing data, click **Manage Policies** on the **FAST** subsection page. Select a policy, and click **View Details**. Under **Related Objects**, select **Tiers**. Select a tier, and click **View Details**. Under **Properties**, **VP Compression Capable** indicates if the tier is capable of compressing data.



Controlling FAST device movement

Aside from using the FAST controller device movement window, there are several other ways of controlling when device movements can take place. These include:

- ◆ Disabling the FAST controller
- ◆ Pinning devices under FAST VP control
- ◆ Changing the data movement mode
- ◆ Modifying data-movement windows

Monitoring FAST VP status

The current status and current activity of FAST VP can be monitored in Unisphere by using the FAST status report on the FAST subsection page. Information provided by this report includes:

- ◆ The FAST VP state

- ◆ Degraded reason
- ◆ FAST VP Current Activities
- ◆ FAST VP Performance Time Window state
- ◆ FAST VP Move Time Window state

The screenshot displays the EMC Unisphere for VMAX V1.5.0.3 interface. The navigation bar includes Home, System, Storage, Hosts, Data Protection, Performance, and Support. The main content area is divided into four panels:

- FAST Status Report:** Shows settings for FAST VP. The State is Enabled (green checkmark), Data Movement Mode is Automatic (blue refresh icon), and Current Activities is Idle (yellow warning icon). Time Windows for Performance and Move are both Open (green checkmarks).
- FAST Policies:** A table listing policies and their tier configurations.

Policy Name	Tier 1	Tier 1 %	Tier 2	Tier 2 %	Tier 3	Tier 4
Custom	VP_R53_EFD	10	VP_R1_FC	50	VP_R0_FTS	
No_EFD	VP_R1_FC	50	VP_R0_FTS	100	VP_R6_SATA	
System_Optimization	VP_R53_EFD	100	VP_R1_FC	100	VP_R6_SATA	
- Tiers Demand Report:** A bar chart for VP_R0_FTS showing storage usage. The x-axis represents percentage from 0 to 100. The legend indicates Used (blue), Free (green), Max SG (purple triangle), and Available (green triangle).
- Storage Groups under FAST control:** A table showing storage groups and their capacity usage across tiers.

Storage Group Name	FAST Policy	Capacity Used Break Down Per Tier	Com
VP_Development	No_EFD	Stacked bar (blue, yellow, purple)	
VP_ProdApp1	System_Optimization	Stacked bar (blue, yellow, purple)	
VP_ProdApp2	System_Optimization	Stacked bar (blue, yellow, purple, red)	

The FAST VP state is typically Enabled, Disabled, or Degraded. If the state is degraded, a reason is listed.

Note: For more information on other possible state values and degraded reason codes, see “Appendix A: FAST VP state” on page 157.

FAST VP current activities either display as Idle or Running Plan. An activity of Idle indicates that there are currently no active data-

movement tasks related to FAST VP in the array. Running Plan indicates that data is actively being moved at the sub-LUN level for thin devices.

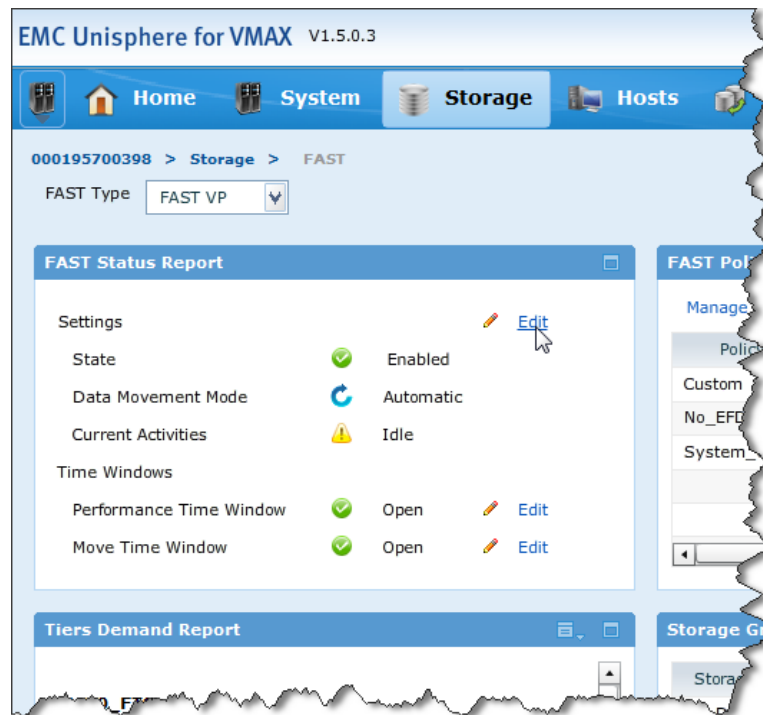
The state of the performance and move time windows are displayed as Open or Closed. Windows are considered open if the current time corresponds to a defined inclusion time window. Similarly, the windows are considered closed if the current time falls outside of any defined inclusion windows.

Note: The FAST VP Move Time Window is displayed as closed if the data-movement mode is Off, regardless of any defined inclusion time windows.

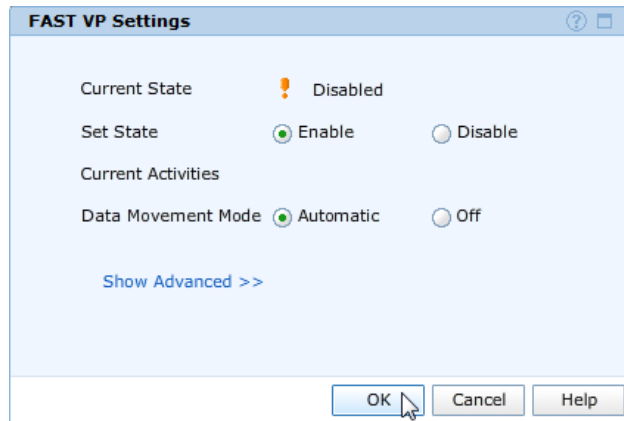
Enabling/disabling FAST VP

In order for FAST VP to perform device movements, FAST VP must first be enabled on the Symmetrix array.

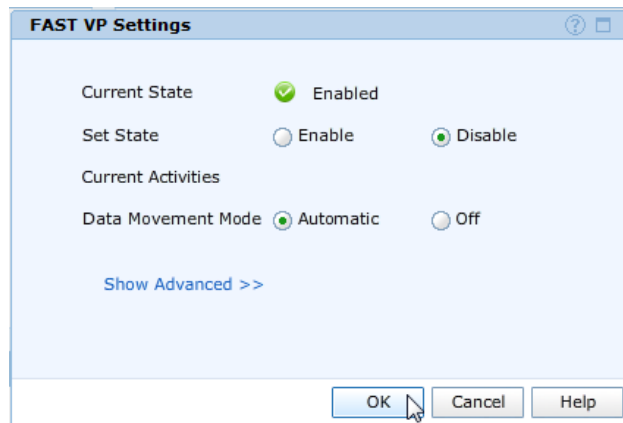
The state of the controller can be changed by clicking **Edit** to the right of **Settings**.



If disabled, FAST VP can be enabled by selecting the radio button to the left of **Enable**.



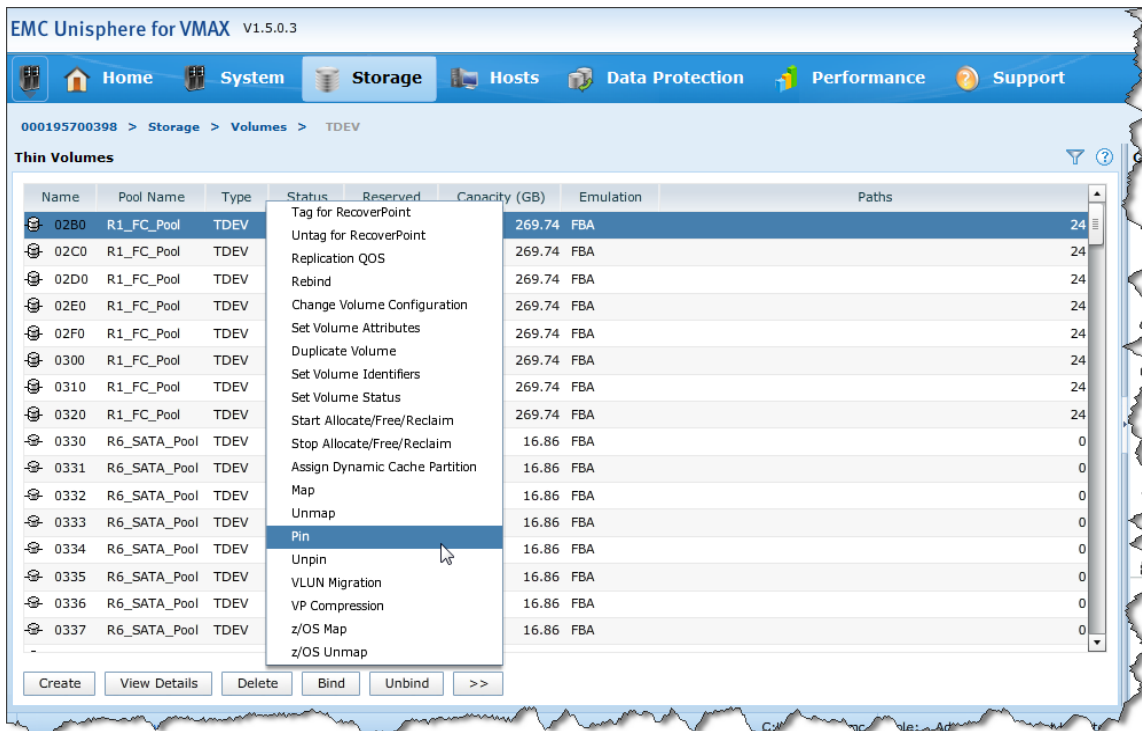
If enabled, FAST VP can be disabled by selecting the radio button to the left of **Disable**.



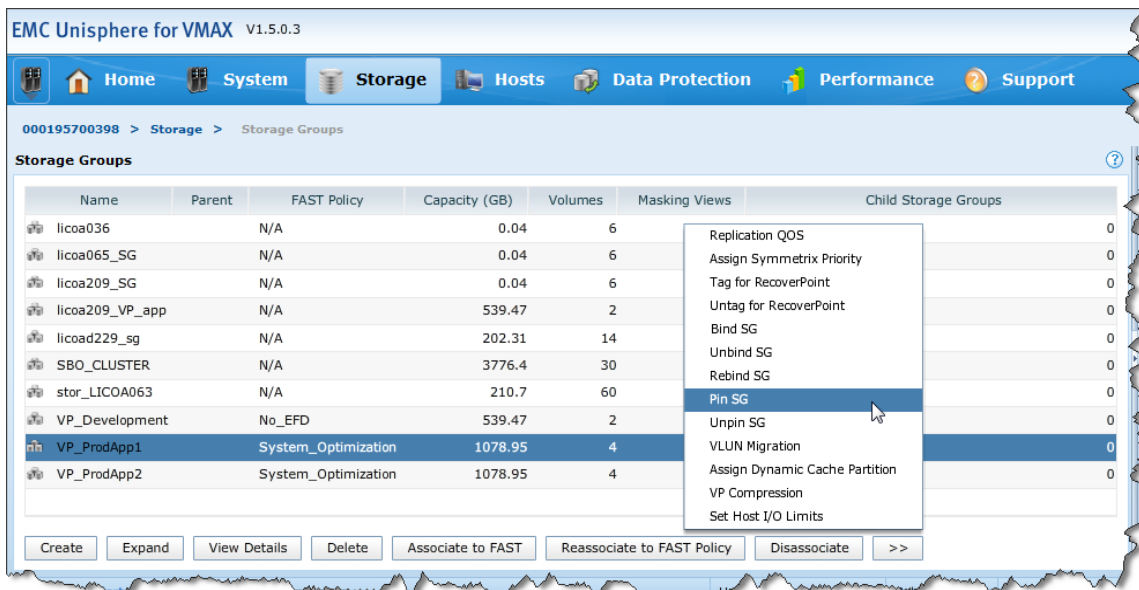
Pinning a thin device under FAST VP control

Pinning a device that is associated with a FAST VP policy prevents any data movement for that device. Devices can be pinned individually, or as a storage group, or device group.

To pin an individual device, select a device on any page where individual devices are listed. For example, on the **TDEV(Meta)** page under **Volumes**, click **>>**, and then select **Pin**.



To pin all devices in a storage group, select a storage group on the **Storage Groups** subsection page, click **>>**, and then select **Pin SG**.

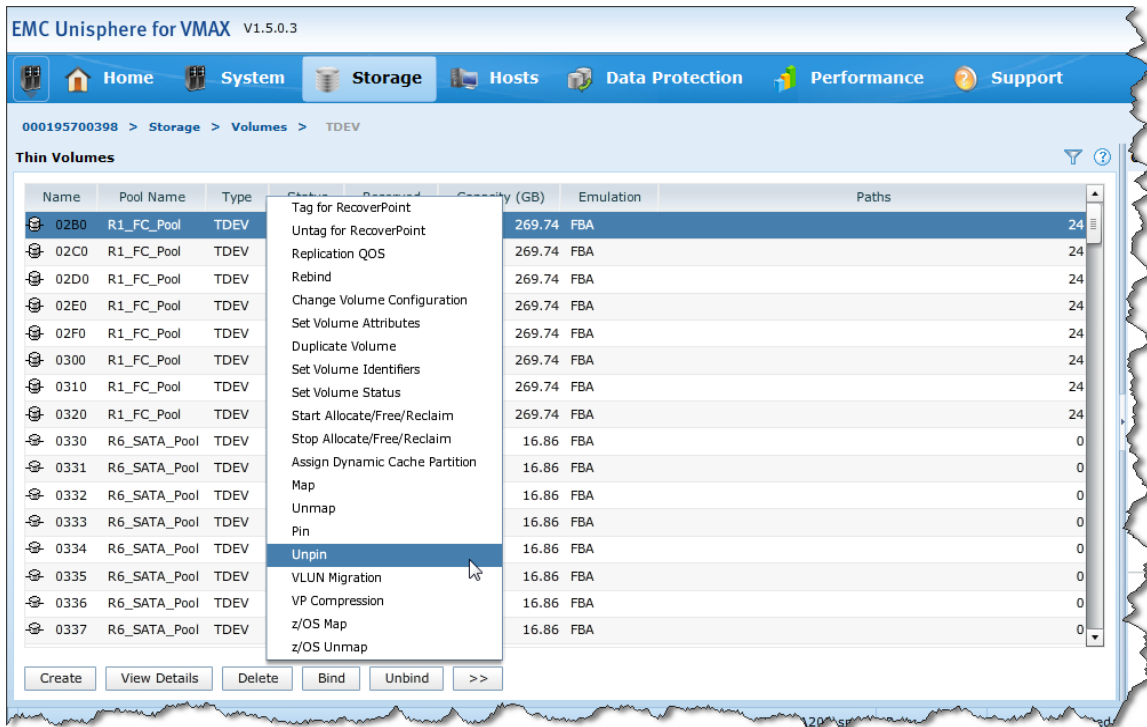


Unpinning a thin device under FAST VP control

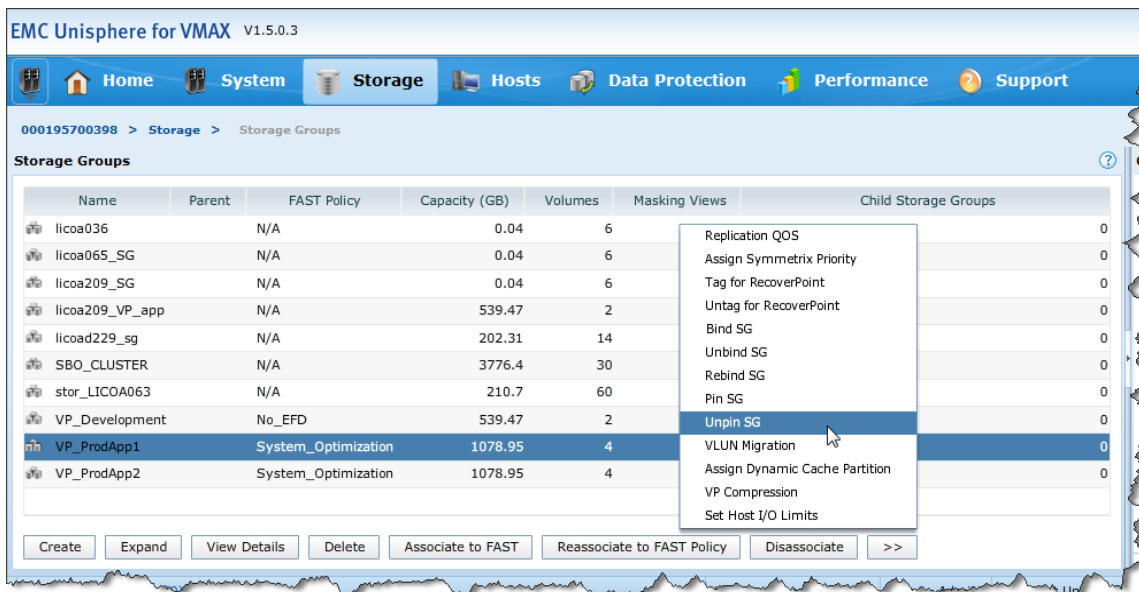
In order for FAST VP to resume data movements after a device has been pinned, it must be unpinned.

Devices can be unpinned individually, or as a storage group, or device group.

To unpin an individual device, select a device on any page where individual devices are listed. For example, on the **TDEV(Meta)** page under **Volumes**, click **>>**, and then select **Unpin**.



To unpin all devices in a storage group, select a storage group on the **Storage Groups** subsection page, click >>, and then select **Unpin SG**.



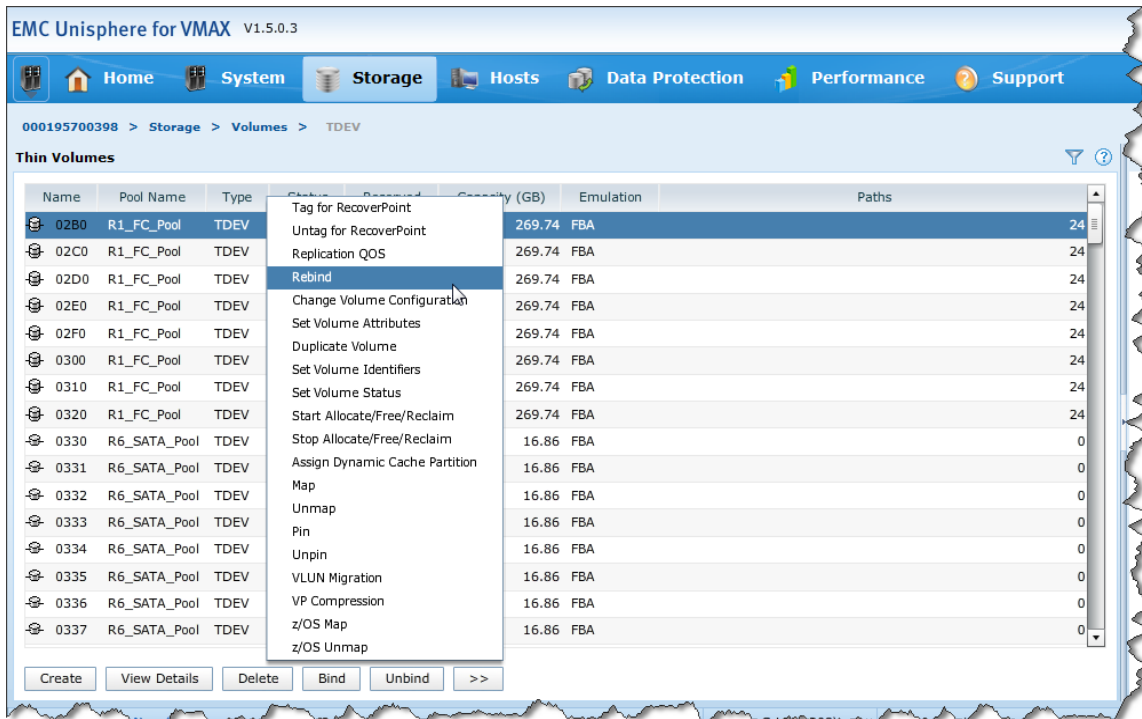
Rebinding a thin device

While FAST VP moves data at the sub-LUN level between device pools, the thin devices associated with a policy still remain bound to a single pool. Any new allocations that occur as the result of a host write come from the bound pool, unless VP allocation by FAST policy is enabled.

