NETAPP TECHNICAL REPORT

Simplified SAN Provisioning and Improved Space Utilization Using NetApp Provisioning Manager

Sharaf Ahmad, Tanmoy Das, Nagender Somavarapu, NetApp

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ABSTRACT

Storage is the heart of information lifecycle management, and to provision the proper, appropriate amount of storage for enterprise data center is a challenge for storage administrator. The asymmetric fashion of rate of data growth makes storage provisioning more challenging for the administrators. Storage administrators have to make sure that their data/information never starves for storage, and at the same time they never overprovision storage for optimal storage utilization. In simple words, in an enterprise environment every application should get optimal storage. The following article will help the storage administrators to follow a simple and efficient approach for storage provisioning and managing provisioned storage in SAN deployments for NetApp® storage using NetApp Provisioning Manager.

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1 INTRODUCTION

Storage provisioning is a critical, complex task that should be performed efficiently to improve storage utilization. In today's scenario the rate of data growth is exponential. To add to that there is a pressure to control costs as rising storage costs are a financial burden to an organization. Hence enterprises are seeking a proper balance between costs involved as well the risk that would arise.

Two factors that influence a CIO/CTO of an enterprise are cost of storage versus the downtime manageable by critical and noncritical applications. They need a balanced solution that mitigates their ever increasing storage cost and application downtime.

- Enterprises that cater to mission-critical applications need storage that is highly available, scalable, meets application performance requirements, and is robust. In such an environment, a downtime of a few moments can result in significant financial loss, and such enterprise accounts are not ready to take risk under any circumstances. They seek ways to make sure of zero or near-zero downtimes. Therefore, in this case storage provisioning has to be done in such a way that risk factors are minimized as much as possible.
- In a few scenarios, organizations are able to manage risks associated with downtime in order to save costs. Storage administrators and architects seek provisioning techniques to maintain a balance between cost and downtime.

Many of the organizations do storage provisioning manually, which is error prone. This is also a factor that needs to be considered in the overall storage provisioning picture.

NetApp storage provides several finer controls allowing for flexibility to provision storage space for different usage scenarios. This requires a storage administrator to learn these intricacies. Storage administrators can accomplish their routine storage provisioning job in an optimal way if they know how to use those technologies and when to use them. The challenge here is that education is needed to understand those technologies and deploy those in an appropriate environment.

To solve the above issues, NetApp has developed Provisioning Manager, which provides a simplistic, automated way of provisioning storage. Provisioning Manager provides effective space monitoring and management solutions. It provisions, reprovisions, and exports data containers in a simple manner while making efficient use of the storage resource available. Policies are used to describe the desired behavior of data containers, and automation is used to create, monitor, and possibly correct deviations automatically from the stated policy.

NetApp Provisioning Manager provides a single point solution for all kinds of NAS and SAN storage provisioning on NetApp storage.

This document describes provisioning and space management in SAN environments for NetApp storage using NetApp Provisioning Manager.

2 INTENDED AUDIENCE

This paper is intended for the following:

- Storage architects designing with NetApp storage appliances.
- Storage administrators responsible for provisioning storage and facilitating storage to server and application administrators
- Server/application administrators to utilize the provisioned storage for various application requirements
- Sales and support engineers to assist the customers in their efficient utilization of storage provisioning using Provisioning Manager

3 SCOPE AND ASSUMPTIONS

The scope of this document is to showcase NetApp Provisioning Manager; providing simple, flexible solutions for real-life SAN deployment scenarios.

Provisioning Manager can also be deployed for provisioning in NAS environments. However, that lies outside the scope of the existing document.

This document is not substitute for a user guide.

This report has been documented with the following assumptions:

- The reader is familiar with NetApp hardware and software solutions in the areas of Fibre Channel and/or iSCSI.
- The reader should have basic understanding of Data ONTAP® configuration parameters related to space management.
- Basic understanding of Operations Manager.

