Lenovo SAN Manager – Thin Provisioning

Lenovo ThinkSystem DS2200, DS4200, DS6200

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Introduction

The Lenovo ThinkSystem DS2200, DS4200 and DS6200 SAN products are differentiated offerings with Lenovo's Storage portfolio, providing both hardware and software feature advantages. These SAN products are designed for simplicity, speed, and scalability and availability. They offer the perfect blend of a high performing SAN product with a very easy-to-use interface.

With simplicity at its core, the DS2200, DS4200 and DS6200 share the same software features and interface. The Lenovo SAN Manager, the operating software to manage the operational and features of the SAN products, is an easy-to-use GUI that makes complex administrative simple by automating configurations and operations. The Lenovo SAN Manager offers enterprise-class features like: Storage Tiering & Caching, Thin Provisioning, Rapid RAID Build, Snapshots, and more.

In this paper, you will learn:

- Benefits of Thin Provisioning for your IT environment and applications – including OS integration with reclamation.

- Configure Lenovo SAN Manager's Thin Provisioning feature using the new Storage Management Console and CLI commands.

Note: Thin provisioning boosts storage utilization by enabling dynamic allocation and intelligent provisioning of physical storage capacity.

What is Thin Provisioning

Thin Provisioning is a storage allocation scheme that automatically allocates storage as your applications need it.

What are the Benefits of Thin Provisioning

Thin provisioning dramatically increases storage utilization by removing the equation between allocated and purchased capacity. Traditionally, application administrators purchased storage based on the capacity required at the moment and for future growth. This resulted in an over-provisioning of capacity with unused space.

With thin provisioning, applications can be provided with all of the capacity to which they are expected to grow but can begin operating on a smaller amount of physical storage. As the applications fill their storage, new storage can be purchased as needed and added to the array's storage pools.

This results in a more efficient utilization of storage and a reduction in power and cooling requirements.

How Does Thin Provisioning Work

Paging is required to eliminate the lack of flexibility associated with Linear. Linear limits the ability to easily expand the physical storage behind the thin-provisioned volume. Paged storage allows physical resources to be disparate and noncontiguous, making it much easier to add storage on the fly.

For example, contrast the methods for creating a volume for Microsoft Exchange Server data:

Typically, administrators create a storage-side volume for Exchange and map that volume with an assigned LUN to hosts, and then create a Microsoft Windows volume for that LUN. Each volume has a fixed size. There are ways to increase the size of a storage-side volume and its associated Windows volume, but they

are often cumbersome. The administrator must make a trade-off between initial disk costs and a volume size that provides capacity for future growth.

With thin provisioning, the administrator can create a very large volume, up to the maximum size allowed by Windows. The administrator can begin with only a small number of disks, and add more as real storage needs grow. The process of expanding the Windows volume is eliminated.

Thin Provisioning and Modern File Systems

Many modern operating systems become automatically aware of an array's ability to support thin provisioning. This is true of Windows 2012 / 2012 R2 and Linux with newer 6.x kernels. When using a non-thin provisioned storage array the deletion of a file does nothing more than rearrange the file system pointers. If the array supports thin provisioning, as the ThinkSystem DS2200, DS4200 and DS6200 does, thinaware operating systems will notify the storage array to free the storage that had been allocated to the file that was deleted. This happens with the SCSI UNMAP command. This will allow for the re-use of the capacity that had been allocated for the deleted file.