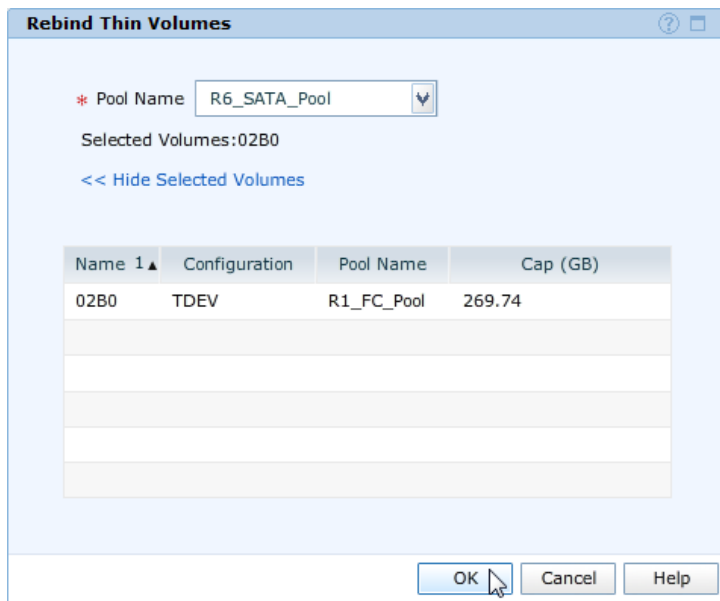
The thin device rebind feature allows the binding information for a thin device to be changed, without changing the current allocation of data across pools.

Note: If the devices being rebound are associated with a FAST VP Policy, only a pool that is contained within the policy can be specified as the new bind pool.

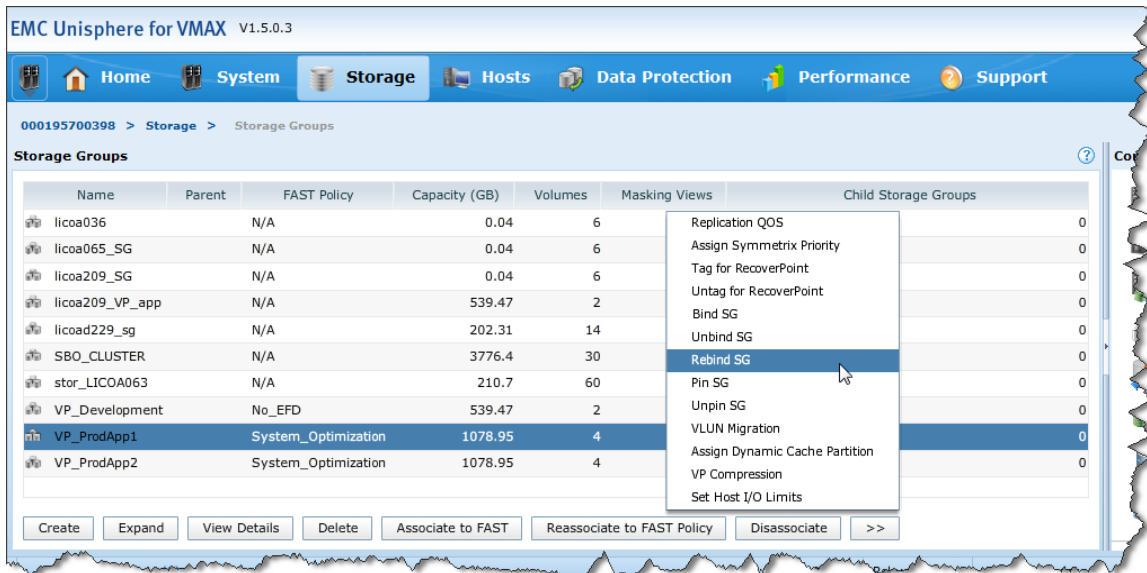
In this example, to rebind thin device 2B0 to the RAID 6 protected SATA thin pool, R6_SATA_Pool, select the device on any page that lists Symmetrix devices, click >>, then select **Rebind**.



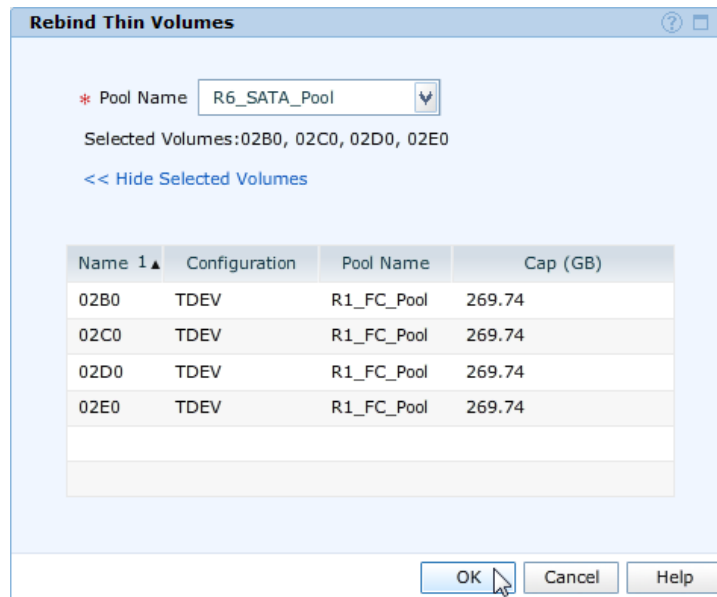
The resulting dialog box provides a drop-down list of available pools to which the device can be rebound. Select the pool, and then click **OK**.



In this example, to rebind all the thin devices in the VP_ProdApp1 storage group to the R6_SATA_Pool thin pool, select the group on the **Storage Group** subsection page, click >>, then select **Rebind SG**.



The resulting dialog box provides a drop-down list of available pools to which the device can be rebound. Select the pool, and then click **OK**.



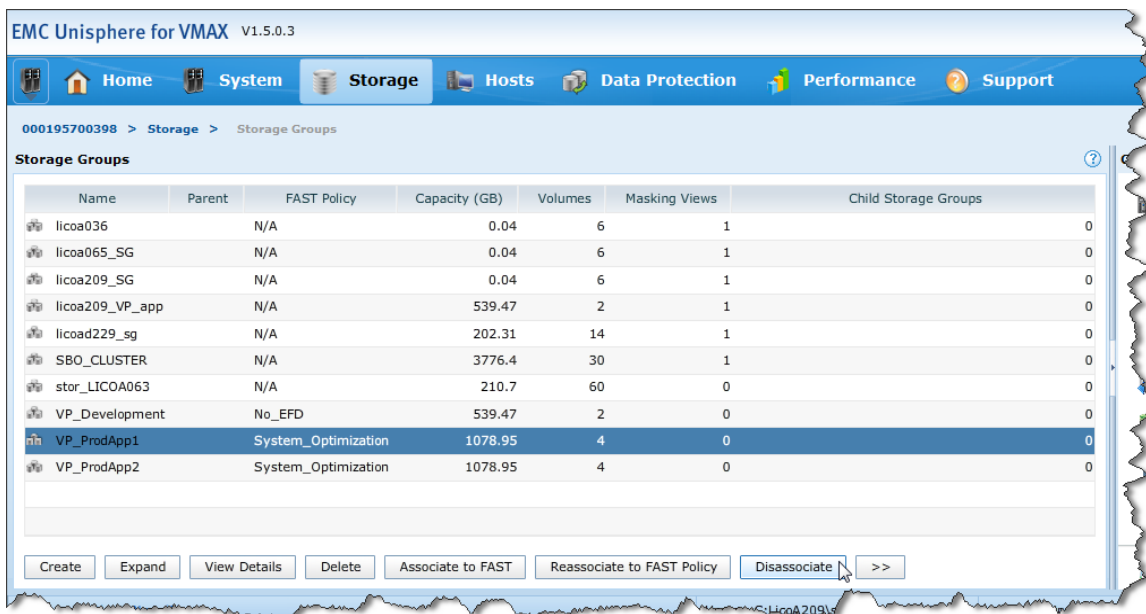
Removing FAST managed objects

The following sections detail the Unisphere interfaces used to break each of the associations and to remove each of the managed objects.

Disassociating a storage group from a FAST policy

Disassociating a storage group from a FAST VP policy removes the devices in the storage group from FAST VP control. Devices no longer under FAST VP control will not have data automatically moved between tiers.

To disassociate a storage group from a FAST policy, select the appropriate storage group on the **Storage Groups** subsection page, then click **Disassociate**.



EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > Storage Groups

Storage Groups

Name	Parent	FAST Policy	Capacity (GB)	Volumes	Masking Views	Child Storage Groups
licoa036		N/A	0.04	6	1	0
licoa065_SG		N/A	0.04	6	1	0
licoa209_SG		N/A	0.04	6	1	0
licoa209_VP_app		N/A	539.47	2	1	0
licoad229_sg		N/A	202.31	14	1	0
SBO_CLUSTER		N/A	3776.4	30	1	0
stor_LICOA063		N/A	210.7	60	0	0
VP_Development		No_EFD	539.47	2	0	0
VP_ProdApp1		System_Optimization	1078.95	4	0	0
VP_ProdApp2		System_Optimization	1078.95	4	0	0

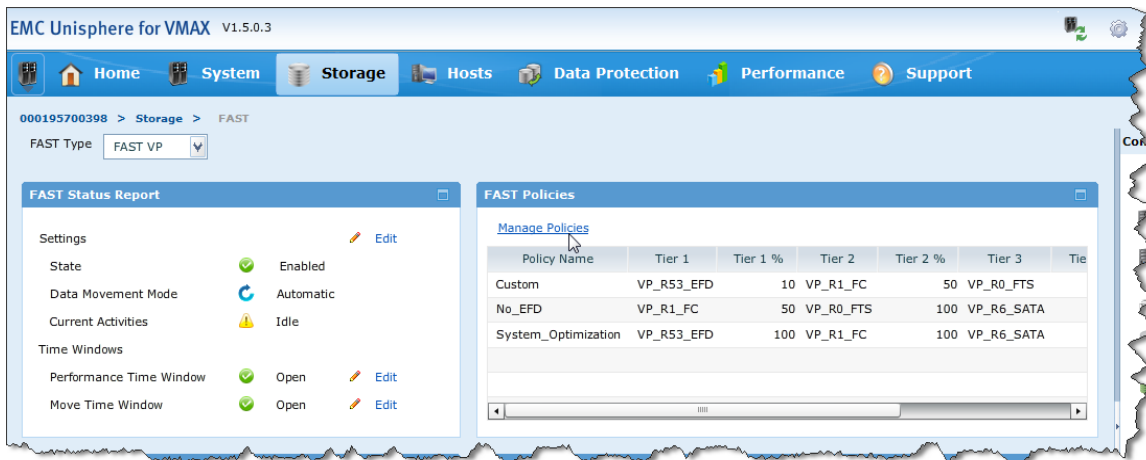
Create Expand View Details Delete Associate to FAST Reassociate to FAST Policy **Disassociate** >>

Removing a Symmetrix tier from a FAST policy

As previously stated, the sum of the upper usage limits for each Symmetrix tier contained in a policy must total a minimum of 100 percent. If a policy has associated storage groups, the removal of a tier will fail if it causes the total tier usage limits to drop below 100 percent.

To successfully remove a Symmetrix tier from a FAST policy, the upper usage limits of the remaining tiers must be modified in order that they total more than 100 percent. Alternatively, the Symmetrix tier can be removed if all storage group associations for the policy are removed in advance.

To remove a Symmetrix tier from a FAST policy, click **Manage Policies** on the **FAST** subsection page.



The screenshot displays the EMC Unisphere for VMAX V1.5.0.3 interface. The navigation bar includes Home, System, Storage, Hosts, Data Protection, Performance, and Support. The breadcrumb path is 000195700398 > Storage > FAST. The FAST Type is set to FAST VP. The interface is divided into two main sections: FAST Status Report and FAST Policies.

FAST Status Report

- Settings: Edit
- State: Enabled
- Data Movement Mode: Automatic
- Current Activities: Idle
- Time Windows:
 - Performance Time Window: Open, Edit
 - Move Time Window: Open, Edit

FAST Policies

[Manage Policies](#)

Policy Name	Tier 1	Tier 1 %	Tier 2	Tier 2 %	Tier 3	Tier
Custom	VP_R53_EFD	10	VP_R1_FC	50	VP_R0_FTS	
No_EFD	VP_R1_FC	50	VP_R0_FTS	100	VP_R6_SATA	
System_Optimization	VP_R53_EFD	100	VP_R1_FC	100	VP_R6_SATA	

Next, select the policy to be modified, and click **View Details**.

EMC Unisphere for VMAX V1.5.0.3

000195700398 > Storage > FAST > Manage Policies

FAST Policies

Policy Name	Tier 1	Tier 1 %	Tier 2	Tier 2 %	Tier 3	Tier 3 %	Tier4	Tier4 %	# Associated Storage Grou
Custom	VP_R53_EFD	10	VP_R1_FC	50	VP_R0_FTS	100	VP_R6_SATA	100	
No_EFD	VP_R1_FC	50	VP_R0_FTS	100	VP_R6_SATA	100	N/A	0	
System_Optimization	VP_R53_EFD	100	VP_R1_FC	100	VP_R6_SATA	100	N/A	0	

Buttons: Create, View Details, Delete, Associate Storage Groups

To remove a tier from the policy, select **N/A** from the drop-down list for the tier being removed, and click **Apply**.

EMC Unisphere for VMAX V1.5.0.3

000195700398 > Storage > FAST > Manage Policies > System_Optimization

Properties

Policy Name:	System_Optimization		
Tier 1	VP_R53_EFD	100	%
Tier 2	VP_R1_FC	100	%
Tier 3	N/A	0	%
Tier 4	N/A	0	%

Related Objects

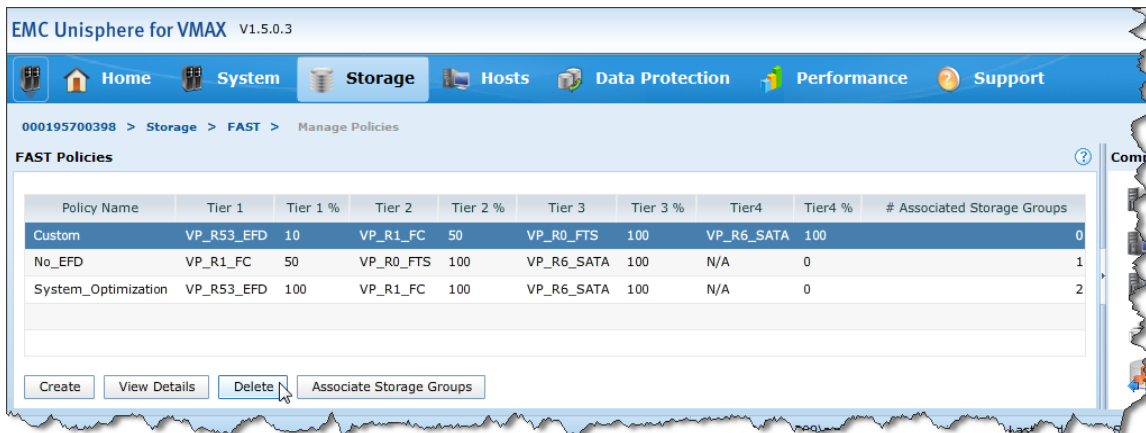
Contains : Tiers - 3
Associated With : Storage Groups - 2

Buttons: Associate Storage Groups, Delete, Apply, Cancel

Deleting a FAST policy

A FAST policy may not be deleted if any storage groups are associated with it. Prior to deleting the policy, all storage group associations should be removed. Also, prior to deleting a policy, all tiers contained in the policy should be removed.

To delete a FAST policy, go to the **Manage Policies** page under **Storage**. Select the policy to be deleted, and then click **Delete**.



EMC Unisphere for VMAX V1.5.0.3

000195700398 > Storage > FAST > Manage Policies

FAST Policies

Policy Name	Tier 1	Tier 1 %	Tier 2	Tier 2 %	Tier 3	Tier 3 %	Tier4	Tier4 %	# Associated Storage Groups
Custom	VP_R53_EFD	10	VP_R1_FC	50	VP_R0_FTS	100	VP_R6_SATA	100	0
No_EFD	VP_R1_FC	50	VP_R0_FTS	100	VP_R6_SATA	100	N/A	0	1
System_Optimization	VP_R53_EFD	100	VP_R1_FC	100	VP_R6_SATA	100	N/A	0	2

Create View Details Delete Associate Storage Groups

Deleting a Symmetrix VP tier

If you want to delete a VP tier, it cannot be included within any FAST policy on the Symmetrix array.

To delete a VP tier, go to the **Tiers** subsection page under **Storage**. Select the tier to be deleted, and then click **Delete**.

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > Tiers

Tiers

Name	Type	Technology	Disk Location	Emulation	Used Capacity	Capacity (GB)	Protection
VP_R0_FTS	Virtual Pool	SATA	External	FBA	15 %	1078	Unprotected
VP_R1_FC	Virtual Pool	FC	Internal	FBA	8 %	10723	RAID-1
VP_R53_EFD	Virtual Pool	EFD	Internal	FBA	3 %	4395	RAID-5(3+1)
VP_R6_SATA	Virtual Pool	SATA	Internal	FBA	9 %	10240	RAID-6(6+2)

Used Capacity Free Capacity

Create Edit View Details Delete

Deleting a storage group

Before deleting a storage group, ensure that the group is not associated with any FAST VP policy.

To delete a storage group, go to the **Storage Groups** subsection page under **Storage**, select the storage group to be deleted, and then click **Delete**.

