

Winchester Systems FlashDisk

Thin Provisioning Storage

"The Right Way"

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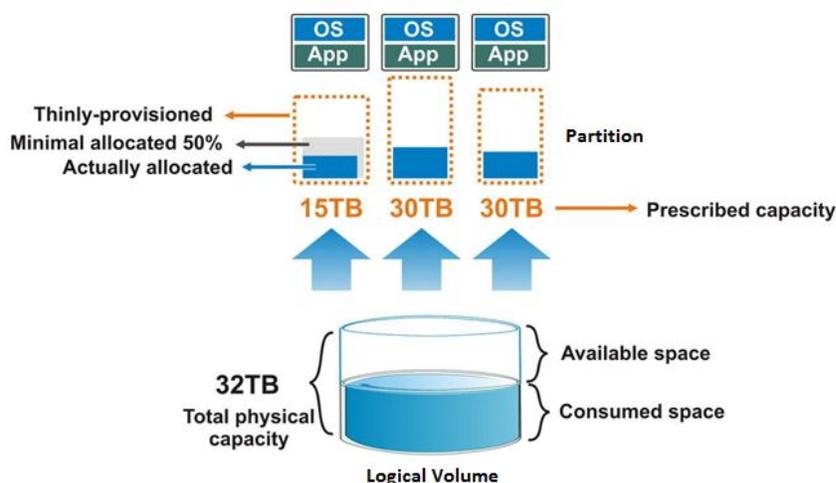
FlashDisk Thin Provisioning

Traditional storage provisioning for applications has several problems. Administrators need to allocate an anticipated amount of storage space to each specific application. When there is not enough capacity, users need to expand the LUN or create a new and larger LUN. This reorganization of storage capacity can cause system downtime.

To try and avoid this time consuming and error-prone process administrators may allocate an initial LUN of a bigger size for applications from the outset. This is so-called “fat provisioning”. Since the unused capacity provisioned for a specific application cannot be used by other applications, this way of provisioning results in poor storage utilization and a waste of money as costly drive space is left essentially idle.

These problems can be overcome by thin provisioning technology. The idea behind thin provisioning is similar to “bluffing” a large amount of virtual capacity for an application server regardless of the actual physical capacity available. If an application is filling a partition to capacity, the volume can be easily expanded by drawing space from a consolidated storage logical volume. When the logical volume runs out of storage capacity, it can be expanded on demand without disrupting online services. Thin provisioning significantly reduces the management overhead caused by traditional provisioning.

The aggregated capacity is presented to applications in the form of virtual data volumes. Partitions can be created using thin-provisioned capacity, a capacity that does not need to be physically allocated at initial setup. Actual disk space is consumed only when data writes occur. Unlike with traditional LUNs, partitions are expanded by drawing capacity from a logical volume and the process is done on the fly.



When creating a partition for a specific application, you can first designate a large prescribed volume, and then assign a minimal percentage of the prescribed volume that is physically allocated, for example 50% of a 15TB partition. This preserves a fixed 7.5TB space from the logical volume as the safe reserve set for this partition. For efficient and easy monitoring of logical volume utilization, you can apply several thresholds to it. When data writes fill up the logical volume space, the system automatically warns administrators to acquire more storage space via FlashDisk Global Manager notifications.

Thin Provisioning Configuration in FlashDisk Global Manager

Create a partition featuring thin provisioning

When you want to create a new partition and configure thin provisioning settings, you can go through the following process in FlashDisk Global Manager.

To start the creation process, go to Logical Volumes > Specific Logical Volume > Partitions > Create Partition.