4 TERMINOLOGIES

THIN PROVISIONING

Thin provisioning of storage means providing more storage space to the connected servers/applications than what is actually available on the storage system. Thin provisioning can help the IT administrator to avoid overprovisioning of storage, to achieve optimal capacity utilization for different servers and hence reducing maintenance costs of storage.

LUN RESERVATION

This is a NetApp storage system specific term. LUN reservation specifies when the space for a LUN has to be reserved or allocated from the hosting volume. If the LUN reservation property is enabled (this is the default), then the space of the LUN is taken upfront. If the LUN reservation property is disabled, then the space of the LUN is consumed as and when new writes come to the LUN.

GUARANTEES

This concept was introduced for flexible volumes from Data ONTAP 7.0 onward. This deals with the space guarantee of a flexible volume, which basically determines when space is reserved or allocated for a particular volume from the hosting aggregates. Following are the three types of space guarantee:

- Volume: A guarantee of “volume” makes sure that the amount of space required by the FlexVol® volume is always available from its aggregate. This is the default setting for FlexVol volumes. With the space guarantee set to “volume,” the space is subtracted, or reserved, from the aggregate’s available space regardless of whether it is actually used for data storage or not.
- None: A FlexVol volume with a guarantee of “none” reserves no space, regardless of the space reservation settings for LUNs in that volume. Write operations to space-reserved LUNs in that volume might fail if the containing aggregate does not have enough available space. Space is first taken from the aggregate when data is actually written to the volume.
- File: The aggregate guarantees that space is always available for overwrites to space-reserved LUNs. The “file” guarantee is basically the same as the “none” guarantee with the exception that space reservations for LUNs and space-reserved files are honored.

FRACTIONAL RESERVE

Fractional reserve is a volume option available in Data ONTAP 6.5 and later that determines how much space Data ONTAP will reserve for Snapshot™ overwrite data for LUNs and space-reserved files. The default value is 100%. Data ONTAP removes or reserves this space from the volume as soon as the first Snapshot copy is created.

SNAP RESERVE

This is a volume-level option and is set as a percentage of the volume. Data ONTAP removes the specified percentage (20% by default) of volume from being available for configuring any LUNs or files. As Snapshot copies need space, they consume space in the snap reserve area.

AUTOSIZE

This is a volume-level setting from Data ONTAP 7.1 onward which determines whether a volume should grow automatically or not when the volume is almost full. There is an option to define how large the volume is allowed to grow, the maximum size.

AUTODELETE

This is a volume-level Snapshot option from Data ONTAP 7.1 onward which allows Data ONTAP to delete Snapshot copies automatically if a threshold is reached.

AGGREGATE OVERCOMMITMENT

Aggregate overcommitment allows presenting more available storage space than exists in the aggregate. This is useful for thin provisioning storage space on NetApp storage systems. Using Provisioning Manager/Operations Manager, one can set overcommitment values on per aggregate basis.

DATASET

A dataset consists of a collection of storage sets along with configuration information associated with their data; the storage sets associated with a dataset include a primary storage set used to export data to clients, and the set of replicas and archives that exist on other storage sets. Datasets represent exportable user data.

RESOURCE POOL

A resource pool is a managed object in DataFabric® Manager, containing storage provisioning resources like storage systems, aggregates, and spare disks. A resource pool serves two purposes. The first is to reduce the total number of distinct objects a storage administrator must manage, and the second is to allow greater opportunities for space and load optimizations. A resource pool can have resources with similar capabilities or a mixture depending on the administrator needs.

PROVISIONING POLICY

A provisioning policy describes how space required for a dataset should be configured; provisioning policy consists of a set of attributes that the dataset requires from a particular resource pool. Specific attributes include but are not limited to cost, performance, availability, how the data can be accessed, and what to do in out-of-space situations.