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > Storage Groups

Storage Groups

Name	Parent	FAST Policy	Capacity (GB)	Volumes	Masking Views	Child Storage Groups
licoa036		N/A	0.04	6	1	0
licoa065_SG		N/A	0.04	6	1	0
licoa209_SG		N/A	0.04	6	1	0
licoa209_VP_app		N/A	539.47	2	1	0
licoad229_sg		N/A	202.31	14	1	0
SBO_CLUSTER		N/A	3776.4	30	1	0
stor_LICOA063		N/A	210.7	60	0	0
VP_Development		No_EFD	539.47	2	0	0
VP_ProdApp1		System_Optimization	1078.95	4	0	0
VP_ProdApp2		N/A	1078.95	4	0	0

Create Expand View Details **Delete** Associate to FAST Reassociate to FAST Policy Disassociate >>

Note: Since storage groups may also be used for the purposes of FAST and Auto-provisioning, prior to deleting the storage group, you must delete any masking views that use the storage group.

Management interface: SYMCLI

Solutions Enabler provides features and functionality for managing FAST VP in both Open Systems and mainframe environments.

There are five Solutions Enabler SYMCLI commands that can be used for the purposes of managing FAST VP:

- ◆ `symtier`
- ◆ `symfast`
- ◆ `symoptmz`
- ◆ `symtw`
- ◆ `symsg`

The `symtier` command provides the ability to create and manage Symmetrix tiers to be used with FAST policies.

The `symfast` command allows for the creation and management of FAST policies, including their associations with storage groups and Symmetrix tiers. The command also provides management control of the FAST controller, including modifying settings, and enabling or disabling the controller.

The `symoptmz` command is used to create and manage legacy time windows, for both performance and data movement.

The `symtw` command is used to create and manage enhanced time windows, for both performance and data movement.

The `symsg` command is used to create and manage storage groups on the Symmetrix array for the purpose of being used with FAST.

Note: The `symaccess` command, introduced in Solutions Enabler V7.0, can also be used to create storage groups for use with FAST. The `symsg` command may also be used to create storage groups to be used in creating masking views as a part of Auto-provisioning Groups.

The following sections detail the use of all of these commands in building, managing, and enabling a FAST VP environment using the Solutions Enabler SYMCLI.

Examining Symmetrix Virtual Provisioning thin pools

Prior to configuration of the FAST controller, and configuring Symmetrix tiers and FAST policies, it is important to understand the existing configuration of the Symmetrix array. Solutions Enabler SYMCLI can inventory the existing thin pools within the array. This can be done with the following command:

```
symcfg -sid 0398 list -pools -thin -mb
```

```
Symmetrix ID: 000195700398
```

S Y M M E T R I X P O O L S							
Pool Name	Flags	Dev PTECSL Config	Usable MBs	Free MBs	Used MBs	Full (%)	Comp (%)
R53_EFD_Pool	TEF-EI	RAID-5(3+1)	4499976	4499976	0	0	0
R1_FC_Pool	TFF-EI	2-Way Mir	10980000	10611946	368055	3	0
R57_FC_Pool	TFF-EI	RAID-5(7+1)	10980000	10980000	0	0	0
R0_FTS_Pool	T-F-EX	Unprotected	1104000	1104000	0	0	0
R6_SATA_Pool	TSFDEI	RAID-6(6+2)	10485708	9818564	667130	6	0
Total			38049684	37014486	1035185	3	0

Legend:

(P)ool Type:

S = Snap, R = Rdfa DSE T = Thin

(T)echnology:

S = SATA, F = Fibre Channel, E = Enterprise Flash Drive, M = Mixed, - = N/A

Dev (E)mulation:

F = FBA, A = AS400, 8 = CKD3380, 9 = CKD3390, - = N/A

(C)ompression:

E = Enabled, D = Disabled, N = Enabling, S = Disabling, - = N/A

(S)tate:

E = Enabled, D = Disabled, B = Balancing

Disk (L)ocation:

I = Internal, X = External, M = Mixed, - = N/A

The output for each thin pool shows the technology type, emulation, and

location of the pool. It also shows the usable capacity of the pool (the free and used capacity), as well as the percentage allocated for the pool.

Running the command without the `-mb` option shows similar information, but the capacity values are displayed in tracks, rather than megabytes (MBs).

Note: To use a thin pool for FAST VP, all data devices in the pool must be configured on the same drive technology.

To see more information on an individual thin pool, including the data devices in the pool and the thin devices bound to the pool, run:

```
symcfg -sid 0398 show -pool R1_FC_Pool -thin -detail -mb
```

```
Symmetrix ID: 000195700398
```

```
Symmetrix ID           : 000195700398
Pool Name              : R1_FC_Pool
Pool Type              : Thin
Disk Location          : Internal
Technology             : FC
Dev Emulation          : FBA
Dev Configuration     : 2-Way Mir
Pool State             : Enabled
Compression State     : N/A
# of Devices in Pool   : 160
# of Enabled Devices in Pool : 160
# of Usable Tracks in Pool : 175680000
# of Allocated Tracks in Pool : 12445056
# of Tracks saved by compression : 0
# of Shared Tracks in Pool : 0
Pool Utilization (%)  : 7
Pool Compression Ratio (%) : 0
Max. Subscription Percent : None
Rebalance Variance    : 1%
Max devs per rebalance scan : 256
Pool Reserved Capacity : None
```

```
Enabled Devices(160):
```

```

{
-----
Sym      Usable      Alloc      Free Full FLG Device
Dev      MBs         MBs         MBs (%)  S  State
-----
00F0     68625       4863       63762   7  .  Enabled
00F1     68625       4871       63754   7  .  Enabled
00F2     68625       4861       63764   7  .  Enabled
...
018D     68625       4872       63753   7  .  Enabled
018E     68625       4868       63758   7  .  Enabled
018F     68625       4862       63763   7  .  Enabled
-----
MBs      10980000    777816    10202184  7
}

```

Pool Bound Thin Devices(14):

```

{
-----
Sym  FLG      Pool      Pool      Total      Compressed
Dev  T      Total Sub  Allocated  Written      Size/Ratio
      MBs (%)  MBs (%)  MBs (%)  MBs (%)  MBs (%)
-----
02B0  B      276210  3      51221  19      0  0      51221  0
02C0  B      276210  3      51221  19      0  0      51221  0
02D0  B      276210  3      51221  19      0  0      51221  0
02E0  B      276210  3      51221  19      0  0      51221  0
02F0  B      276210  3      51221  19      0  0      51221  0
0300  B      276210  3      51221  19      0  0      51221  0
0310  B      276210  3      51221  19      0  0      51221  0
0320  B      276210  3      51221  19      0  0      51221  0
0350  B      276210  3      51221  19      0  0      51221  0
0360  B      276210  3      51221  19      0  0      51221  0
0370  B      276210  3      265471  96      265429  96      265471  0
0380  B      276210  3      115    0      89  0      115    0
0390  B      276210  3      13     0      0  0      13     0
03A0  B      276210  3      13     0      0  0      13     0
-----
MBs      3866940  35      777816  20      265518  7      777816  0
}

```

No Other-Pool Bound Thin Devices have allocations in Device Pool R1_FC_Pool

Legend:

Enabled devices FLG:

(S)hared Tracks : X = Shared Tracks , . = No Shared Tracks

Bound Devices FLG:

S(T)atus : B = Bound, I = Binding, U = Unbinding, A = Allocating,
D = Deallocating, R = Reclaiming, C = Compressing,
N = Uncompressing, . = Unbound,

Running the command without the `-mb` option shows similar information, but the capacity values are displayed in tracks, rather than megabytes (MBs).

Configuring the Symmetrix FAST controller

There are multiple FAST VP settings and parameters that affect the behavior of the FAST controller. These include:

- ♦ FAST VP Data Movement Mode
- ♦ Workload Analysis Period
- ♦ Initial Analysis Period
- ♦ Pool Reserved Capacity (PRC)
- ♦ FAST VP Relocation Rate
- ♦ VP Allocation by FAST Policy
- ♦ Performance Time Window
- ♦ Data Movement Time Window

The following sections detail the SYMCLI commands used to list and modify each of these settings.

FAST controller settings list information

To view the existing FAST controller settings, the `symfast list` command can be used with the `-control_parms` option:

```
symfast -sid 0398 list -control_parms
```

```
Symmetrix ID: 000195700398
```

```
Optimizer and FAST Control Parameters:
```

```
Data Movement Mode : User_Approve
```



```
Max Simultaneous Device Moves      : 8
Max Device Moves Per Day           : 200
```

Optimizer, FAST and FAST VP Control Parameters:

```
Min Initial Workload Period(hrs)   : 8
Workload Analysis Period(hrs)      : 168
```

FAST Control Parameters:

```
Swap Not Visible Devices           : Disabled
Allow Only Swap                    : Disabled
```

FAST VP Control Parameters:

```
FAST VP Data Movement Mode        : NONE
FAST VP Data Relocation Rate       : 5
Thin Pool Reserved Capacity(%)    : 10
VP Allocation By FAST policy       : Disabled
FAST VP Time to Compress           : Never
FAST VP Compression Rate           : 5
```

Setting the FAST VP Data Movement Mode

There are two possible values for the Data Movement Mode: Automatic (AUTO) and Off (NONE). The default value is NONE.

To set the mode to Automatic, run:

```
symfast -sid 0398 set -control_parms -vp_data_move_mode AUTO
```

```
Execute SET CONTROL PARAMETERS operation for FAST (y/[n]) ? y
```

```
The FAST SET CONTROL PARAMETERS operation finished successfully
```

To set the mode to Off, run:

```
symfast -sid 0398 set -control_parms -vp_data_move_mode NONE
```

```
Execute SET CONTROL PARAMETERS operation for FAST (y/[n]) ? y
```

```
The FAST SET CONTROL PARAMETERS operation finished successfully
```

Setting the Workload Analysis Period

The Workload Analysis Period is shared with Optimizer and FAST. It

can be set between two hours and four weeks, but its value is specified in hours. The default value is 168 hours (1 week).

To set the Workload Analysis Period for FAST, run:

```
symfast -sid 0398 set -control_parms -workload_period 72
```

```
Execute SET CONTROL PARAMETERS operation for FAST (y/[n]) ? y
```

```
The FAST SET CONTROL PARAMETERS operation finished successfully
```

Setting the Initial Analysis Period

The Initial Analysis Period is a shared parameter with Optimizer and FAST. It can be set between two hours and four weeks. The default value is eight hours.

To set the Initial Analysis Period for FAST, run:

```
symfast -sid 0398 set -control_parms -min_perf_period 24
```

```
Execute SET CONTROL PARAMETERS operation for FAST (y/[n]) ? y
```

```
The FAST SET CONTROL PARAMETERS operation finished successfully
```

Setting the system-wide FAST VP Pool Reserved Capacity

The FAST VP Pool Reserved Capacity (PRC) is specified as a percentage and can be set to be between 1 and 80. The default value is 10.

To set the PRC, run:

```
symfast -sid 0398 set -control_parms -pool_resv_cap 20
```

```
Execute SET CONTROL PARAMETERS operation for FAST (y/[n]) ? y
```

```
The FAST SET CONTROL PARAMETERS operation finished successfully
```

Setting the pool-level FAST VP Pool Reserved Capacity

The pool-level FAST VP Pool Reserved Capacity (PRC) can be used to override the system-wide setting for each individual pool. At the pool-level, the PRC can be set between 1 and 80 percent, or NONE. The default value is NONE.

The value of NONE indicates that the system-wide setting should be used for the pool.

To set or change the PRC at the pool level, run:

```
symconfigure -sid 0398 -cmd "set pool R53_EFD_Pool, type=thin,  
pool_resv_cap=1;" commit -v
```

```
Execute a symconfigure operation for symmetrix '000195700398' (y/[n]) ? y
```

```
A Configuration Change operation is in progress. Please wait...
```

```
Establishing a configuration change session.....Established.  
{  
  set pool R53_EFD_Pool type=thin, pool_resv_cap=1;  
}
```

```
Performing Access checks.....Allowed.  
Checking Device Reservations.....Allowed.  
Committing configuration changes.....Reordering.  
Setting pool attributes .....Done.  
Committing configuration changes.....Committed.  
Terminating the configuration change session.....Done.
```

```
The configuration change session has successfully completed.
```

To set or change the PRC back to NONE, run:

```
symconfigure -sid 0398 -cmd "set pool R53_EFD_Pool, type=thin,  
pool_resv_cap=NONE;" commit
```

```
Execute a symconfigure operation for symmetrix '000195700398' (y/[n]) ? y
```

```
A Configuration Change operation is in progress. Please wait...
```

```
Establishing a configuration change session.....Established.  
{  
  set pool R53_EFD_Pool type=thin, pool_resv_cap=NONE;  
}
```

```
Performing Access checks.....Allowed.
Checking Device Reservations.....Allowed.
Committing configuration changes.....Reordering.
Setting pool attributes .....Done.
Committing configuration changes.....Committed.
Terminating the configuration change session.....Done.
```

The configuration change session has successfully completed.

Setting the FAST VP Relocation Rate

The FAST VP Relocation Rate can be set to be between 1 and 10. The default value is 5.

To set the Relocation Rate, run:

```
symfast -sid 0398 set -control_parms -vp_reloc_rate 8
```

```
Execute SET CONTROL PARAMETERS operation for FAST (y/[n]) ? y
```

```
The FAST SET CONTROL PARAMETERS operation finished successfully
```

Setting VP allocation by FAST policy

VP allocation by FAST policy can be set to enabled or disabled. The default value is disabled.

To enable VP allocation by FAST policy, run:

```
symfast -sid 0398 set -control_parms -vp_allocation_by_fp ENABLE
```

```
Execute SET CONTROL PARAMETERS operation for FAST (y/[n]) ? y
```

```
The FAST SET CONTROL PARAMETERS operation finished successfully
```

To disable VP allocation by FAST policy, run:

```
symfast -sid 0398 set -control_parms -vp_allocation_by_fp DISABLE
```

```
Execute SET CONTROL PARAMETERS operation for FAST (y/[n]) ? y
```

```
The FAST SET CONTROL PARAMETERS operation finished successfully
```

Setting the FAST VP Time to Compress

The FAST VP Time to Compress can be set to be between 40 and 400 days, or Never. The default value is Never.

To set the Time to Compress, run:

```
symfast -sid 0398 set -control_parms -time_to_compress 40
```

```
Execute SET CONTROL PARAMETERS operation for FAST (y/[n]) ? y
```

```
The FAST SET CONTROL PARAMETERS operation finished successfully
```

Setting the FAST VP Compression Rate

The FAST VP Compression Rate can be set to be between 1 and 10. The default value is 5.

To set the Compression Rate, run:

```
symfast -sid 0398 set -control_parms -fast_compression_rate 8
```

```
Execute SET CONTROL PARAMETERS operation for FAST (y/[n]) ? y
```

```
The FAST SET CONTROL PARAMETERS operation finished successfully
```

Modifying all FAST controller settings

Alternatively, all settings can be modified at the same time with the following single command:

```
symfast -sid 0398 set -control_parms -vp_data_move_mode AUTO  
-workload_period 72 -min_perf_period 24 -vp_reloc_rate 8 -pool_resv_cap 5  
-vp_allocation_by_fp ENABLE -time_to_compress 40 -fast_compression_rate 8
```

```
Execute SET CONTROL PARAMETERS operation for FAST (y/[n]) ? y
```

```
The FAST SET CONTROL PARAMETERS operation finished successfully
```

Verifying FAST controller settings

When all changes have been made to the FAST controller settings, the changes can be verified by listing all the control settings:

```
symfast -sid 0398 list -control_parms
```

```
Symmetrix ID: 000195700398
```

```
Optimizer and FAST Control Parameters:
```

```
Data Movement Mode           : User_Approve
Max Simultaneous Device Moves : 8
Max Device Moves Per Day      : 200
```

```
Optimizer, FAST and FAST VP Control Parameters:
```

```
Min Initial Workload Period(hrs) : 24
Workload Analysis Period(hrs)    : 72
```

```
FAST Control Parameters:
```

```
Swap Not Visible Devices       : Disabled
Allow Only Swap                : Disabled
```

```
FAST VP Control Parameters:
```

```
FAST VP Data Movement Mode    : AUTO
FAST VP Data Relocation Rate   : 8
Thin Pool Reserved Capacity(%) : 20
VP Allocation By FAST policy   : Enabled
FAST VP Time to Compress       : 40 days
FAST VP Compression Rate       : 8
```

Legacy time-window management

Management of the legacy time windows is managed through the SYMCLI `symoptmz` command.

For the management of FAST VP, it is recommended to use enhanced time-window management.

Note: For information on managing legacy time windows, refer to the *EMC Solutions Enabler Symmetrix Array Controls CLI* product guide available at <http://support.emc.com>.

Converting time-window type from legacy to enhanced

On a Symmetrix VMAX Series array, in order to use the enhanced time-window definitions, it is necessary to first convert the legacy time windows to the new format. This conversion is performed using the `symtw` command.

The following guidelines apply to convert to the enhanced time-window format:

- ◆ Only the time windows defined during the seven-day period, beginning with the start, are converted. All inclusive time windows defined that do not include this period of time are deleted.
- ◆ If the enhanced time-window format is defined as ONCE, exclusive time windows previously defined for a future date are converted to the enhanced format.
- ◆ The time windows' start and end time are rounded to the half hour. The start time is rounded down to the previous half hour, and the end time is rounded up to the next half hour.
- ◆ If the legacy time-window definitions cannot be translated to the enhanced format, an error returns indicating that a specific window is either nonconvertible or partially convertible. In either case, the `-force` option can be specified to complete a best-effort conversion.

Note: Following a successful conversion, the `symoptmz` is no longer supported for the management of time windows.

To perform a conversion of the time windows to the enhanced format, run:

```
symtw -sid 0398 convert -date 04012012
```

```
Execute symtw 'CONVERT' operation (y/[n]) ? y
```

Execute conversion of legacy time windows for Symmetrix 000195700398

```
Evaluating Performance Time Window 'DEFAULT_PERF_TW': Expired
Evaluating Performance Time Window 'Negate_Default': Convertible
Evaluating Performance Time Window 'Production_Day': Convertible
Evaluating Move DP Time Window 'DEFAULT_SWAP_TW': Expired
Evaluating Move VP Time Window 'DEFAULT_THIN_SWAP_TW': Expired
Evaluating Move VP Time Window 'Production_Day': Convertible
```

```
Converting Performance Time Window 'DEFAULT_PERF_TW': Skipped
Converting Performance Time Window 'Negate_Default': Done
Converting Performance Time Window 'Production_Day': Done
Converting Move DP Time Window 'DEFAULT_SWAP_TW': Skipped
Converting Move VP Time Window 'DEFAULT_THIN_SWAP_TW': Skipped
Converting Move VP Time Window 'Production_Day': Done
```

Conversion of legacy time windows successfully completed

Enhanced time-window list information

Management of the enhanced time windows is available through the SYMCLI `symtw` command.