Windows 2012 / 2012 R2 also issues notifications when the allocations reach a high percentage of the "advertised" capacity. This, along with the capacity usage notifications, signals the user that it may be time to add more physical storage.
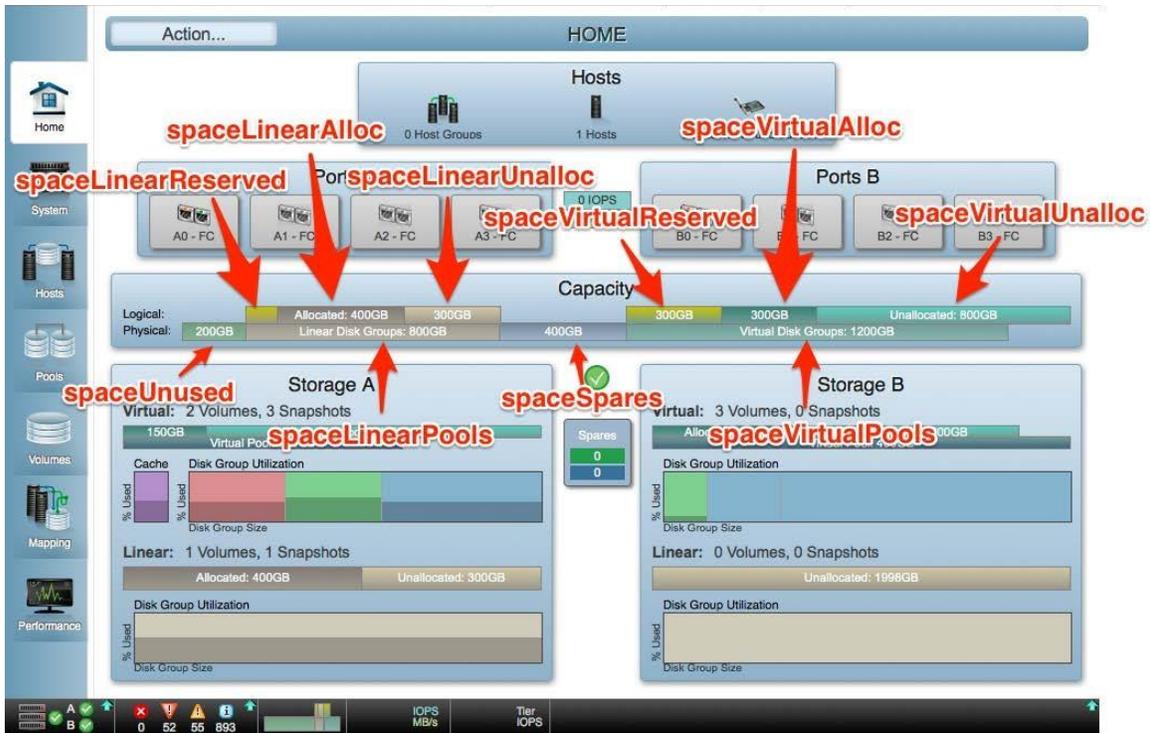
Figure 1 – The labels 'spaceLinearUnalloc' and 'spaceVirtualUnalloc' indicate the space that is not used in the Pools. Over-commitment can be controlled by Pool settings

Enable Storage Over-Commitment with Lenovo SAN Manager

Overcommit is a pool setting (default on). When enabled, the aggregate capacity of a volume can exceed the physical backing storage.

The user can create a volume on a pool with over-commitment Enabled, no configuration needs to be done to create such a volume. Figure 3 shows that a volume can be logically larger than the pool that it's assigned to.

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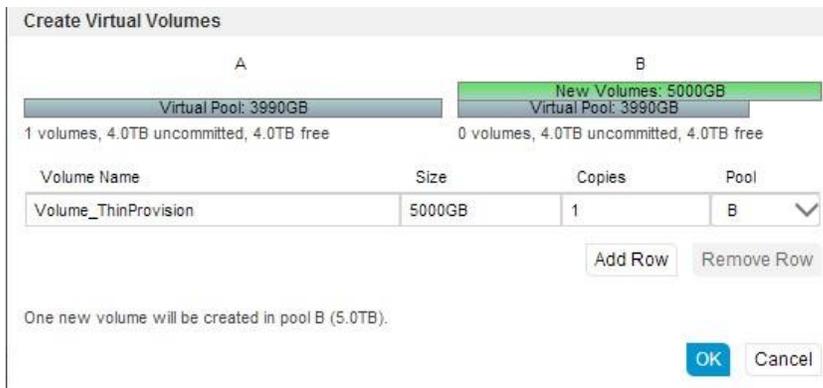
Figure 3 – Volume that is logically larger than the pool

Note: If you try to disable overcommit and the total space allocated to thin provisioned volumes exceeds the physical capacity of their storage pool, an error will say that there is insufficient free disk space to complete the operation and overcommit will remain enabled.

Thresholds and Notifications

Users with a manage role can view and change settings that affect the thresholds and corresponding notifications for each storage pool.

- Low Threshold – When this percentage of pool capacity has been used, Informational event 462 is generated to notify the administrator.   Thus value must be less than the Mid Threshold value. The default is 25%.

- Mid Threshold – When this percentage of pool capacity has been used, event 462 is generated to notify the administrator to add capacity to the pool. This value must be between the Low Threshold and High Threshold values.   The default is 50%.   If the commitment setting is

enabled, the event has Informational severity; if the over-commitment setting is disabled, the event has Warning severity.

- High Threshold – When this percentage of pool capacity has been used, Critical event 462 is generated to alert the administrator that it is critical to add capacity to the pool. This value is automatically calculated based on the available capacity of the pool minus reserved space.

Key CLI Commands for this Feature

- Set pool

  [low-threshold <percentOfPool>]

  [middle-threshold <percentOfPool>]

  [overcommit <on|off|enabled|disabled>]

  <pool-id>

- Show pools

  The output of the show pools command contains the "OverCommit" setting

Summary

- Thin provisioning allocates storage on demand.

- Volumes can be provisioned that exceed physical storage. This can be configured via an overcommit setting.

- Capacity alarms provide notifications to service storage or add capacity.

- Thin-provisioned aware Operating Systems used with Lenovo SAN Manager enables space reclamation for pools.