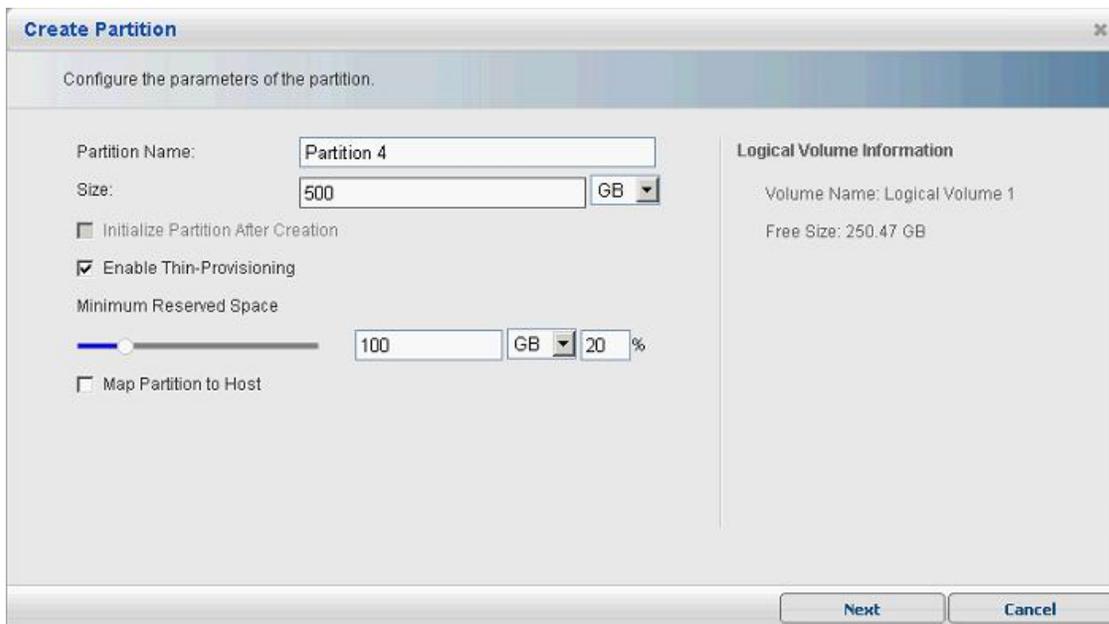
Step 1. Specify the name and description of the partition

Step 2. Specify Enable Thin-provisioning (mutually exclusive with Initialize Partition After Creation)

Step 3. Specify the partition size (for example, if the free size in the logical volume is 100GB, you can still create a larger partition than this figure via thin provisioning)

Step 4. Set the minimum reserved amount to enable minimum reserved space settings for the partition. The minimum reserved size can be set in percentage or a specific capacity, and the default setting is 0%. These settings can be later adjusted, if necessary.

Step 5. You can map the partition to the host here or do it later.



Capacity threshold and notification settings

To prevent potential system crashes resulting from storage shortages, FlashDisk enhances its thin provisioning technology by allowing users to easily monitor the utilization of logical volumes with a threshold mechanism.

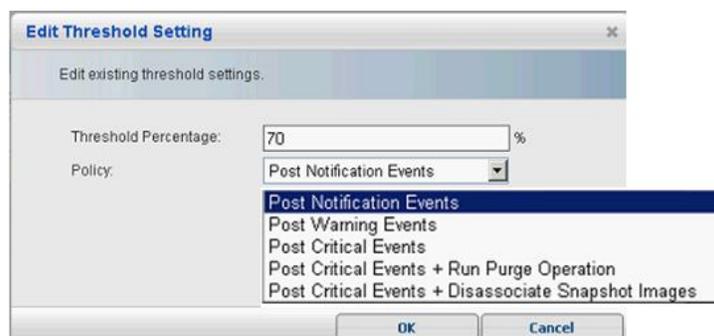
To configure the thresholds, go to Logical Volumes > Specific Logical Volume > Threshold.



The following settings window will appear:



When modifying a threshold, you will see this window:



The following policy options are available:

- **Post Notification Events:** sends out event notifications.
- **Post Warning Events:** sends out warning notifications.
- **Post Critical Events:** sends out critical notifications.
- **Post Critical Events + Run Purge Operation:** sends out critical notifications and purges snapshot images. Purge operation removes snapshot images by policy to release more space for use. Please refer to the user manual for more information on purge settings.
- **Post Critical Events + Disassociate Snapshot Images:** sends out critical notifications and de-associates snapshot images. Existing snapshot images may become invalid to release all their capacity.

Users may assign multiple threshold values on each logical volume to be notified when applications are filling up usable space. Adding more thresholds can prevent missing out on even a single event.