To view existing enhanced time windows configured on the Symmetrix array (both performance and data movement), the following command can be run:

`symtw -sid 0398 list`

Symmetrix ID: 000195700398

DP Data Movement Time Windows

```
Sunday      : None
Monday      : None
Tuesday     : None
Wednesday   : None
Thursday    : None
Friday      : None
Saturday    : None
```


Exclusive Time Windows (0)

VP Data Movement Time Windows

```
Sunday      : 07:00 - 19:00
Monday      : 07:00 - 19:00
Tuesday     : 07:00 - 19:00
Wednesday  : 07:00 - 19:00
Thursday    : 07:00 - 19:00
Friday      : 07:00 - 19:00
Saturday    : 07:00 - 19:00
```

Exclusive Time Windows (0)

Performance Time Windows

```
Sunday      : 07:00 - 19:00
Monday      : 07:00 - 19:00
Tuesday     : 07:00 - 19:00
Wednesday  : 07:00 - 19:00
Thursday    : 07:00 - 19:00
Friday      : 07:00 - 19:00
Saturday    : 07:00 - 19:00
```

Exclusive Time Windows (0)

Adding enhanced FAST VP time windows

To add an enhanced time window to be used by FAST VP, the following information needs to be decided:

- ◆ Time-window type (performance or data movement)
- ◆ Whether the time windows are inclusive or exclusive
- ◆ Days of the week the window will be used (inclusive only)
- ◆ Times of the day the window will be used (inclusive only)
- ◆ Time period for which the time window is valid (exclusive only)

In this example, to add an inclusive performance time window that collects performance metrics between 5 a.m. and 7 a.m., Monday through Friday, run:

```
symtw -sid 0398 -inclusive -type perf add -days MON,TUE,WED,THU,FRI  
-start_time 05:00 -end_time 07:00
```

```
Execute symtw 'ADD' operation (y/[n]) ? y
```

The Time Window ADD operation finished successfully

In this example, to add an inclusive VP data movement time window that allows FAST VP data movement between 5 a.m. and 7 a.m., Monday through Friday, run:

```
symtw -sid 0398 -inclusive -type move_vp add -days MON,TUE,WED,THU,FRI  
-start_time 05:00 -end_time 07:00
```

Execute symtw 'ADD' operation (y/[n]) ? y

The Time Window ADD operation finished successfully

Note: For inclusive time windows, the start and end time must be specified in 30-minute increments, from 00:00 to 24:00, based on the 24-hour clock format.

The start time and end time cannot be extended to the previous or next day, and the end time must be greater than the start time. Any time windows that extend to the next day need to be defined separately.

In this example, to add an exclusive VP performance time window that prevents FAST VP performance collection from 5 p.m. on April 20, 2012 until 5 a.m. on April 23, 2012, run:

```
symtw -sid 0398 -exclusive -type perf add -start_day 04202012:1700  
-end_day 04232012:0500
```

Execute symtw 'ADD' operation (y/[n]) ? y

The Time Window ADD operation finished successfully

In this example, to add an exclusive VP data movement time window that prevents FAST VP data movement from 5 p.m. on April 20, 2012 until 5 a.m. on April 23, 2012, run:

```
symtw -sid 0398 -exclusive -type move_vp add -start_day 04202012:1700  
-end_day 04232012:0500
```

Execute symtw 'ADD' operation (y/[n]) ? y

The Time Window ADD operation finished successfully

Note: For exclusive time windows, the start day/time and end day/time are specified in the format MMDDYYYY:HHMM. The start and end times must be specified in 30-minute increments and are based on the 24-hour clock format.

To view the changes, run:

symtw -sid 0398 list

Symmetrix ID: 000195700398

DP Data Movement Time Windows

Sunday : None
Monday : None
Tuesday : None
Wednesday : None
Thursday : None
Friday : None

Saturday : None

Exclusive Time Windows (0)

VP Data Movement Time Windows

Sunday : 07:00 - 19:00
Monday : 05:00 - 19:00
Tuesday : 05:00 - 19:00
Wednesday : 05:00 - 19:00
Thursday : 05:00 - 19:00
Friday : 05:00 - 19:00
Saturday : 07:00 - 19:00

Exclusive Time Windows (1)

```
{  
  Fri Apr 20 17:00:00 2012 - Mon Apr 23 05:00:00 2012  
}
```

Performance Time Windows

```
Sunday      : 07:00 - 19:00
Monday      : 05:00 - 19:00
Tuesday     : 05:00 - 19:00
Wednesday  : 05:00 - 19:00
Thursday    : 05:00 - 19:00
Friday      : 05:00 - 19:00
Saturday    : 07:00 - 19:00
```

```
Exclusive Time Windows (1)
{
  Fri Apr 20 17:00:00 2012 - Mon Apr 23 05:00:00 2012
}
```

Removing enhanced FAST VP time windows

To remove an enhanced time window used by FAST VP, the following information needs to be decided:

- ◆ Time-window type (performance or data movement)
- ◆ Whether the time windows are inclusive or exclusive
- ◆ Days of the week the window will be removed from (inclusive only)
- ◆ Times of the day the window will be removed from (inclusive only)
- ◆ Time period for which the time window will be removed (exclusive only)

When removing a time window, the time periods specified may include all or part of existing time windows. Partially removing an existing time window may generate additional time windows on either side of the removed time period.

In this example, to remove an inclusive performance time window that currently collects performance metrics between 11 a.m. and 1 p.m., Monday and Friday, run:

```
symtw -sid 0398 -inclusive -type perf remove -days MON,FRI -start_time 11:00 -end_time 13:00
```

```
Execute symtw 'REMOVE' operation (y/[n]) ? y
```

The Time Window REMOVE operation finished successfully

To remove an inclusive VP data movement time window that currently allows FAST VP data movement between 5 a.m. and 7 a.m., Monday and Friday, run:

```
symtw -sid 0398 -inclusive -type move_vp remove -days MON,FRI -start_time 11:00 -end_time 13:00
```

Execute symtw 'REMOVE' operation (y/[n]) ? y

The Time Window REMOVE operation finished successfully

Note: For inclusive time windows, the start and end times must be specified in 30-minute increments, from 00:00 to 24:00, based on the 24-hour clock format.

In this example, to remove an exclusive VP performance time window that is defined to prevent FAST VP performance collection from 5 p.m. on April 21, 2012 until 5 a.m. on April 22, 2012, run:

```
symtw -sid 0398 -exclusive -type perf remove -start_day 04212012:1700 -end_day 04222012:0500
```

Execute symtw 'REMOVE' operation (y/[n]) ? y

The Time Window REMOVE operation finished successfully

In this example, to remove an exclusive VP data movement time window that is defined to prevent FAST VP data movement from 5 p.m. on April 21, 2012 until 5 a.m. on April 22, 2012, run:

```
symtw -sid 0398 -exclusive -type move_vp remove -start_day 04212012:1700 -end_day 04222012:0500
```

Execute symtw 'REMOVE' operation (y/[n]) ? y

The Time Window REMOVE operation finished successfully

Note: For exclusive time windows, the start day/time and end day/time are specified in the format MMDDYYYY:HHMM. The start and end times must be specified in 30-minute increments and are based on the 24-hour clock

```
format.
```

To view the changes, run:

```
symtw -sid 0398 list
```

```
Symmetrix ID: 000195700398
```

```
DP Data Movement Time Windows
```

```
Sunday      : None
Monday      : None
Tuesday     : None
Wednesday   : None
Thursday    : None
Friday      : None
Saturday    : None
```

```
Exclusive Time Windows (0)
```

```
VP Data Movement Time Windows
```

```
Sunday      : 07:00 - 19:00
Monday      : 05:00 - 11:00
              13:00 - 19:00
Tuesday     : 05:00 - 19:00
Wednesday   : 05:00 - 19:00
Thursday    : 05:00 - 19:00
Friday      : 05:00 - 11:00
              13:00 - 19:00
Saturday    : 07:00 - 19:00
```

```
Exclusive Time Windows (2)
```

```
{
  Fri Apr 20 17:00:00 2012 - Sat Apr 21 17:00:00 2012
  Sun Apr 22 05:00:00 2012 - Mon Apr 23 05:00:00 2012
}
```

```
Performance Time Windows
```

```
Sunday      : 07:00 - 19:00
```

```

Monday       : 05:00 - 11:00
              13:00 - 19:00
Tuesday      : 05:00 - 19:00
Wednesday    : 05:00 - 19:00
Thursday     : 05:00 - 19:00
Friday       : 05:00 - 11:00
              13:00 - 19:00
Saturday     : 07:00 - 19:00

```

Exclusive Time Windows (2)

```

{
  Fri Apr 20 17:00:00 2012 - Sat Apr 21 17:00:00 2012
  Sun Apr 22 05:00:00 2012 - Mon Apr 23 05:00:00 2012
}

```

Viewing the FAST VP time-window summary

A week time-window summary can also be displayed. This summary displays the current week, starting on Sunday, and indicates the actions that are performed in increments of 30 minutes for that week.

The actions displayed indicate when performance data is collected, or not collected, and when data movement occurs for both FAST DP and FAST VP.

It also displays time periods when these actions are explicitly overridden by an exclusion window.

To view the **Time Window Summary**, run:

```
symtw -sid 0398 list -summary
```

```
Symmetrix ID: 000195700398
```

```

                                Time Window Summary
                                -----|
                                | SUN | MON | TUE | WED | THU | FRI | SAT |
                                |-----|-----|-----|-----|-----|-----|-----|
                                | D V P | D V P | D V P | D V P | D V P | D V P | D V P |
                                |-----|-----|-----|-----|-----|-----|-----|
00:00 - 00:30 | . . . | . . . | . . . | . . . | . . . | . . . | . . . |
00:30 - 01:00 | . . . | . . . | . . . | . . . | . . . | . . . | . . . |
01:00 - 01:30 | . . . | . . . | . . . | . . . | . . . | . . . | . . . |
01:30 - 02:00 | . . . | . . . | . . . | . . . | . . . | . . . | . . . |
02:00 - 02:30 | . . . | . . . | . . . | . . . | . . . | . . . | . . . |
02:30 - 03:00 | . . . | . . . | . . . | . . . | . . . | . . . | . . . |

```


23:30 - 24:00 | . . . | . . . | . . . | . . . | . . . | . . . | . . . |
|-----|-----|-----|-----|-----|-----|-----|

Legend: D = Disk Group Provisioning Movement Time Window
V = Virtual Provisioning Movement Time Window
P = Performance Time Window
E = Time Windows Overridden by the Exclusive Time Windows

Note: The time slot marked with the -> and <- symbols indicates the time slot during which the time-window summary was displayed.

To see the summary for a specific week in the future, the `-date` option may also be specified.

Creating FAST managed objects

There are three managed objects related to the use of FAST VP in a Symmetrix VMAX Series array. They are:

- ◆ Symmetrix VP tiers
- ◆ FAST policies
- ◆ Storage groups

When created, storage groups can be associated with a FAST policy, which in turn associates the devices in the storage group with up to three VP tiers, while defining the upper usage limit for the storage group in each tier.

The following sections detail the SYMCLI commands used to create each of the managed objects, and the methods for associating them.

Information is also shown for removing these associations and removing each of the objects.

Creating a Symmetrix VP tier

A Symmetrix VP tier may contain between one and four Virtual Provisioning thin pools. When creating a VP tier, the following information must be known:

- ◆ The tier name
- ◆ The desired protection type of the tier
- ◆ The drive technology, or location, to be used for the tier

- ♦ The thin pools to be added to the tier

Once this information has been decided, the tier can be created.

Creating an internal tier

To create an internal tier, run:

```
symtier -sid 0398 create -name VP_R1_FC -tgt_raid1 -technology FC -vp
```

This command created an empty Symmetrix VP tier, with target protection type of RAID 1, and disk technology of Fibre Channel (FC). The Symmetrix tier name was chosen to indicate the RAID protection type (RAID 1), the drive type (FC), and the fact that it is a VP tier, VP_R1_FC.

The `symtier list` command can be used to verify the successful creation of the Symmetrix VP tier.

```
symtier -sid 0398 list -vp
```

```
Symmetrix ID          : 000195700398
```

```
-----
                L                I   Logical Capacities (GB)
                O   Target        n -----
Tier Name       C Tech Protection Emul c Enabled      Free      Used
-----
VP_R1_FC        I FC   RAID-1     N/A S          0          0          0
```

Legend:

Disk (Location) : I = Internal, X = External

Flgs:

(Inc) Type : S = Static, D = Dynamic

(Dyn) Discovery : X = Enabled, . = Disabled, - = N/A

Once the empty tier has been created, thin pools can be added to it, again using the `symtier` command.

To add a thin pool to the tier, run:

```
symtier -sid 0398 add -tier_name VP_R1_FC -pool R1_FC_Pool
```

To add more than one thin pool to the tier, the following can be run:

```
symtier -sid 0398 add -tier_name VP_R1_FC -pool R1_FC_Pool1,R1_FC_Pool2
```

Once the pool, or pools, has been added, details on the tier can be seen by using the `symtier show` command, as follows:

```
symtier -sid 0398 show -tier_name VP_R1_FC
```

```
Symmetrix ID          : 000195700398

Tier Name             : VP_R1_FC
Tier Type             : VP
Disk Location         : Internal
Technology            : FC
Target Protection     : RAID-1
Emulation             : FBA
Include Type          : Static

Thin Pools(1)
{
-----
                Logical Capacities (GB)
Pool Name      Dev  ----- Full
                Emul  Enabled   Free   Used  (%)
-----
R1_FC_Pool     FBA   10723   9970   753   7
-----
Total          10723   9970   753
}
}
```

Legend:

Tier Type : DP = Disk Group Provisioning, VP = Virtual Pools

Creating an external tier

To create an external tier, run:

```
symtier -sid 0398 create -name VP_R0_FTS -tgt_unprotected -external -vp
```

This command created an empty Symmetrix VP tier, with target protection type of unprotected, with an external location.

Note: External tiers can only have a RAID level of unprotected. Also, drive technology is not specified, only location.

The Symmetrix tier name was chosen to indicate the RAID protection type (RAID 0), the drive type (FTS), and the fact that it is a VP tier, VP_R0_FTS.

To create an external tier of a particular technology type, in this case SATA, run:

```
symtier -sid 0398 create -name VP_R0_FTS -tgt_unprotected -external -vp  
-technology SATA
```

Note: If no technology type is specified, the tier will default to SATA. Valid choices for technology are EFD, FC, and SATA.

The `symtier list` command can be used to verify the successful creation of the Symmetrix VP tier.

```
symtier -sid 0398 list -vp
```

```
Symmetrix ID          : 000195700398
```

```
-----  
                L          I   Logical Capacities (GB)  
                O      Target   n -----  
Tier Name       C Tech Protection Emul c Enabled   Free   Used  
-----  
VP_R0_FTS       X SATA Unprotected N/A S      0       0       0  
VP_R1_FC        I FC   RAID-1      FBA S    10723   9974   749
```

Legend:

Disk (Loc)ation : I = Internal, X = External

Flgs:

(I)nc Type : S = Static, D = Dynamic

(D)yn Discovery : X = Enabled, . = Disabled, - = N/A

Once the empty tier has been created, thin pools can be added to it, again using the `symtier` command.

To add a thin pool to the external tier, run:

```
symtier -sid 0398 add -tier_name VP_R0_FTS -pool R0_FTS_Pool
```

To add more than one thin pool to the tier, the following can be run:

```
symtier -sid 0398 add -tier_name VP_R0_FTS -pool R0_FTS_Pool1,R0_FTS_Pool2
```

Once the pool, or pools, has been added, details on the tier can be seen by using the `symtier show` command, as follows:

```
symtier -sid 0398 show -tier_name VP_R0_FTS
```

```
Symmetrix ID          : 000195700398

Tier Name              : VP_R0_FTS
Tier Type              : VP
Disk Location          : External
Technology              : FC
Target Protection      : Unprotected
Emulation              : FBA
Include Type           : Static

Thin Pools(1)
{
-----
                Logical Capacities (GB)
Pool Name      Dev  ----- Full
                Emul  Enabled   Free   Used  (%)
-----
R0_FTS_Pool    FBA      1078   1078    0    0
-----
Total                1078   1078    0
}
}
```

Legend:

Tier Type : DP = Disk Group Provisioning, VP = Virtual Pools

Modifying an external tier

It is possible to change the technology type associated with an external tier in order to change the performance expectations of that tier.

However, to do so leads to the tier's ranking being changed in any policy

it is included in.

To change the technology type of an external tier, in this case to FC, run:

```
symtier -sid 0398 modify -tier_name VP_R0_FTS -technology FC
```

Note: The technology type of an external tier may be changed in order to raise or lower the performance expectations of the tier.

Symmetrix tier list information

After additional VP tiers have been created, information on all the VP tiers in the Symmetrix array can be viewed by running:

```
symtier -sid 0398 list -vp
```

```
Symmetrix ID          : 000195700398
```

```
-----  
                                L           I   Logical Capacities (GB)  
                                O   Target   n -----  
Tier Name                    C Tech Protection Emul c Enabled   Free   Used  
-----  
VP_R0_FTS                    X FC   Unprotected FBA S    1078   1078   0  
VP_R1_FC                      I FC   RAID-1     FBA S    10723  9976   747  
VP_R53_EFD                    I EFD  RAID-5(3+1) FBA S    4395   4395   0  
VP_R6_SATA                    I SATA RAID-6(6+2) FBA S    10240  9589   651
```

Legend:

Disk (Loc)ation : I = Internal, X = External

Flgs:

(I)nc Type : S = Static, D = Dynamic

(D)yn Discovery : X = Enabled, . = Disabled, - = N/A

More expansive details, including the pools contained in each tier, can be viewed by running:

```
symtier -sid 0398 list -vp -v
```

```
Symmetrix ID          : 000195700398
```

```

Tier Name          : VP_R0_FTS
Tier Type          : VP
Disk Location      : External
Technology         : FC
Target Protection  : Unprotected
Emulation          : FBA
Include Type       : Static

```

Thin Pools(1)

```

{
-----
                Logical Capacities (GB)
Pool Name      Dev ----- Full
                Emul Enabled   Free   Used (%)
-----
R0_FTS_Pool    FBA      1078   1078    0    0
-----
Total          1078   1078    0
}

```

```

Tier Name          : VP_R1_FC
Tier Type          : VP
Disk Location      : Internal
Technology         : FC
Target Protection  : RAID-1
Emulation          : FBA
Include Type       : Static

```

Thin Pools(1)

```

{
-----
                Logical Capacities (GB)
Pool Name      Dev ----- Full
                Emul Enabled   Free   Used (%)
-----
R1_FC_Pool     FBA     10723   9977    746    6
-----
Total          10723   9977    746
}

```

```

Tier Name          : VP_R53_EFD
Tier Type          : VP
Disk Location      : Internal
Technology         : EFD
Target Protection  : RAID-5 (3+1)
Emulation          : FBA

```

Include Type : Static

Thin Pools(1)

```
{
-----
                        Logical Capacities (GB)
Pool Name      Dev  ----- Full
              Emul  Enabled   Free   Used  (%)
-----
R53_EFD_Pool  FBA      4395   4395    0    0
-----
Total                4395   4395    0
}
```

Tier Name : VP_R6_SATA
Tier Type : VP
Disk Location : Internal
Technology : SATA
Target Protection : RAID-6(6+2)
Emulation : FBA
Include Type : Static

Thin Pools(1)

```
{
-----
                        Logical Capacities (GB)
Pool Name      Dev  ----- Full
              Emul  Enabled   Free   Used  (%)
-----
R6_SATA_Pool  FBA     10240   9589   651   6
-----
Total                10240   9589   651
}
```

Legend:

Tier Type : DP = Disk Group Provisioning, VP = Virtual Pools

The Free column indicates the sum of the unallocated space of all the thin pools included in the tier.

The Used column displays the total pool-allocated capacity for all thin pools in the tier.

The Enabled column is total enabled capacity for all thin pools in the tier.

Note: For the Used values, all allocated capacity is counted, including capacity allocated on data devices that may be disabled. In this case, it is possible for the Used value to be greater than the Enabled value.

Creating a Symmetrix FAST policy

A FAST policy defines the upper usage limits for up to three tiers for any storage groups associated with the policy.

When creating a FAST policy, the following information must be known:

- ◆ The FAST policy name
- ◆ The VP tiers (maximum of four) to be used in the policy
- ◆ The upper usage limits for each of the VP tiers being added

Once this information has been decided, the FAST policy can be created by running:

```
symfast -sid 0398 -fp create -name System_Optimization
```

Symmetrix tiers can then be added, one at a time, by running:

```
symfast -sid 0398 -fp -fp_name System_Optimization add -tier_name VP_R1_FC
symfast -sid 0398 -fp -fp_name System_Optimization add -tier_name VP_R53_EFD
-max_sg_percent 100
symfast -sid 0398 -fp -fp_name System_Optimization add -tier_name
VP_R614_SATA -max_sg_percent 100
```

Note: The `-max_sg_percentage` parameter is optional. If not included in the command, the percentage value defaults to 100 percent.

The creation of the FAST policy can be verified by running:

```
symfast -sid 0398 show -fp_name System_Optimization

Symmetrix ID           : 000195700398

Policy Name            : System_Optimization
Emulation              : FBA
```

Tiers (3)

```
{
-----
                                L
Tier Name                        Type  Max SG O   Target      Flgs
                                Percent C Tech Protection  C
-----
VP_R53_EFD                       VP      100 I EFD   RAID-5(3+1)  .
VP_R1_FC                          VP      100 I FC    RAID-1       .
VP_R6_SATA                        VP      100 I SATA  RAID-6(6+2)  .
}
```

No Storage Groups associated with Policy System_Optimization

Legend:

Tier Type : DP = Disk Group Provisioning, VP = Virtual Pools
Disk (Loc)ation : I = Internal, X = External

Flgs:

(C)ompression : X = Compression Capable, . = Not Compression Capable

FAST policy list information

After additional policies have been created, information on all FAST policies in the Symmetrix array can be viewed by running:

```
symfast -sid 0398 list -fp
```

Symmetrix ID : 000195700398

```
-----
Policy Name                Tiers Assocs
-----
Custom                     4         0
No_EFD                     3         0
System_Optimization        3         0
```

Creating a Symmetrix storage group

A storage group logically combines Symmetrix devices to be managed together. The creation and management of storage groups are performed using the `symsg` command.

When creating a storage group, the following information must be known:

- ◆ The storage group name
- ◆ The Symmetrix devices to be added to the group

Once this information has been decided, the storage group can be created by running:

```
symsg -sid 0398 create VP_ProdApp1
```

Devices can be added to the storage group in a number of ways:

- ◆ One device at a time

```
symsg -sid 0398 -sg VP_ProdApp1 add dev 2B0
```

- ◆ A contiguous range of devices

```
symsg -sid 0398 -sg VP_ProdApp1 addall devs -range 2B0:2E0
```

- ◆ A comma-separated list of devices

```
symsg -sid 0398 -sg VP_ProdApp1 addall devs -devs 2B0,2C0,2D0,2E0
```

- ◆ A comma-separated list of devices and device ranges

```
symsg -sid 0398 -sg VP_ProdApp1 addall devs -devs 2B0,2C0:2E0
```

- ◆ A device file

```
symsg -sid 0398 -sg VP_ProdApp1 addall devs -file mydevices.txt
```

To verify the successful creation of the storage group, and the addition of the devices, run:

```
symsg -sid 0398 show VP_ProdApp1
```

```
Name: VP_ProdApp1
```

```
Symmetrix ID           : 000195700398
Last updated at        : Wed Apr 25 14:37:25 2012
Masking Views          : No
FAST Policy            : No
FE Quota               : None
FE Quota Max (MB/Sec)  : N/A
FE Quota Max (IO/Sec)  : N/A
Number of Storage Groups : 0
Storage Group Names    : N/A
```

```
Devices (4):
```

```
{
```

```
-----
Sym          Device          Cap
Dev  Pdev Name  Config      Sts  (MB)
-----
02B0  N/A        TDEV                RW  276210
02C0  N/A        TDEV                RW  276210
02D0  N/A        TDEV                RW  276210
02E0  N/A        TDEV                RW  276210
}
```

Storage group list information

The `symsg list` command is available with several options to provide information for storage groups, including:

- ◆ The names of all created storage groups
- ◆ Whether the storage group is associated with a FAST policy
- ◆ Whether the storage group is used in a masking view
- ◆ The cascaded status of the storage group
- ◆ Whether a front-end quota is defined for the storage group
- ◆ The number of devices in each storage group
- ◆ The number of child storage groups, if the group is a parent SG

```
symmsg -sid 0398 list
```

S T O R A G E G R O U P S

```
Symmetrix ID:           000195700398
```

Storage Group Name	Flags	Number FMSQ Devices	Child SGs
licoa036	.X..	6	0
SBO_CLUSTER	.X..	30	0
VP_Development	.X..	2	0
VP_ProdApp1	.X..	4	0
VP_ProdApp2	.X..	4	0

Legend:

Flags:

(F)ast Policy, X = Associated with Fast Policy, . = N/A
(M)asking View, X = Contained in Mask View(s), . = N/A
Cascade (S)tatus, P = Parent SG, C = Child SG, . = N/A
Front End (Q)uota, D = FE Quota Defined, S = FE Quota Shared, . = N/A

Associating a storage group with a FAST VP policy

Associating a storage group with a FAST VP policy brings the devices in the storage group under FAST VP control. All devices in the storage group are considered candidates to have data moved between the tiers included in the policy the storage group is associated with.

When creating a FAST policy association, the following information must be known:

- ◆ The FAST policy name
- ◆ The storage group name
- ◆ The priority of the storage group within the policy

Once this information has been decided, the association is performed by running:

```
symfast -sid 0398 -fp_name System_Optimization associate -sg VP_ProdApp1
```

To verify the successful association of the storage group to the FAST policy, run:

symfast -sid 0398 show -association -sg VP_ProdApp1

Symmetrix ID : 000195700398

Storage Group : VP_ProdApp1

Thin Devices(4)

```
{
-----
      Flgs Dev      Total Bound      Allocated
Sym  PC  Emul      Tracks Pool Name      Tracks
-----
02B0 ..  FBA      4419360 R1_FC_Pool      1168860
02C0 ..  FBA      4419360 R1_FC_Pool      1170600
02D0 ..  FBA      4419360 R1_FC_Pool      1166676
02E0 ..  FBA      4419360 R1_FC_Pool      1216356

Total          -----
Tracks          17677440          4722492
      GBs          1079          288
}
```

Policy Name : System_Optimization

Priority : 2

RDF Coordination : Disabled

Tiers(3)

```
{
-----
                                L
                                Max SG O      Target      Flgs
Tier Name                        Type  Percent C Tech  Protection  C
-----
VP_R53_EFD                        VP      100 I EFD  RAID-5(3+1)  .
VP_R1_FC                          VP      100 I FC   RAID-1        .
VP_R6_SATA                        VP      100 I SATA RAID-6(6+2)  .
}
```

Legend:

Tier Type: DP = Disk Group Provisioning, VP = Virtual Pools

Device Flags:

(P)inned : Y = Device is Pinned, N = Device is not Pinned
 (C)ompression : X = Device is Compressed, . = Device is not Compressed
 Tier Flags:
 Disk (Loc)ation : I = Internal, X = External
 (C)ompression : X = Compression Capable, . = Not Compression Capable

When additional associations have been made, all storage groups associations can be viewed by running:

symfast -sid 0398 list -association

Symmetrix ID : 000195700398

Storage Group Name	Policy Name	Pri	Flgs
VP_Development	No_EFD	2	.
VP_ProdApp1	System_Optimization	2	.
VP_ProdApp2	Custom	2	.

Legend:

Flgs:

(R)DF Coordination : X = Enabled, . = Disabled

Modifying a storage group's priority in a FAST policy

After a storage group has been associated with a FAST policy, it is possible to modify the priority of the storage group within the policy, using the `symfast` command.

To modify the storage group's priority in the FAST policy, run the following command:

symfast -sid 0398 -fp_name System_Optimization modify -sg VP_ProdApp1 -priority 1

To verify the priority of the storage group was changed successfully, run:

symfast -sid 0398 list -association

Symmetrix ID : 000195700398

Storage Group Name	Policy Name	Pri	Flgs
--------------------	-------------	-----	------

-----			R
VP_Development	No_EFD	2	.
VP_ProdApp1	System_Optimization	1	.
VP_ProdApp2	Custom	2	.

Legend:

Flgs:

(R)DF Coordination : X = Enabled, . =

Enabling/disabling SRDF coordination

By default, SRDF coordination is disabled for any storage group associated with a FAST policy. SRDF coordination may be enabled on a storage group while it is being associated with a policy, or it may be enabled after the group has been associated.

To enable SRDF coordination during association, run:

```
symfast -sid 0398 -fp_name Custom associate -sg VP_ProdApp2
-priority 2 -rdf_coordination ENABLE
```

To enable SRDF coordination after the association, run:

```
symfast -sid 0398 -fp_name Custom modify -sg VP_ProdApp2
-rdf_coordination ENABLE
```

To verify that SRDF coordination has been enabled, run:

```
symfast -sid 0398 list -association
```

```
Symmetrix ID          : 000195700398
```

-----			R
Storage Group Name	Policy Name	Pri	Flgs
VP_Development	No_EFD	2	.
VP_ProdApp1	System_Optimization	1	.
VP_ProdApp2	Custom	2	X

Legend:

Flgs:

(R)DF Coordination : X = Enabled, . =

To disable SRDF coordination on a storage group associated with a policy, run:

```
symfast -sid 0398 -fp_name Custom modify -sg VP_ProdApp2
-rdf_coordination DISABLE
```

Reassociating a storage group to a different FAST VP policy

To move a storage group from one FAST policy to another, run:

```
symfast -sid 0398 -sg VP_ProdApp2 reassociate -fp_name System_Optimization
```

To verify the successful reassociation of the storage group to the FAST policy, run:

```
symfast -sid 0398 list -association
```

Symmetrix ID : 000195700398

```
-----
Storage Group Name          Policy Name                Pri Flgs
                             R
-----
VP_Development             No_EFD                    2 .
VP_ProdApp1                System_Optimization       1 .
VP_ProdApp2                System_Optimization       2 X
```

Legend:

Flgs:

(R)DF Coordination : X = Enabled, . = Disabled

Note: During the reassociation, any attributes of the association (such as priority or SRDF coordination) that have been changed from the default are maintained with the new policy.

Modifying a Symmetrix tier in a FAST policy

After some time, it may be determined that the upper usage limit of a particular tier within a FAST policy needs to be adjusted. This can be done dynamically through the `symfast` command.

If any storage groups are associated with the policy being modified, the change in the usage limit cannot cause the sum of the usage limits for all tiers in the policy to fall below 100 percent. In this case, the Custom policy is modified. The current tier percentages can be viewed by running:

```
symfast -sid 0398 show -fp_name Custom
```

```
Symmetrix ID          : 000195700398
```

```
Policy Name           : Custom
```

```
Emulation              : FBA
```

```
Tiers (4)
```

```
{
-----
                                L
Tier Name                        Type  Max SG O   Target      Flgs
                                Percent C Tech Protection  C
-----
VP_R53_EFD                       VP      10 I EFD  RAID-5 (3+1)  .
VP_R1_FC                          VP      20 I FC   RAID-1         .
VP_R0_FTS                         VP     100 X SATA Unprotected   .
VP_R6_SATA                       VP     100 I SATA RAID-6 (6+2)  .
}
```

```
Storage Groups (1)
```

```
{
-----
Storage Group Name              Pri
-----
VP_ProdApp2                     2
}
```

```
Legend:
```

Tier Type : DP = Disk Group Provisioning, VP = Virtual Pools
Disk (Loc)ation : I = Internal, X = External

Flgs:
(C)ompression : X = Compression Capable, . = Not Compression
Capable

To modify the usage limit for a Symmetrix tier within a policy, run:

```
symfast -sid 0398 -fp -fp_name Custom modify -tier_name VP_R1_FC  
-max_sg_percent 50
```

In this case, the percentage of capacity allowed on the V_R1_FC tier was increased from 20 percent to 50 percent.

To verify the change was successful, run:

```
symfast -sid 0398 show -fp_name Custom
```

Symmetrix ID : 000195700398

Policy Name : Custom

Emulation : FBA

Tiers(4)

```
{  
-----  
L  
Max SG O Target Flgs  
Tier Name Type Percent C Tech Protection C  
-----  
VP_R53_EFD VP 10 I EFD RAID-5(3+1) .  
VP_R1_FC VP 50 I FC RAID-1 .  
VP_R0_FTS VP 100 X SATA Unprotected .  
VP_R6_SATA VP 100 I SATA RAID-6(6+2) .  
}
```

Storage Groups(1)

```
{  
-----  
Storage Group Name Pri  
-----  
VP_ProdApp2 2  
}
```

Legend:

Tier Type : DP = Disk Group Provisioning, VP = Virtual Pools
Disk (Loc)ation : I = Internal, X = External

Flgs:

(C)ompression : X = Compression Capable, . = Not Compression Capable

Enabling FAST VP compression

In order for FAST VP to automatically compress data, a FAST policy must include at least one tier that contains a thin pool that has been enabled for compression. Also, the FAST VP Time to Compress parameter should be set to a value in the range of 40 to 400 days.

The following sections show how to enable compression on a pool, as well as identifying policies that are capable of compressing data.

Enabling compression on a thin pool

To enable compression on a thin pool, run:

```
symconfigure -sid 0398 -cmd "set pool R6_SATA_Pool, type=thin, vp_compression=ENABLE;" commit
```

```
Execute a symconfigure operation for symmetrix '000195700398' (y/[n]) ? y
```

```
A Configuration Change operation is in progress. Please wait...
```

```
Establishing a configuration change session.....Established.  
Performing Access checks.....Allowed.  
Checking Device Reservations.....Allowed.  
Committing configuration changes.....Reordering.  
Setting pool attributes .....Done.  
Committing configuration changes.....Committed.  
Terminating the configuration change session.....Done.
```

```
The configuration change session has successfully completed.
```

To verify that the pool is now enabled for compression, run:

```
symcfg -sid 0398 show -pool R6_SATA_Pool -thin -detail
```

Symmetrix ID: 000195700398

```
Symmetrix ID           : 000195700398
Pool Name              : R6_SATA_Pool
Pool Type              : Thin
Disk Location          : Internal
Technology             : SATA
Dev Emulation          : FBA
Dev Configuration     : RAID-6(6+2)
Pool State             : Enabled
Compression State    : Enabled
# of Devices in Pool   : 128
# of Enabled Devices in Pool : 128
# of Usable Tracks in Pool : 167771136
# of Allocated Tracks in Pool : 12314676
# of Tracks saved by compression : 0
# of Shared Tracks in Pool : 0
Pool Utilization (%)   : 7
Pool Compression Ratio (%) : 0
Max. Subscription Percent : None
Rebalance Variance    : 1%
Max devs per rebalance scan : 256
Pool Reserved Capacity : None
```

Enabled Devices(128):

```
{
-----
Sym      Usable      Alloc      Free Full FLG Device
Dev      Tracks      Tracks      Tracks (%) S  State
-----
053B     1310712      96120      1214592  7 . Enabled
053C     1310712      96036      1214676  7 . Enabled
053D     1310712      96300      1214412  7 . Enabled
...

```

Viewing a compression-capable policy

To see if a tier in a policy is capable of compressing data, run:

```
symfast -sid 0398 show -fp_name System_Optimization
```

```
Symmetrix ID           : 000195700398
```

```
Policy Name            : Platinum
```

```
Emulation              : FBA
```

Tiers(3)

```

{
-----
                                L
Tier Name                        Type  Max SG O   Target      Flgs
                                Percent C Tech Protection  C
-----
VP_R53_EFD                       VP      100 I EFD   RAID-5(3+1)  .
VP_R1_FC                          VP      100 I FC    RAID-1        .
VP_R6_SATA                        VP      100 I SATA RAID-6(6+2)  X
}

```

Storage Groups(1)

```

{
-----
Storage Group Name                Pri
-----
VP_ProdApp1                       1
}

```

Legend:

Tier Type : DP = Disk Group Provisioning, VP = Virtual Pools
Disk (Loc)ation : I = Internal, X = External

Flgs:

(C)ompression : X = Compression Capable, . = Not Compression Capable

Controlling FAST device movement

Aside from using the FAST controller device movement window, there are several other ways of controlling when device movements can take place. These include:

- ◆ Disabling the FAST controller
- ◆ Pinning devices under FAST VP control
- ◆ Changing the data-movement mode
- ◆ Modifying data-movement windows

Monitoring FAST VP status

The current status and current activity of FAST VP can be monitored using SYMCLI by means of the FAST status report. Information provided by this report includes:

- ◆ The FAST VP state
- ◆ Degraded reason
- ◆ FAST VP Current Activities
- ◆ FAST VP Performance Time Window state
- ◆ FAST VP Move Time Window state

To display the FAST status report, run:

```
symfast -sid 0398 list -state -vp
```

```
Symmetrix ID: 000195700398
```

```
FAST VP State           : Enabled
Reason(s)               : N/A
FAST VP Current Activities : Idle
FAST VP Perf Time Window : Open
FAST VP Move Time Window : Open
```

The FAST VP state is typically Enabled, Disabled, or Degraded. If the state is degraded, a reason is listed.

Note: For more information on possible state values and degraded reason codes, see “Appendix A: FAST VP state” on page 157.

FAST VP current activities are displayed as either Idle or Running Plan. An activity of Idle indicates that there are currently no active data-movement tasks related to FAST VP in the array. Running Plan indicates that data is actively being moved at the sub-LUN level for thin devices.

The state of the performance and move time windows are displayed as Open or Closed. Windows are considered open if the current time corresponds to a defined inclusion time window. Similarly, the windows are considered closed if the current time falls outside of any defined inclusion windows.

Note: The FAST VP move time window is displayed as closed if the data-movement mode is Off, regardless of any defined inclusion time windows.

Enabling/disabling FAST VP

In order for FAST VP to perform device movements, it must first be enabled on the Symmetrix array.

The state of the controller can be changed using the `symfast` command.

If disabled, FAST VP can be enabled by running:

```
symfast -sid 0398 enable -vp
```

```
Execute ENABLE operation for FAST (y/[n]) ? y
```

```
The FAST ENABLE operation finished successfully
```

If enabled, the FAST controller can be disabled by running:

```
symfast -sid 0398 disable -vp
```

```
Execute DISABLE operation for FAST (y/[n]) ? y
```

```
The FAST DISABLE operation finished successfully
```

Pinning a thin device under FAST VP control

Pinning a device that is associated with a FAST VP policy prevents any data movement for that device. Devices can be pinned individually, by device range, or device file, using the `symdev` command. Devices may also be pinned by storage group or device group, using the `symsg` and `symdg` commands, respectively.