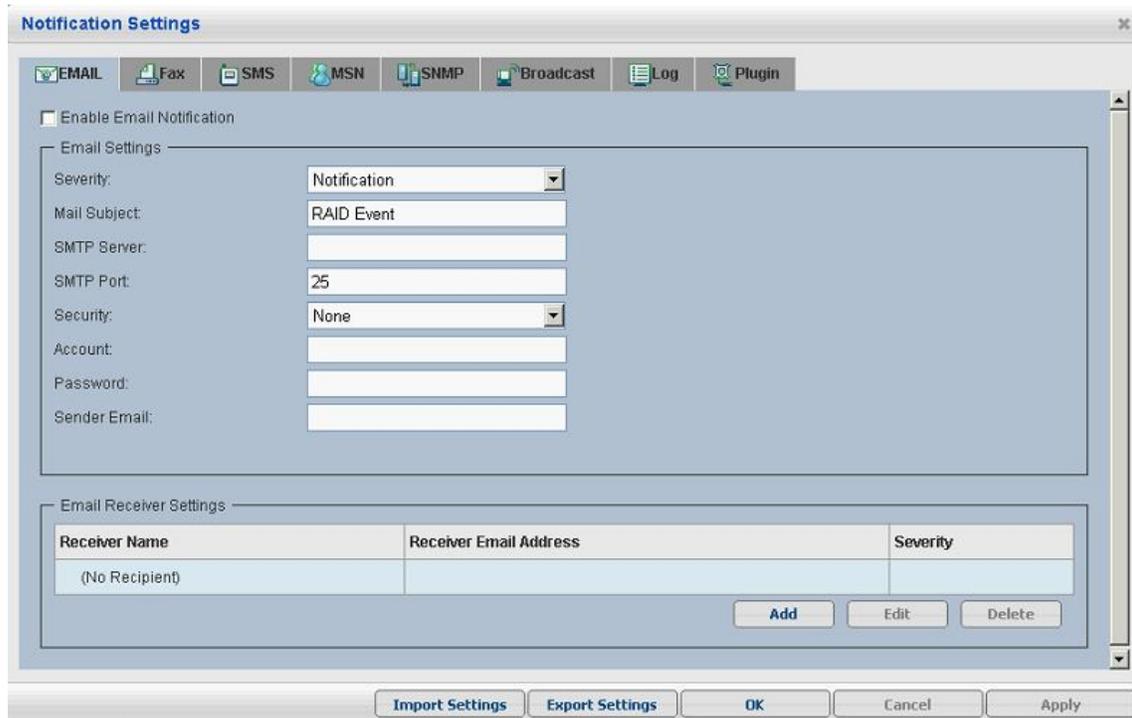
FlashDisk Global Manager offers users a number of methods through which they can be notified of the aforementioned threshold events, including:

- **SNMP:** notifies users through SNMP protocol.
- **Email:** notifies users through an email message.
- **Broadcasting** sends notifications via LAN networks
- **Fax:** notifies users through fax.
- **MSN:** notifies users through MSN chat.
- **SMS:** notifies users through SMS on mobile phone.

To change notification settings, the Notification Manager module in FlashDisk Global Manager can be used. To access Notification Settings, click on Settings > Notification Settings in the tool bar.



Notification settings appear in the main window, showing the notification settings log by default.



The icons at the top of the page can be used to configure the different notification methods, as shown below:



Available Options when a Logical Volume Reaches Capacity Threshold

Add storage capacity

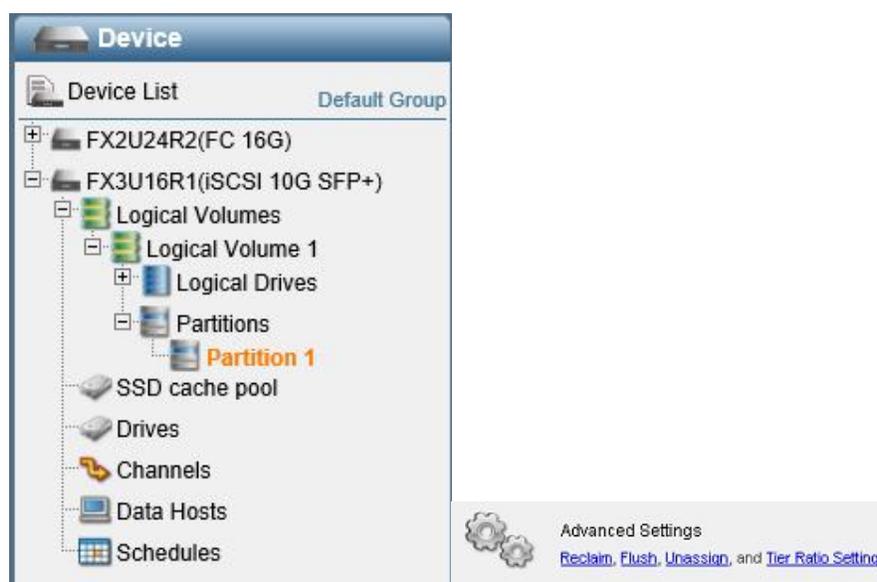
When a logical volume featuring thin provisioning hits its capacity threshold, FlashDisk users have several options available. Depending on available budgets, you can consider adding drives with or without attaching expansion enclosures (JBODs) to the FlashDisk system. Expansion enclosures can be connected without any downtime, offering large capacity increases to existing storage deployments.

Space reclamation

If users do not want to expand logical volume capacity, data may be deleted and the FlashDisk space reclamation function can be used to free up space in the logical volume.

Space reclamation deals with an often-seen phenomenon with thin provisioning, namely that the space of deleted data on the host system cannot be re-used by the storage system in thin-provisioned volumes due to a lack of communication between the host file system and the storage system. This could potentially lead to a situation whereby space in the storage system is filled to capacity, while on the host a large proportion of the equivalent storage space is still available for use. With space reclamation on FlashDisk systems, the storage system is made aware of actual usage in the host and can reclaim space accordingly.