To pin an individual device, run:

```
symdev -sid 0398 pin 2B0
```

```
Execute a 'Pin' Device operation for device '2B0' (y/[n]) ? y
```


'Pin' Device operation successfully completed for the device.

To pin a range of devices, run:

```
symdev -sid 0398 pin -range 2B0:2E0
```

Execute a 'Pin' operation for devices in range '2b0' to '2e0' (y/[n]) ? y

'Pin' operation succeeded for devices in RANGE 2B0:2E0.

To pin all the devices in a device file, run:

```
symdev -sid 0398 pin -file my_devices.txt
```

Execute a 'Pin' operation for devices in file 'my_devices.txt' (y/[n]) ? y

'Pin' operation succeeded for devices in file 'my_devices.txt'.

To pin all devices in a storage group, run:

```
symsg -sid 0398 -sg VP_ProdApp1 pin
```

Execute a 'Pin' Device operation for all devices
in storage group 'VP_ProdApp1' (y/[n]) ? y

'Pin' Device operation successfully completed for the storage group.

To pin all devices in a device group, run:

```
symdg -g VP_ProdApp1 pin
```

Execute a 'Pin' Device operation for all devices
in device group 'VP_ProdApp1' (y/[n]) ? y

'Pin' Device operation successfully completed for the device group.

Unpinning a thin device under FAST VP control

After a device has been pinned, in order for FAST VP to resume data movements on the device, it must be unpinned.

Devices can be unpinned individually, by device range, or device file, using the `symdev` command. Devices may also be unpinned by storage group or device group, using the `symsg` and `symdg` commands, respectively.

To unpin an individual device, run:

```
symdev -sid 0398 unpin 2B0
```

```
Execute a 'Unpin' Device operation for device '2B0' (y/[n]) ? y
```

```
'Unpin' Device operation successfully completed for the device.
```

To unpin a range of devices, run:

```
symdev -sid 0398 unpin -range 2B0:2E0
```

```
Execute a 'Unpin' operation for devices in range '2b0' to '2e0' (y/[n]) ? y
```

```
'Unpin' operation succeeded for devices in RANGE 2B0:2E0.
```

To unpin all the devices in a device file, run:

```
symdev -sid 0398 unpin -file my_devices.txt
```

```
Execute a 'Unpin' operation for devices in file 'my_devices.txt' (y/[n]) ? y
```

```
'Unpin' operation succeeded for devices in file 'my_devices.txt'.
```

To unpin all devices in a storage group, run:

```
symmsg -sid 0398 unpin -sg VP_ProdApp1
```

```
Execute a 'Unpin' Device operation for all devices  
in storage group 'VP_ProdApp1' (y/[n]) ? y
```

```
'Unpin' Device operation successfully completed for the storage group.
```

To unpin all devices in a device group, run:

```
symdg -g VP_ProdApp1 unpin
```

```
Execute a 'Unpin' Device operation for all devices  
in device group 'VP_ProdApp1' (y/[n]) ? y
```

```
'Unpin' Device operation successfully completed for the device group.
```

Modifying the copy pace of a FAST device movement

Symmetrix quality of service (QoS) tools can be used to control the pace at which data is copied for individual devices during FAST VP data movements. This is in addition to the system-wide relocation-rate setting that applies to all thin devices associated with a FAST VP policy. The QoS setting that needs to be changed is the VLUN copy pace.

To change this setting, the `symqos` command can be run against a device group or a storage group.

To change the VLUN QoS setting on all devices in a device group, run:

```
symqos -g VP_ProdApp1 set VLUN pace 8
```

To verify the change was successful, run:

```
symqos -g VP_ProdApp1 list
```

```
Device Group (DG) Name: VP_ProdApp1
DG's Type           : REGULAR
DG's Symmetrix ID   : 000195700398
```

Device Name		Copy Pace					
Sym	Physical	Config	BCV	RDF	MIR	CLN	VLN
2B0	Not Visible	TDEV	0	0	0	0	8
2B1	Not Visible	TDEV	0	0	0	0	8
2B2	Not Visible	TDEV	0	0	0	0	8
...							
2ED	Not Visible	TDEV	0	0	0	0	8
2EE	Not Visible	TDEV	0	0	0	0	8
2EF	Not Visible	TDEV	0	0	0	0	8

Rebinding a thin device

While FAST VP moves data at the sub-LUN level between device pools, the thin devices associated with a policy still remain bound to a single pool. Any new allocations that occur as the result of a host write come from the bound pool.

The thin device rebind feature allows the binding information for a thin device to be changed, without changing the current allocation of data across pools.

Note: If the devices being rebound are associated with a FAST VP Policy, only pools that are contained within the policy can be specified as the new bind pool.

In this example, to rebound thin device 2B0 to the RAID 6 protected SATA thin pool, R6_SATA_Pool, run:

```
symconfigure -sid 0398 -cmd "rebind tdev 90D to pool R6_SATA_Pool;" commit
```

In this example, to rebound a range of thin devices, 2B0 through 2E0, to the R6_SATA_Pool thin pool, run:

```
symconfigure -sid 0398 -cmd "rebind tdev 90D:925 to pool R6_SATA_Pool;" commit
```

In this example, to rebound all the thin devices in the VP_ProdApp1 storage group to the R6_SATA_Pool thin pool, run:

```
symconfigure -sid 0398 -cmd "rebind tdev in SG VP_ProdApp1 to pool R6_SATA_Pool;"  
commit
```

In this example, to rebound all the thin devices in the VP_ProdApp1 device group to the R6_SATA_Pool thin pool, run:

```
symconfigure -sid 0398 -cmd "rebind tdev in DG VP_ProdApp1 to pool R6_SATA_Pool;"  
commit
```

Removing FAST managed objects

The following sections detail the SYMCLI commands used to break each of the associations and to remove each of the managed objects.

Disassociating a storage group from a FAST policy

Disassociating a storage group from a FAST VP policy removes the devices in the storage group from FAST VP control. Devices no longer under FAST VP control will not have data automatically moved between tiers.

To disassociate a storage group from a FAST policy, run:

```
symfast -sid 0398 -fp_name System_Optimization disassociate -sg VP_ProdApp1
```

Removing a Symmetrix tier from a FAST policy

As previously stated, the sum of the upper usage limits for each Symmetrix tier contained in a policy must total a minimum of 100 percent. If a policy has associated storage groups, the removal of a tier will fail if in doing so causes the total tier usage limits to drop below 100 percent.

To successfully remove a Symmetrix tier from a FAST policy, the upper usage limits of the remaining tiers must be modified in order that they total more than 100 percent. Alternatively, the Symmetrix tier can be removed if all storage group associations for the policy are removed in advance.

To remove a Symmetrix tier from a FAST policy, run:

```
symfast -sid 0398 -fp -fp_name System_Optimization remove -tier_name VP_R1_FC
```

Deleting a FAST policy

A FAST policy may not be deleted if any storage groups are associated with the policy. Prior to deleting the policy, all storage group associations should be removed. Also, prior to deleting a policy, all tiers contained in the policy should be removed.

To delete a FAST policy, run:

```
symfast -sid 0398 delete -fp -fp_name System_Optimization
```

Deleting a Symmetrix VP tier

If you want to delete a VP tier, it cannot be included within any FAST policy on the Symmetrix array.

To delete a VP tier, run:

```
symtier -sid 0398 delete -tier_name VP_R53_EFD
```

Deleting a storage group

Before deleting a storage group, the group should not be associated with any FAST VP policy.

To delete a storage group, run:

```
symsg -sid 0398 delete VP_ProdApp1
```

A storage group that contains devices may be deleted by adding the `-force` option to the `symsg delete` command.

Note: Since storage groups may also be used for the purposes of FAST and Auto-provisioning, prior to deleting the storage group, you must delete any masking views that use the storage group.

Reporting

Both Solutions Enabler and Unisphere for VMAX provide two types of capacity-utilization reports to assist in monitoring the FAST VP environment: Compliance reports and technology demand reports.

The compliance report displays tier utilization for all storage groups associated with FAST policies, disk-group provisioning (DP), or Virtual Provisioning (VP). The report displays compliance for each storage group individually. The compliance report does not account for competition among storage groups sharing a policy or capacity consumed by devices not under FAST control.

The technology demand report provides detail on thin-capacity utilization and demand from the point of view of the technology type and tier definitions.

There are also reports that show the allocation of thin devices across multiple pools, due to FAST VP data movements, as well as the utilization of capacity within a thin pool for devices not bound to that pool.

The following sections discuss each of these reports.

Compliance reporting

A storage group is considered to be compliant with the FAST policy it is associated with when all the devices in the storage group are fully configured within the bounds of the upper usage limits for each tier contained within the policy.

The information contained in the compliance report includes:

- ◆ FAST policy name
- ◆ Associated storage group name
- ◆ Associated Symmetrix tiers
- ◆ Storage group usage of associated Symmetrix tiers

Each compliance report output contains the following values for each tier included in the policy:

- ◆ Type: Indicates whether the tiers included in the policy are disk-group provisioning (DP) or Virtual Provisioning (VP). All tiers in a

- FAST policy can only be of a single type.
- ◆ Target Prot: Displays the RAID protection associated with the tier, based on the thin pools that are included in the tier.
 - ◆ Max SG Percent: Indicates the maximum usage limit, as a percentage, of the storage group's configured capacity per tier. This upper usage limit is as defined in the FAST policy.
 - ◆ Max SG Demand: Shows the calculated upper limit, in GB, for the storage group on the tier, based on the configured capacity of the storage group.
 - ◆ FAST SG Usage: Shows the current occupancy of the storage group's allocated capacity in a Symmetrix tier.
 - ◆ Growth: Indicates how much additional capacity of the storage group can be added to that tier, as determined by the FAST policy.

Note: If the growth value is negative, the storage group has exceeded the capacity limit for the tier and is considered to be noncompliant.

Note: The compliance report does not take into account any compression that may have taken place on devices within the SG. Only the logical capacity consumption is considered.

SYMCLI

The `symfast` command can be run with certain options to determine current capacity usage by storage groups of the Symmetrix tiers contained within their associated FAST policies. The report indicates the compliance of the storage group within the FAST policy or any noncompliance, including storage that is out of policy.

To list the association, and storage demand, of all storage groups under FAST VP control, the following command can be run:

```
symfast -sid 0398 list -association -demand
```

```
Symmetrix Id      : 000195700398  
Policy Name      : Custom  
Storage Group    : VP_ProdApp2
```


Priority : 2
 RDF Coordination : Enabled
 Tiers (4)

```
{
-----
                                Logical Capacities (GB)
                                -----
                                Ty      Max
                                p Target SG
                                e Prot  ()
Name                               Demand  Usage  Growth
-----
VP_R53_EFD                         VP R5(3+1)  10      108      90      +18
VP_R1_FC                           VP R1       50      540     124     +416
VP_R0_FTS                          VP Unprot  100     1079    108     +971
VP_R6_SATA                         VP R6(6+2) 100     1079    149     +930

      Total                               -----
                                          2806    471
}
```

Policy Name : No_EFD
 Storage Group : VP_Development
 Priority : 2
 RDF Coordination : Disabled
 Tiers (3)

```
{
-----
                                Logical Capacities (GB)
                                -----
                                Ty      Max
                                p Target SG
                                e Prot  ()
Name                               Demand  Usage  Growth
-----
VP_R1_FC                         VP R1       50      270     178     +92
VP_R0_FTS                       VP Unprot  100     539      54     +485
VP_R6_SATA                       VP R6(6+2) 100     539     108     +431

      Total                               -----
                                          1348    340
}
```

Policy Name : System_Optimization
 Storage Group : VP_ProdApp1
 Priority : 1
 RDF Coordination : Disabled
 Tiers (3)

```
{
-----
```

Name	Tier Type	Target Prot	Max SG	Logical Capacities (GB)		
				Max Demand	FAST Usage	Growth
VP_R53_EFD	VP R5 (3+1)		100	1079	45	+1034
VP_R1_FC	VP R1		100	1079	250	+829
VP_R6_SATA	VP R6 (6+2)		100	1079	101	+978
Total				3237	396	

Legend:

Tier Type : DP = Disk Group Provisioning, VP = Virtual Pools

The compliance report can also be run for an individual storage group by running:

symfast -sid 0398 list -association -demand -sg VP_ProdApp1

Symmetrix Id : 000195700398

Policy Name : System_Optimization

Storage Group : VP_ProdApp1

Priority : 1

RDF Coordination : Disabled

Tiers (3)

Name	Tier Type	Target Prot	Max SG	Logical Capacities (GB)		
				Max Demand	FAST Usage	Growth
VP_R53_EFD	VP R5 (3+1)		100	1079	45	+1034
VP_R1_FC	VP R1		100	1079	250	+829
VP_R6_SATA	VP R6 (6+2)		100	1079	101	+978
Total				3237	396	

Legend:

Tier Type : DP = Disk Group Provisioning, VP = Virtual Pools

To see the compliance report for all storage groups associated with a particular FAST policy, run:

symfast -sid 0398 list -association -demand -fp_name Custom

Symmetrix Id : 000195700398

Policy Name : Custom
Storage Group : VP_ProdApp2
Priority : 2
RDF Coordination : Enabled
Tiers (4)

```
{
-----

```

Name	Type	Target Prot	Logical Capacities (GB)			Growth
			Max SG	Max Demand	FAST SG Usage	
VP_R53_EFD	VP R5 (3+1)		10	108	90	+18
VP_R1_FC	VP R1		50	540	124	+416
VP_R0_FTS	VP Unprot		100	1079	108	+971
VP_R6_SATA	VP R6 (6+2)		100	1079	149	+930
Total				2806	471	

```
-----
}
```

Legend:

Tier Type : DP = Disk Group Provisioning, VP = Virtual Pools

Unisphere for VMAX

Similar reports can be viewed in Unisphere for each individual storage group. When looking at the properties for a storage group, the FAST Compliance report is shown in the lower half of the window.

Details : Storage Group : VP_ProdApp1

Properties

Name	VP_ProdApp1
FAST Policy	System_Optimization
FAST Priority	1
Total Capacity (GB)	1078.95
Host Name	N/A
Volumes	4
Masking Views	0
Enable FAST VP RDF Coordination	<input type="checkbox"/>
Last Updated	2012-04-25 14:36:22
Host I/O Limit	N/A

Related Objects

Contains : [Volumes - 4](#)

Associated With : [FAST Policy - 1](#)

Create Expand Delete Apply Cancel

FAST Compliance Report

Tier	Protection	Technology	Max SG Demand (%)	Limit (GB)	Fast SG Used (GB)	Growth (GB)
VP_R53_EFD	RAID-5 (3+1)	EFD	100	+1078.95	+45.06	+1033.89
VP_R1_FC	RAID-1	FC	100	+1078.95	+264.71	+814.23
VP_R6_SATA	RAID-6 (6+2)	SATA	100	+1078.95	+100.62	+978.32

Technology demand reporting

Technology demand reporting exists to display capacity usage from the perspective of the disk technologies and defined Symmetrix tiers.

The technology demand report can be used to detect possible contention for tier resources among the thin devices under FAST VP control.

The information contained in the technology demand report for FAST VP, includes:

- ♦ Tier: Shows the names of all Symmetrix tiers that have been created on the technology type.
- ♦ Attr: Shows the status of the Symmetrix tier on the technology type. Possible values are:

- F: In a FAST policy associated with a storage group
- P: In a FAST policy, or policies, but none of the FAST policies are associated with a storage group
- N: Not in any FAST policy
- ◆ Target Prot: Indicates the target protection of the tier.
- ◆ Logical Tier Enabled: Indicates the total capacity for all enabled data devices in the thin pools included in the tier.
- ◆ Logical Tier Free: Displays the amount of unallocated space available in the tier. This is calculated as the difference between the logical tier-enabled value and the logical-tier-used value, with a minimum value of 0 (zero).
- ◆ Logical Tier Used: Shows the total capacity allocated on all data devices in the thin pools included in the tier.

Note: The allocated capacity in a thin pool may include tracks allocated on data devices that are not currently enabled (inactive or draining). As a result, the logical-tier-used capacity may actually be greater than the logical-tier-enabled capacity.

- ◆ Logical FAST SG Usage: This is the sum of the allocated capacity residing on the VP tier from the thin devices in all storage groups associated with FAST policies containing that tier.
- ◆ Logical FAST Available: Indicates the maximum logical capacity available in the tier to FAST VP. This is calculated as the sum of the logical SG usage and the logical tier free, minus the capacity reserved by the PRC value.
- ◆ Logical Max SG Demand: Displays the total amount of capacity required for all thin devices in storage groups associated with policies containing the tier to occupy the maximum allotted quota, based on the limit defined on the FAST policy.

Note: If -allocated is specified, the Max SG Demand is calculated using allocated instead of configured capacity.

- ◆ Logical Excess: Displays the difference between the available value and the max SG demand value. A positive value indicates that there is sufficient capacity to satisfy the maximum demand. A negative value indicates that there is contention among storage groups for capacity in that tier.

SYMCLI

The `symfast` command can be run with certain options to determine the current FAST VP technology demands within a Symmetrix array.

To list the thin demand for all technologies, run:

Note: The `-vp` option is required to see information pertinent to FAST VP. Leaving out `-vp` option shows information related to FAST DP.

```
symfast -sid 0398 list -demand -tech ALL -vp
```

```
Symmetrix ID : 000195700398
```

```
Technology      : EFD  
Disk Location   : Internal
```

```
VP Tiers (1)
```

```
{  
-----  
          A                      Logical Capacities (GB)  
          T                      -----  
Tier      T Target      Tier      Tier      Tier FAST SG      FAST Max SG Excess  
          R Prot      Enabled      Free      Used      Usage Avail Demand  
-----  
VP_R53_EFD F R5(3+1)      4395      4260      135      135      4350      1187 +3163  
Total  
          4395      4260      135      135      4350      1187 +3163  
}
```

```
Technology      : FC  
Disk Location   : Internal
```

```
VP Tiers (1)
```

```
{  
-----  
          A                      Logical Capacities (GB)  
          T                      -----  
Tier      T Target      Tier      Tier      Tier FAST SG      FAST Max SG Excess  
          R Prot      Enabled      Free      Used      Usage Avail Demand  
-----  
VP_R1_FC    F R1          10723      9811      912      552      8219      1888 +6331  
Total  
          10723      9811      912      552      8219      1888 +6331  
}
```

```

}

Technology      : SATA
Disk Location   : N/A

VP Tiers (1)
{
-----
          A                               Logical Capacities (GB)
          T                               -----
Tier      T Target      Tier      Tier      Tier FAST SG   FAST Max SG Excess
Tier      R Prot       Enabled   Free     Used   Usage  Avail Demand
-----
VP_R6_SATA F R6(6+2)    10240  9231   1009   358   7540   2697 +4843
Total                                     10240  9231   1009   358   7540   2697 +4843
}

```

```

Technology      : SATA
Disk Location   : External

VP Tiers (1)
{
-----
          A                               Logical Capacities (GB)
          T                               -----
Tier      T Target      Tier      Tier      Tier FAST SG   FAST Max SG Excess
Tier      R Prot       Enabled   Free     Used   Usage  Avail Demand
-----
VP_R0_FTS  F Unprot     1078   916   162   162   863   1618 -755
Total                                     1078   916   162   162   863   1618 -755
}

```

Legend:

- ATTR : F = Tier in a FAST policy associated with SG(s)
- : P = Tier in a FAST policy unassociated with SG(s)
- : N = Tier not in any FAST policy

The thin demand report can also be run for a single technology type (EFD, FC, or SATA) by running:

symfast -sid 0398 list -demand -tech EFD -vp

Symmetrix ID : 000195700398

```

Technology      : EFD
Disk Location   : Internal

```

```

VP Tiers (1)
{
-----

```

Tier	A T T Target R Prot	Logical Capacities (GB)						
		Tier Enabled	Tier Free	Tier Used	FAST SG Usage	FAST Max Avail	SG Demand	Excess
VP_R53_EFD	F R5(3+1)	4395	4260	135	135	4350	1187	+3163
Total		4395	4260	135	135	4350	1187	+3163

Legend:

ATTR : F = Tier in a FAST policy associated with SG(s)
: P = Tier in a FAST policy unassociated with SG(s)
: N = Tier not in any FAST policy

The `-v` option can be added to the previous command to provide more detailed information on the storage groups that are associated with each of the tiers that contain the disk groups of a particular technology. The `-v` option also provides summary information for each technology and each tier:

symfast -sid 0398 list -tech EFD -demand -vp -v

```
Symmetrix ID : 000195700398

Technology : EFD
Logical Tier Enabled Total (GB) : 4395
Logical Tier Free Total (GB) : 4260
Logical Tier Used Total (GB) : 135
Logical FAST SG Usage Total (GB) : 135
Logical FAST Available Total (GB) : 4350
Logical Max SG Demand Total (GB) : 1187
Logical Excess (GB) : +3163

VP Tiers (1)
{
Tier Name : VP_R53_EFD
Target Prot : R5(3+1)
Logical Tier Enabled (GB) : 4395
Logical Tier Free (GB) : 4260
Logical PRC Total (GB) : 44
Logical Tier Used (GB) : 135
```



```

Logical FAST SG Usage Total (GB)      :      135
Logical FAST Available (GB)          :      4350
Logical Max SG Demand Total (GB)     :      1187
Logical Excess (GB)                  :      +3163
Tier Status                           : Tier in a FAST policy associated with
SG(s)

```

Storage Groups (2)

```

{
-----
          P  FAST SG   Max SG
          r  Usage   Demand
SG Name   FAST      i Log (GB) Log (GB)
-----
VP_ProdApp2 Custom    2     90    108
VP_ProdApp1 System_Optim* 1     45   1079
-----
          Total                135    1187
}

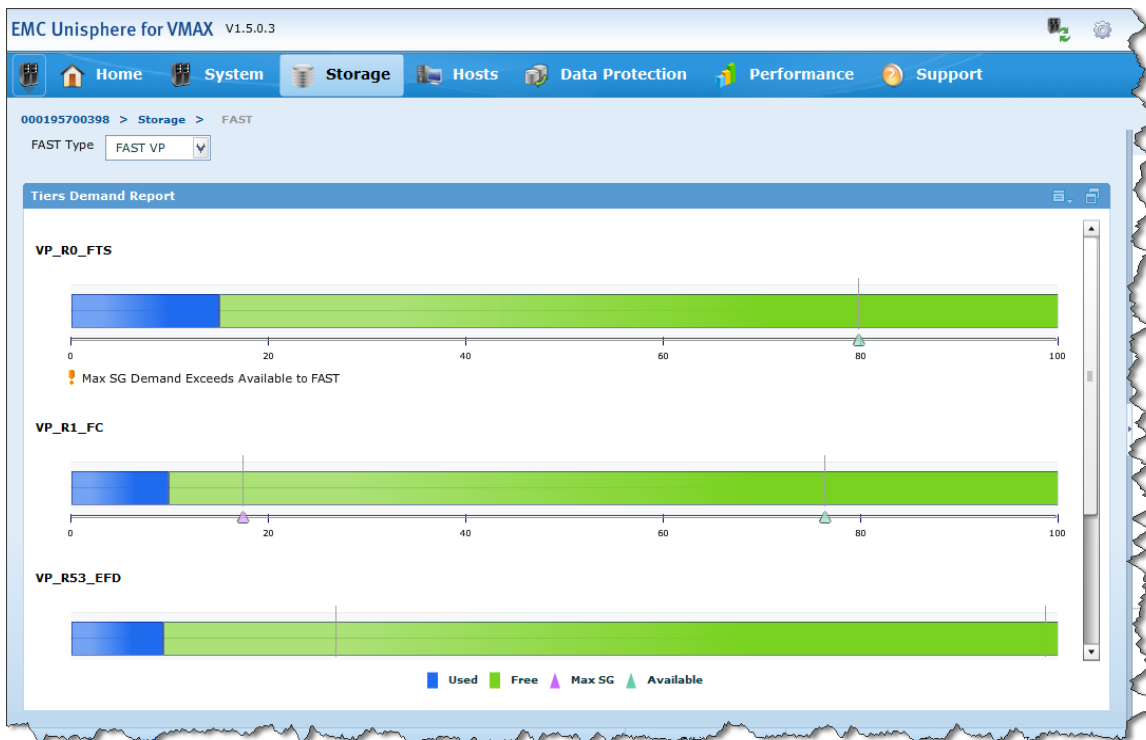
```

Unisphere for VMAX

In Unisphere, the technology demand reports can be accessed by the FAST view, located under Storage. The demand report can be viewed graphically in a chart or as a table.

The screenshot shows the EMC Unisphere for VMAX V1.5.0.3 interface. The navigation bar includes Home, System, Storage, Hosts, Data Protection, Performance, and Support. The breadcrumb path is 000195700398 > Storage > FAST. The FAST Type is set to FAST VP. The Tiers Demand Report table is displayed below.

Name	Tech + Prot	Used (GB)	Free (GB)	Maximum SG Demand (GB)	Available (GB)	Excess (GB)
VP_R0_FTS	SATA Unprotected	162	916	1618	863	-755
VP_R1_FC	FC RAID-1	926	9797	1888	8219	+6331
VP_R53_EFD	EFD RAID-5(3+1)	135	4260	1187	4350	+3163
VP_R6_SATA	SATA RAID-6(6+2)	995	9245	2697	7540	+4843



Note: The Used value shown for a tier in Unisphere is the total capacity allocated in the pools of the tier for all thin devices and not just those managed by FAST VP.

Thin pool utilization

As FAST VP migrates data between thin pools at the sub-LUN level, the thin devices that are under FAST VP control remain bound to a single pool. Each thin pool in the Symmetrix array has the possibility of having data allocated not only from the devices bound to it, but also from thin devices bound to other pools.

The thin pool utilization report can be used to determine how much capacity of the pool is currently allocated. The report provides a

breakdown of the capacity allocated to devices bound to the thin pool. It also details information on the allocation to thin devices bound to other pools (capacity allocated as a result of FAST VP data movements).

The information contained in the thin pool utilization report includes:

- ◆ Pool Name: The name of pool for which the report was generated.
- ◆ Pool Type: The type of pool being viewed (in this case, it is thin).
- ◆ Disk Location: Whether the pool is configured on internal or external storage.
- ◆ Technology: The drive type the pool is configured on (EFD, FC, or SATA).
- ◆ Dev Emulation: The device emulation of the data devices contained in the pool.
- ◆ Dev Configuration: The RAID protection type of the data devices contained in the pool.
- ◆ Pool State: The overall state of the pool, Enabled or Disabled.
- ◆ Compression State: Displays if data can be compressed within the pool or not.
- ◆ # of Devices in Pool: The total number of data devices contained in the pool.
- ◆ # of Enabled Devices in Pool: The total number of enabled data devices contained in the pool.
- ◆ # of Usable Tracks in Pool: The total number of tracks on all enabled data devices contained in the pool.
- ◆ # of Allocated Tracks in Pool: The total number of tracks allocated for thin devices within the pool.
- ◆ # of Tracks saved by compression: The number of tracks that have been saved by compressing data within the pool.
- ◆ # of Shared Tracks in Pool: The number of tracks shared by target devices in VP Snap sessions within the pool.
- ◆ Pool Utilization (%): The percent capacity currently allocated in the pool.
- ◆ Max. Subscription Percent: Indicates the maximum capacity of thin devices that can be bound to the pool. It is expressed in terms of a percentage of the total enabled capacity of the pool.
- ◆ Rebalance Variance: A target percentage for the variance in utilization of any one data device as measured against the thin pool's utilization.
- ◆ Max devs per rebalance scan: The maximum number of data devices

in a thin pool that the rebalancing algorithm can work on concurrently.

- ◆ Enabled Devices: A listing of the enabled data devices contained in the pool.

The list includes:

- SymDev: The Symmetrix device number for the data device.
- Total Tracks: The total capacity of the data device, expressed in 64 KB tracks.
- Alloc Tracks: The number of 64 KB tracks currently allocated from the data device to thin devices.
- Free Tracks: The number of 64 KB tracks not currently allocated from the data device.
- Full (%): The percent capacity currently allocated from the data device.
- FLG: A flag indicating whether the data device contains shared tracks from VP Snap sessions.
- Device State: The current data device state.

- ◆ Pool Bound Thin Devices: A listing of the thin devices bound to the pool.

The list includes:

- SymDev: The Symmetrix device number for the thin device.
- FLG: A flag indicating the current state of the device.
- Total Tracks: The total capacity of the thin device, expressed in 64KB tracks.
- Pool Subs (%): Indicates the subscribed percentage of the thin device to the pool. This is the ratio of the capacity of the thin device to the total enabled capacity of the pool.
- Pool Allocated Tracks: The number of logical tracks allocated for the thin device in the thin pool.
- Pool Allocated (%): The percentage of the thin devices tracks that are allocated in the thin pool.
- Total Written Tracks: The total number of written tracks for the thin device.
- Total Written (%): The percentage of the thin device tracks that have been written to.

- Compressed Size Tracks: The actual number of tracks allocated for the device after compression.
- Compressed Ratio %: The percent compression ratio of logical tracks allocated versus actual tracks allocated after compression.
- ♦ Other Pool Bound Thin Devices: A listing of the thin devices that are bound to other thin pools, but have data allocated in the thin pool being viewed.

The list includes:

- SymDev: The Symmetrix device number for the thin device.
- Bound Pool Name: The name of the pool to which the thin device is bound.
- Total Tracks: The total capacity of the thin device, expressed in 64 KB tracks.
- Pool Allocated Tracks: The number of tracks allocated for the thin device in the thin pool being viewed.
- Pool Allocated (%): The percentage of the thin devices tracks that are allocated in the thin pool being viewed.
- Compressed Size Tracks: The actual number of tracks allocated for the device after compression.
- Compressed Ratio %: The percent compression ratio of logical tracks allocated versus actual tracks allocated after compression.

SYMCLI

To view the thin pool utilization report for a particular pool using SYMCLI, run:

```
symcfg -sid 0398 show -pool R6_SATA_Pool -thin -detail
```

```
Symmetrix ID: 000195700398
```

```
Symmetrix ID           : 000195700398
Pool Name              : R6_SATA_Pool
Pool Type              : Thin
Disk Location          : Internal
Technology              : SATA
Dev Emulation          : FBA
Dev Configuration      : RAID-6 (6+2)
Pool State              : Enabled
Compression State      : Enabled
# of Devices in Pool   : 128
# of Enabled Devices in Pool : 128
```

```

# of Usable Tracks in Pool      : 167771136
# of Allocated Tracks in Pool   : 16248012
# of Tracks saved by compression : 289992
# of Shared Tracks in Pool      : 0
Pool Utilization (%)           : 9
Pool Compression Ratio (%)      : 1
Max. Subscription Percent      : None
Rebalance Variance             : 1%
Max devs per rebalance scan    : 256
Pool Reserved Capacity         : None

```

Enabled Devices(128):

```

{
-----
Sym      Usable      Alloc      Free Full FLG Device
Dev      Tracks      Tracks      Tracks (%) S  State
-----
053B     1310712    127032    1183680  9 . Enabled
053C     1310712    126708    1184004  9 . Enabled
053D     1310712    126840    1183872  9 . Enabled
...
05B8     1310712    127116    1183596  9 . Enabled
05B9     1310712    126576    1184136  9 . Enabled
05BA     1310712    127092    1183620  9 . Enabled
-----
Tracks  167771136  16248012  151523124  9
}

```

Pool Bound Thin Devices(29):

```

{
-----
Sym  FLG      Pool      Pool      Total      Compressed
Dev  T      Total Sub  Allocated  Written  Size/Ratio
      T      Tracks (%)  Tracks (%)  Tracks (%)  Tracks (%)
-----
0330  B      276210  0    276216 100      0  0    276216  0
0331  B      276210  0    276216 100      0  0    276216  0
0332  B      276210  0    276216 100      0  0    276216  0
...
04B4  B      1638405  1    619032  38    222044  14    619032  0
04B5  B      1638405  1    624696  38    223593  14    624696  0

```

```

04B6  B      1638405  1      630252  38      224578  14      630252  0
-----
Tracks      29918340  18     12444876  42     2234883  7     12444876  0
}

```

Other-Pool Bound Thin Devices(8):

```

{
-----
          Bound          Total          Pool          Compressed
Sym  Pool Name      Tracks      Allocated  Size/Ratio
-----
02B0 R1_FC_Pool      4419360      464820  11      456900  2
02C0 R1_FC_Pool      4419360      776448  18      507588  35
02D0 R1_FC_Pool      4419360      254376   6      250008  2
02E0 R1_FC_Pool      4419360      151632   3      142788  6
02F0 R1_FC_Pool      4419360         132   0         132   0
0300 R1_FC_Pool      4419360      849468  19      849468  0
0310 R1_FC_Pool      4419360      930324  21      930324  0
0320 R1_FC_Pool      4419360      664392  15      664392  0
-----
Tracks      35354880      4091592  11      3801600  7
}

```

Legend:

Enabled devices FLG:

(S)hared Tracks : X = Shared Tracks , . = No Shared Tracks

Bound Devices FLG:

S(T)atus : B = Bound, I = Binding, U = Unbinding, A = Allocating,
D = Deallocating, R = Reclaiming, C = Compressing,
N = Uncompressing, . = Unbound,

Unisphere for VMAX

In Unisphere, the pool utilization report can be accessed through the Thin Pools view, located under Storage.

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > Thin Pools

Thin Pools

Name	Technology	Configuration	Emulation	Allocated Capacity	Enabled Capacity (GB)
R0_FTS_Pool	N/A	Unprotected	FBA	15 %	1078.13
R1_FC_Pool	FC	2-Way Mir	FBA	8 %	10722.66
R53_EFD_Pool	EFD	RAID-5 (3 + 1)	FBA	3 %	4394.51
R57_FC_Pool	FC	RAID-5 (7 + 1)	FBA	0 %	10722.66
R6_SATA_Pool	SATA	RAID-6 (6 + 2)	FBA	9 %	10239.94

Allocated Capacity Free Capacity

Create Expand View Details Delete

Last Up

More detail on individual pools can be seen by double-clicking a pool name and selecting one of the related objects.

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > Thin Pools > R6_SATA_Pool

Details : Thin Pool : R6_SATA_Pool

Properties

Name	R6_SATA_Pool
RAID Protection	RAID-6 (6 + 2)
Type	Thin
Technology	SATA
Emulation	FBA
Total Capacity (GB)	10239.94
Free Capacity (GB)	9248.24
Thin Volumes	29
Enabled Volumes	128
Disabled Volumes	0
% Allocated	9
Set Maximum Subscription	<input type="checkbox"/>
Maximum Subscription (0-65534)	None

Related Objects

Contains : [DATA Volumes - 128](#)

Associated With : [Bound Volumes - 29](#)
[Other Pool Bound Volumes - 8](#)

Create Expand Bind >> Apply Cancel

EMC Unisphere for VMAX V1.5.0.3

Home System **Storage** Hosts Data Protection Performance Support

000195700398 > Storage > Thin Pools > R6_SATA_Pool > Other Bound Volumes

Other Volumes For Thin Pool

Name	Pool Name	% Allocated	Allocated Capacity (GB)
02B0	R1_FC_Pool	11 %	28.37
02C0	R1_FC_Pool	18 %	47.39
02D0	R1_FC_Pool	6 %	15.53
02E0	R1_FC_Pool	3 %	9.25
02F0	R1_FC_Pool	0 %	0.01
0300	R1_FC_Pool	19 %	51.85
0310	R1_FC_Pool	21 %	56.78
0320	R1_FC_Pool	15 %	40.55

Thin device distribution

As mentioned previously, a thin device associated with a FAST VP policy may have track extents allocated across multiple pools. However, it always remains bound to a single pool.

The thin device distribution report can be used to determine both the thin pool to which a thin device is bound and any other pools that have tracks allocated for that device.

The information contained in the thin device distribution report is:

- ◆ Sym: The Symmetrix device number for the thin device.
- ◆ Pool Name: The name of pool to which the thin device is bound, or the pool the device has tracks allocated in.
- ◆ Flags ESPT: Indicates the emulation of the thin device (E), if there are shared tracks present in the pool (S), if the device has persistent allocations (P), and the current status of the device in the pool (T).
- ◆ Total Tracks: The total capacity of the thin device, expressed in 64 KB tracks.
- ◆ Pool Subs (%): Indicates the subscribed percentage of the thin device to the pool. This is the ratio of the capacity of the thin device to the total enabled capacity of the pool.
- ◆ Pool Allocated Tracks: The number of tracks allocated for the thin device in the thin pool.
- ◆ Pool Allocated (%): The percentage of the thin devices tracks that are allocated in the thin pool.
- ◆ Total Written Tracks: The total number of written tracks for the thin device. It is only shown for the pool to which the thin device is bound.
- ◆ Total Written (%): The percentage of the thin device tracks that have been written to. It is only shown for the pool to which the thin device is bound.
- ◆ Compressed Size Tracks: The actual number of tracks allocated for the device after compression.
- ◆ Compressed Ratio %: The percent compression ratio of logical tracks allocated versus actual tracks allocated after compression.