First, users can delete data they find no longer necessary. After deleting data, the space reclamation function can be used. Choose a specific volume, then go to Logical Volume > Partition > Reclaim.



After reclaiming, free space is released to the logical volume and partitions in it have new capacity available to use for applications.

Delete unnecessary snapshot images

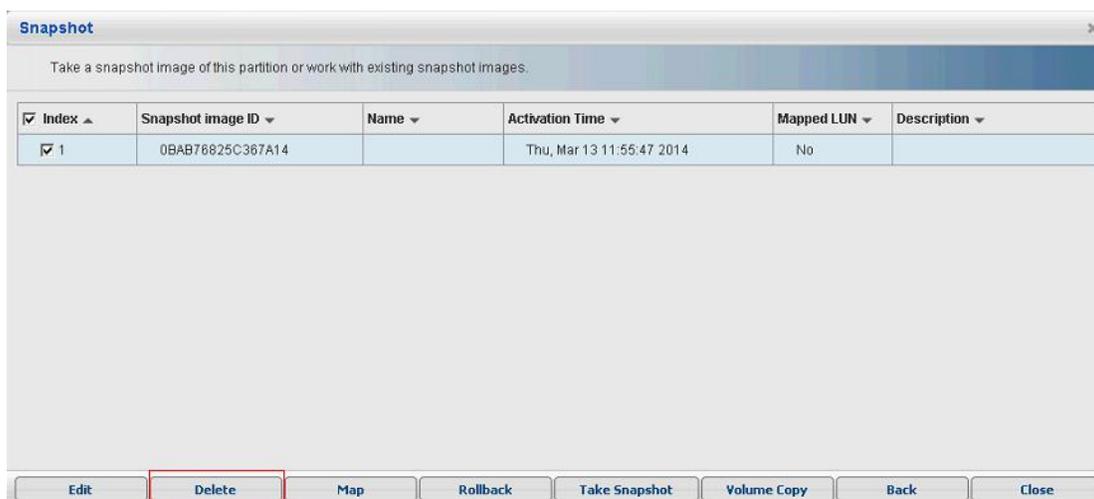
In addition, users also have the option of deleting snapshot images to free up space in the logical volume. Snapshots are often used to create differential data copies, which allow users to rollback data and prevent loss. Depending on user environments, previously taken snapshot images can lose their usefulness after a period of time when data is backed up by more recent snapshots or other backup methods. Relevant considerations include:

- How many data changes occur within a certain timeframe?
- How many snapshots do you need to recover data?
- For how long can you tolerate loss of data (= how frequently do you need to take snapshots)?

Based on these considerations, users can assess which previously taken snapshots can be deleted.

To delete snapshots, go to a specific partition, then Partition > Snapshot.

Previously taken snapshots can be found in the Snapshot List. Highlight a snapshot image (or multiple snapshots) and select Delete.



The screenshot shows a window titled "Snapshot" with a close button (x) in the top right corner. Below the title bar is a blue header with the text "Take a snapshot image of this partition or work with existing snapshot images." Below this is a table with the following columns: Index, Snapshot image ID, Name, Activation Time, Mapped LUN, and Description. The table contains one row with the following data: Index 1 (checked), Snapshot image ID 0BAB76825C367A14, Name (empty), Activation Time Thu, Mar 13 11:55:47 2014, Mapped LUN No, and Description (empty). Below the table is a row of buttons: Edit, Delete (highlighted with a red box), Map, Rollback, Take Snapshot, Volume Copy, Back, and Close.

Index ▲	Snapshot image ID ▼	Name ▼	Activation Time ▼	Mapped LUN ▼	Description ▼
<input checked="" type="checkbox"/> 1	0BAB76825C367A14		Thu, Mar 13 11:55:47 2014	No	

Buttons: Edit, Delete, Map, Rollback, Take Snapshot, Volume Copy, Back, Close

Conclusions

Thin provisioning is a key technology on storage systems. It brings a number of benefits which traditional methods cannot provide. The “just in time capacity” approach essentially eliminates allocated but unused storage. It also greatly simplifies storage provisioning tasks, reducing administration costs. When evaluating initial capacity configuration, budgeting, planning capacity growth over time, and calculating the total cost of ownership, users should look at storage systems that support thin provisioning.

The award-winning FlashDisk series offers SAN storage systems built on a revolutionary concept that reinforces storage virtualization capabilities and delivers performance enhancements plus massive scalability. Together with several other key features optimized to meet mission-critical demands for scalability, performance, and availability, the FlashDisk series helps enterprises achieve optimized return on investment while simplifying storage infrastructure and maximizing application productivity to ensure a much lower total cost of ownership.