SYMCLI

To view the thin device allocation report for all thin devices using SYMCLI, run:

```
symcfg -sid 0398 list -tdev -detail
```

Symmetrix ID: 000195700398

Enabled Capacity (Tracks) : 635295810

Bound Capacity (Tracks) : 102837780

S Y M M E T R I X T H I N D E V I C E S

Sym	Bound Pool Name	Flags ESPT	Total Tracks	Pool Subs (%)	Pool Allocated Tracks (%)	Total Written Tracks (%)	Compressed Size/Ratio Tracks (%)
02B0	R1_FC_Pool	F..B	4419360	3	871980 20	1252909 28	871980 0
	R53_EFD_Pool	-.--	-	-	134484 3	- -	134484 0
	R6_SATA_Pool	-.--	-	-	464820 11	- -	456900 1
02C0	R1_FC_Pool	F..B	4419360	3	617832 14	1577355 36	617832 0
	R53_EFD_Pool	-.--	-	-	278328 6	- -	278328 0
	R6_SATA_Pool	-.--	-	-	776448 18	- -	507588 34
02D0	R1_FC_Pool	F..B	4419360	3	1152996 26	1259502 28	1152996 0
	R53_EFD_Pool	-.--	-	-	104952 2	- -	104952 0
	R6_SATA_Pool	-.--	-	-	254376 6	- -	250008 1
02E0	R1_FC_Pool	F..B	4419360	3	1694232 38	1347249 30	1694232 0
	R53_EFD_Pool	-.--	-	-	220488 5	- -	220488 0
	R6_SATA_Pool	-.--	-	-	151632 3	- -	142788 5
02F0	R1_FC_Pool	F..B	4419360	3	1087524 25	1810431 41	1087524 0
	R53_EFD_Pool	-.--	-	-	1468224 33	- -	1468224 0
	R0_FTS_Pool	-.--	-	-	192 0	- -	192 0
	R6_SATA_Pool	-.--	-	-	132 0	- -	132 0
0300	R1_FC_Pool	F..B	4419360	3	139008 3	1652062 37	139008 0
	R0_FTS_Pool	-.--	-	-	732672 17	- -	732672 0
	R6_SATA_Pool	-.--	-	-	849468 19	- -	849468 0
0310	R1_FC_Pool	F..B	4419360	3	172596 4	1652266 37	172596 0
	R0_FTS_Pool	-.--	-	-	618228 14	- -	618228 0
	R6_SATA_Pool	-.--	-	-	930324 21	- -	930324 0
0320	R1_FC_Pool	F..B	4419360	3	638544 14	1654375 37	638544 0
	R0_FTS_Pool	-.--	-	-	418212 9	- -	418212 0
	R6_SATA_Pool	-.--	-	-	664392 15	- -	664392 0
...							
Total			124658370	20	37218108 6	19313789 3	36887580 1

Legend:

Flags: (E)mulation : A = AS400, F = FBA, 8 = CKD3380, 9 = CKD3390
 (S)hared Tracks : S = Shared Tracks Present, . = No Shared Tracks
 (P)ersistent Allocs : A = All, S = Some, . = None
 S(T)atus : B = Bound, I = Binding, U = Unbinding, A = Allocating,
 D = Deallocating, R = Reclaiming, C = Compressing,
 N = Uncompressing, . = Unbound,

To view the thin device allocation report for a single thin device, or a range of devices, run:

symcfg -sid 0398 list -tdev -RANGE 2B0:2C0 -detail

Symmetrix ID: 000195700398

Enabled Capacity (Tracks) : 635295810
 Bound Capacity (Tracks) : 8838720

S Y M M E T R I X T H I N D E V I C E S

Sym	Bound Pool Name	Flags ESPT	Total Tracks	Pool Subs (%)	Pool Allocated Tracks (%)	Total Written Tracks (%)	Compressed Size/Ratio Tracks (%)
02B0	R1_FC_Pool	F..B	4419360	3	871980 20	1252909 28	871980 0
	R53_EFD_Pool	-.--	-	-	134484 3	- -	134484 0
	holding	-.--	-	-	0 0	- -	0 0
	R6_SATA_Pool	-.--	-	-	464820 11	- -	456900 1
02C0	R1_FC_Pool	F..B	4419360	3	617832 14	1577355 36	617832 0
	R53_EFD_Pool	-.--	-	-	278328 6	- -	278328 0
	holding	-.--	-	-	0 0	- -	0 0
	R6_SATA_Pool	-.--	-	-	776448 18	- -	507588 34
Total			8838720	1	3143892 0	2830264 0	2867112 9

Legend:

Flags: (E)mulation : A = AS400, F = FBA, 8 = CKD3380, 9 = CKD3390
 (S)hared Tracks : S = Shared Tracks Present, . = No Shared Tracks
 (P)ersistent Allocs : A = All, S = Some, . = None
 S(T)atus : B = Bound, I = Binding, U = Unbinding, A = Allocating,
 D = Deallocating, R = Reclaiming, C = Compressing,
 N = Uncompressing, . = Unbound,

Note: To display information for a single device, specify the same device number for both the start and end device in the range. An example is 2B0:2B0.

To view the thin device allocation report for all the thin devices in a storage group, run:

```
symcfg -sid 0398 list -tdev -sg VP_ProdApp1 -detail
```

```
Symmetrix ID: 000195700398
```

```
Enabled Capacity (Tracks) : 635295810
Bound Capacity (Tracks) : 17677440
```

S Y M M E T R I X T H I N D E V I C E S

Sym	Bound Pool Name	Flags ESPT	Total Tracks	Pool	Pool		Total		Compressed		
				Subs (%)	Allocated Tracks (%)	Written Tracks (%)	Size/Ratio Tracks (%)				
02B0	R1_FC_Pool	F..B	4419360	3	871980	20	1252909	28	871980	0	
	R53_EFD_Pool	-.--	-	-	134484	3	-	-	134484	0	
	R6_SATA_Pool	-.--	-	-	464820	11	-	-	456900	1	
02C0	R1_FC_Pool	F..B	4419360	3	617832	14	1577355	36	617832	0	
	R53_EFD_Pool	-.--	-	-	278328	6	-	-	278328	0	
	R6_SATA_Pool	-.--	-	-	776448	18	-	-	507588	34	
02D0	R1_FC_Pool	F..B	4419360	3	1152996	26	1259502	28	1152996	0	
	R53_EFD_Pool	-.--	-	-	104952	2	-	-	104952	0	
	R6_SATA_Pool	-.--	-	-	254376	6	-	-	250008	1	
02E0	R1_FC_Pool	F..B	4419360	3	1694232	38	1347249	30	1694232	0	
	R53_EFD_Pool	-.--	-	-	220488	5	-	-	220488	0	
	R6_SATA_Pool	-.--	-	-	151632	3	-	-	142788	5	
Total			-----								
Tracks			17677440	3	6722568	1	5437015	1	6432576	4	

Legend:

Flags: (E)mulation : A = AS400, F = FBA, 8 = CKD3380, 9 = CKD3390
 (S)hared Tracks : S = Shared Tracks Present, . = No Shared Tracks
 (P)ersistent Allocs : A = All, S = Some, . = None
 S(T)atus : B = Bound, I = Binding, U = Unbinding, A = Allocating,
 D = Deallocating, R = Reclaiming, C = Compressing,
 N = Uncompressing, . = Unbound,

Unisphere for VMAX

In Unisphere, the pool utilization report can be accessed by the Other Pool Info related object, which is available when viewing the properties of a specific thin device.

Other Pool Info

Name	Pool Name	Allocated (GB)	Allocated Capacity (%)
02B0	R1_FC_Pool	53.22	20 %
02B0	R53_EFD_Pool	8.21	3 %
02B0	R6_SATA_Pool	28.37	11 %

Used: [Blue bar] Free: [Green bar]

Alerting

Several Symmetrix alerts exist to allow monitoring of the FAST VP environment. These relate to when changes have occurred to the FAST VP configuration, and also to when events that may affect the operation of FAST VP occur.

The following sections detail the methods for alerting on FAST VP in both Solutions Enabler and Unisphere for VMAX.

Solutions Enabler

In UNIX, Linux, and Windows environments, the event daemon, **storevntd**, enables monitoring of Symmetrix operations by detecting and reporting events as they happen. The event daemon continually collects Symmetrix event information in real time, filters the events by severity and type, and responds by logging events to specified targets. When configuring the daemon to log events, you can specify to log the events to the UNIX Syslog, the Windows Event log, SNMP, or a file on disk.

Several event codes have been added to Symmetrix operations to track FAST activities. Table 1 shows the event code and the related activity being tracked.

FAST VP administration event codes

Event codes tracking administrative changes to Symmetrix tiers, FAST policies, policy associations, and FAST controller configuration settings are shown in Table 1.

Table 1. FAST administration event codes

Event code	Event description
1289	A FAST Symmetrix tier has been changed
1290	A FAST policy has been changed
1291	A FAST policy/storage group association has changed
1292	A FAST/Optimizer time window has been changed
1293	A FAST/Optimizer configuration setting has been changed

FAST VP activity event codes

Event codes tracking FAST VP activities such as a change in the state of

the controller, allocation levels crossing specific thresholds, or an external tier's performance level changing are shown in Table 2.

Table 2. FAST activity event codes

Event code	Event description
1508	The state of the FAST controller has changed
1510	The combined allocation in pools has changed
1511	FAST Tier <name> performance changed

Solutions Enabler Event Daemon

The FAST activity event codes can be enabled for the Solutions Enabler event daemon (storevntd) by way of the daemon_options file.

To enable event code 1508, the following entry should be made:

```
storevntd:log_symmetrix_events = \  
  sid=000195700398, 1508;
```

Event code 1510 allows for multiple alerts to be set, with the severity increasing as custom thresholds are crossed. Custom thresholds may also be set for individual policies.

The following example shows thresholds set for two separate policies, with differing thresholds for each.

```
storevntd:log_symmetrix_events = \  
  sid=000195700398, "comp=policy1", 1510, thresh_critical=90,  
  thresh_major=80, thresh_warning=70; \  
  sid=000195700398, "comp=policy2", 1510, thresh_critical=95,  
  thresh_major=90, thresh_warning=85; \  

```

To enable event code 1511, the following entry should be made:

```
storevntd:log_symmetrix_events = \  
  sid=000195700398, 1511;
```


To enable all three alerts in the event daemon, the `daemon_options` file should contain the following:

```
storevntd:log_symmetrix_events = \  
    sid=000195700398, 1508; \  
    sid=000195700398, "comp=policy1", 1510, thresh_critical=90,  
thresh_major=80, thresh_warning=70; \  
    sid=000195700398, "comp=policy2", 1510, thresh_critical=95,  
thresh_major=90, thresh_warning=85; \  
    sid=000195700398, 1511;
```

Note: For more information on configuring alerts with the Solutions Enabler event daemon, refer to the *EMC Solutions Enabler Installation Guide* available at <http://support.emc.com>.

Unisphere for VMAX

The FAST activity event codes can also be configured in Unisphere to monitor FAST VP. In Unisphere, they are known as:

- ◆ FAST controller switched state
- ◆ FAST FTS performance
- ◆ FAST VP Policy Utilization threshold

To configure the state change and FTS performance alerts, select the **Administration** subsection page for **All Symmetrix**, then select **Alert Settings**, and then **Alert Policies**.

Select the alert to be enabled, and click **Enable**.

EMC Unisphere for VMAX V1.5.0.3

Home Performance Support

All Symmetrix > Home > Administration > Alert Settings > Alert Policies

Alert Policies

Symmetrix ID 1 ▲	Type	Policy Name 2 ▲	State	Notification
000195700398	Array	Event Lost Alert	disabled	
000195700398	Array	Event Overflow Alert	disabled	
000195700398	Array	FAST Controller switched state	disabled	
000195700398	Array	FAST FTS Performance	enabled	
000195700398	Array	GK Timeout	disabled	
000195700398	Array	GK Utilization	disabled	
000195700398	Array	Hotspare Invoked	disabled	
000195700398	Array	Migration Complete Alert	disabled	
000195700398	Array	Optimizer switched mode	disabled	
000195700398	Array	Port Link Status	disabled	
000195700398	Array	Port Status	disabled	

Enable Disable Notify

To configure the policy allocation alert, select **Alert Thresholds** on the **Alert Settings** subsection page. Select **FAST VP Policy Utilization**, and click **Create**.

EMC Unisphere for VMAX V1.5.0.3

Home Performance Support

All Symmetrix > Home > Administration > Alert Settings > Alert Thresholds

Alert Thresholds

Symmetrix ID 1 ▲	Category 2 ▲	Instance 3 ▲	State	Notification	Warning	Critical	Fatal	Custom
000195700398	Fast VP Policy Utilization	*	enabled		60%	80%	100%	
000195700398	Snap Pool Utilization	*	enabled		60%	80%	100%	
000195700398	Thin Pool Utilization	*	enabled		60%	80%	100%	

Create Edit Notify Delete

On the resulting dialog box, set the **Category** field to **FAST VP Policy Utilization**. Under **Instances to enable**, select the appropriate policy. Finally, select the desired percentage values for each threshold alert, and click **OK**.

Create Threshold Policies

Symmetrix: 000195700398

Category: Fast VP Policy Utilization

Instances to enable:

Pool Names
Custom
No_EFD
System_Optimization

Warning: 60%(default)

Critical: 75%

Fatal: 90%

Buttons: OK, Cancel, Help

EMC Unisphere for VMAX v1.5.0.3

Home Performance Support

All Symmetrix > Home > Administration > Alert Settings > Alert Thresholds

Alert Thresholds

Symmetrix ID	Category	Instance	State	Notification	Warning	Critical	Fatal	Custom
000195700398	Fast VP Policy Utilization	*	enabled		60%	80%	100%	
000195700398	Fast VP Policy Utilization	System_Optimization	enabled		60%	75%	90%	
000195700398	Snap Pool Utilization	*	enabled		60%	80%	100%	
000195700398	Thin Pool Utilization	*	enabled		60%	80%	100%	

Buttons: Create, Edit, Notify, Delete

Conclusion

EMC Symmetrix VMAX FAST VP for Virtual Provisioning environments automates the identification of active or inactive application data for the purposes of reallocating that data across different performance/capacity tiers within an array. FAST VP proactively monitors workloads at both the LUN and sub-LUN level in order to identify busy data that would benefit from being moved to higher-performing drives. FAST VP also identifies less-busy data that could be moved to higher-capacity drives, without existing performance being affected. This promotion/demotion activity is based on policies that associate a storage group to multiple drive technologies, or RAID protection schemes, by way of thin storage pools, as well as the performance requirements of the application contained within the storage group. Data movement executed during this activity is performed non-disruptively, without affecting business continuity and data availability.

Appendix A: FAST VP state

There are five possible states that the FAST controller can be reported in. These are:

- ◆ **Enabled:** All FAST VP functions are performed. Performance data collection, performance data analysis, data-movement request generation, and data-movement execution.
- ◆ **Disabled:** Only performance data collection is performed. Data analysis is not performed, and data movement is not executed.
- ◆ **Disabling:** The transition of the FAST controller from Enabled to Disabled.
- ◆ **DisabledwithError:** The FAST controller has stopped operation due to an internal error. Statistics collection and FAST VP performance data movements continue to be performed, however, FAST VP compliance movements are not performed.
- ◆ **Degraded:** FAST VP can perform some or all of its functions. However, it cannot perform each function fully.

Enabled state

When the state of the FAST controller is queried, and the state is Enabled, the current activity being performed by the controller is also displayed. Valid activities include:

- ◆ **Idle:** The FAST controller is currently idle.
- ◆ **RunningPlan:** There are currently active data-movement tasks running, moving thin device data between tiers.

Degraded state

When the state of the FAST controller is Degraded, a reason code is displayed when the FAST state is queried, and it indicates the cause of the degraded state.

These reason codes include:

- ◆ **Invalid Swap/Performance time windows:** At least one of the defined time windows is invalid. To correct, each time window should be checked, and any invalid time windows should be deleted or modified.
- ◆ **Invalid device attributes:** One or more storage groups have an invalid priority in a FAST policy. To correct, each storage group's priority should be checked in the FAST policy they are associated

- with. Any invalid priority should be modified to a valid value.
- ◆ Invalid FAST parameters: One or more of the FAST controller configuration settings are invalid. To correct, each configuration setting should be checked and set to a valid value.
 - ◆ Performance time window is not present or does not extend into the future: No performance time window, default or user-defined, exists, or any that do exist have expired. To correct, a valid, inclusion performance time window should be created.
 - ◆ FAST thin move time window is not present or does not extend into the future: No thin data movement time window, default or user-defined, exists, or any that do exist have expired. To correct, a valid, inclusion thin data movement time window should be created.
 - ◆ FAST VP compliance movement failed: The most recent attempt to perform a FAST VP compliance movement was not successful. EMC customer service should be contacted to investigate the reason for the failure. If a subsequent attempt to perform a compliance movement is successful, the degraded state is cleared.
 - ◆ FAST VP performance-movement policy update failed: The most recent attempt to generate a data-movement policy failed. EMC customer service should be contacted to investigate. If a subsequent attempt to generate a movement policy is successful, the degraded state is cleared.
 - ◆ FAST VP is not licensed: An entitlement file including FAST VP has not been loaded to the Symmetrix array. To correct, the appropriate entitlement file should be obtained from EMC and loaded to the Symmetrix array.
 - ◆ Statistics collection is failing for thin devices: No performance movement will happen: Performance statistics are not being collected for thin devices under FAST VP control. EMC Customer Service should be contacted to investigate. If a subsequent attempt to collect statistics is successful, the degraded state is cleared.
 - ◆ Timed out attempting to communicate with the FAST controller: Either the FAST controller running on the service processor is unavailable, or the service processor itself is unavailable. EMC Customer Service should be contacted to investigate.

Appendix B: Feature support

The following table describes the minimum Enginuity™ and management interface levels needed to support various FAST VP features.

Feature	Enginuity	Management interface
FAST VP (Base)	5875.135.91	Solutions Enabler V7.3 SMC 7.3 Unisphere for VMAX 1.0
Setting PRC per pool	5875.198.38	Solutions Enabler V7.3.1 SMC 7.3.1 Unisphere for VMAX 1.0
VP allocation by FAST policy	5876.82.57	Solutions Enabler V7.4 Unisphere for VMAX 1.0
FAST VP SRDF coordination	5876.82.57	Solutions Enabler V7.4 Unisphere for VMAX 1.0
FAST VP SRDF coordination for multisite SRDF	5876.229.145	Solutions Enabler V7.6 Unisphere for VMAX 1.6
External tier (FTS)	5876.82.57	Solutions Enabler V7.4 Unisphere for VMAX 1.0

Storage group reassociation	5876.82.57	Solutions Enabler V7.4 Unisphere for VMAX 1.0
FAST VP for CKD	5876.82.57	Solutions Enabler V7.4 Unisphere for VMAX 1.0
FAST VP for IBM i	5876.82.57	Solutions Enabler V 7.4 Unisphere for VMAX 1.0
FAST VP compression	5876.159.102	Solutions Enabler V7.5 Unisphere for VMAX 1.5
Four tiers in a FAST VP policy	5876.159.102	Solutions Enabler V7.5 Unisphere for VMAX 1.5
User-defined FTS tier	5876.159.102	Solutions Enabler V7.5 Unisphere for VMAX 1.5

References

- ◆ EMC Solutions Enabler Symmetrix Array Controls CLI Product Guide
- ◆ EMC Solutions Enabler Symmetrix Array Management CLI Product Guide
- ◆ EMC Solutions Enabler Symmetrix CLI Command Reference HTML Help
- ◆ EMC Solutions Enabler Installation Guide
- ◆ EMC Symmetrix VMAX Series Product Guide
- ◆ FAST VP for EMC Symmetrix VMAX Theory and Best Practices for Planning and Performance
- ◆ Best Practices for Fast, Simple Capacity Allocation with EMC Symmetrix Virtual Provisioning Technical Note
- ◆ z/OS and Virtual Provisioning Best Practices
- ◆ Design and Implementation Best Practices for EMC Symmetrix Federated Tiered Storage (FTS) Technical Note
- ◆ Best Practices for Nondisruptive Tiering via EMC Symmetrix Virtual LUN Technical Note

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