5 PROVISIONING WORKFLOW

This section describes the SAN provisioning workflow. The workflow requires following one-time configuration steps:

- Resource pool creation
- Provisioning policy creation
- Dataset creation and attaching resource pool and provisioning policy with the dataset

The following diagram illustrates this provisioning workflow.

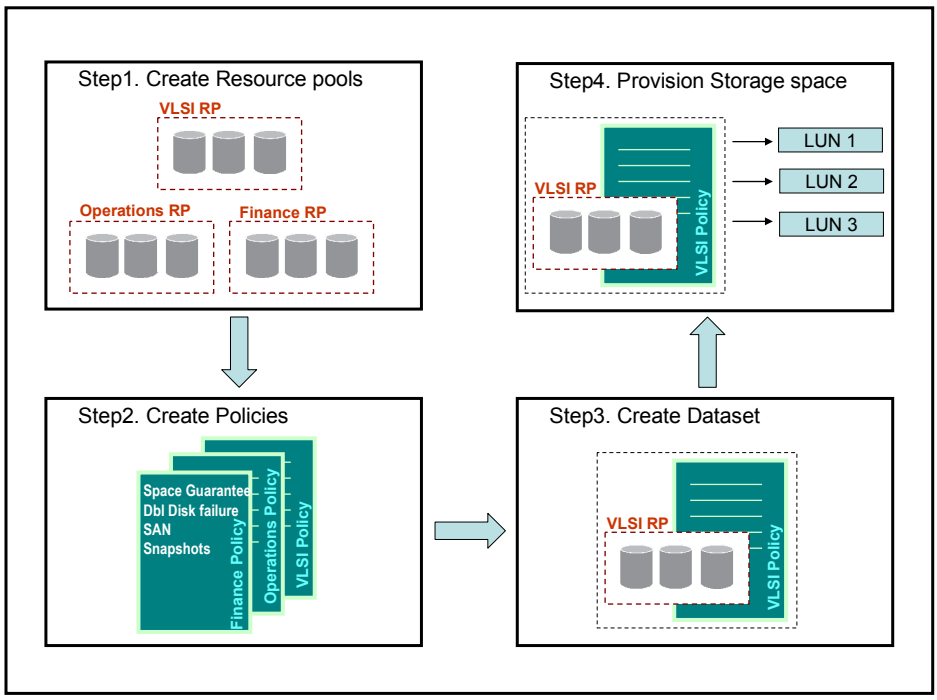

Figure 1) Provisioning workflow.

RESOURCE POOL CREATION

Resource pool creation involves the following steps:

- **Resource pool members**: Addition of storage systems or aggregates from the storage systems. Multiple storage systems and aggregates can be assigned to a resource pool. When a storage system is added to a resource pool, it implies that all its aggregates and disks are part of the resource pool.
- **Resource label**: Storage administrators can specify resource pools and its members with some labels. For example they can specify tier 1 (gold), tier 2 (silver), or tier 3 (bronze) for their storage based on performance and cost. These labels can then be used in provisioning policy to specify the tier of storage. During resource selection Provisioning Manager will try to find a resource in a resource pool that matched the label.
- **Space thresholds**: These sets of thresholds can be used to track the space utilization from a resource pool. Administrators get alerts when these thresholds are breached.
- **Aggregate overcommit thresholds:** In thin provisioning environments, administrators overcommit more storage than is physically available. These set of thresholds govern the amount of overcommitment. Once these thresholds are breached an overcommitment alert is generated.

PROVISIONING POLICY CREATION

Provisioning policy creation involves the following steps:

- **Storage type:** Type of storage to be provisioned. For discussions in this document, it will be SAN
- **Availability properties:** Storage reliability and availability settings (RAID properties, active/active controllers)
- **Container properties:** Space and capacity attributes in SAN environments (space guarantees, Snapshot reserve, overwrite reserve, quotas)

- **Space thresholds:** Used space thresholds to report dataset space status

The following figure depicts the storage availability properties in a provisioning policy.

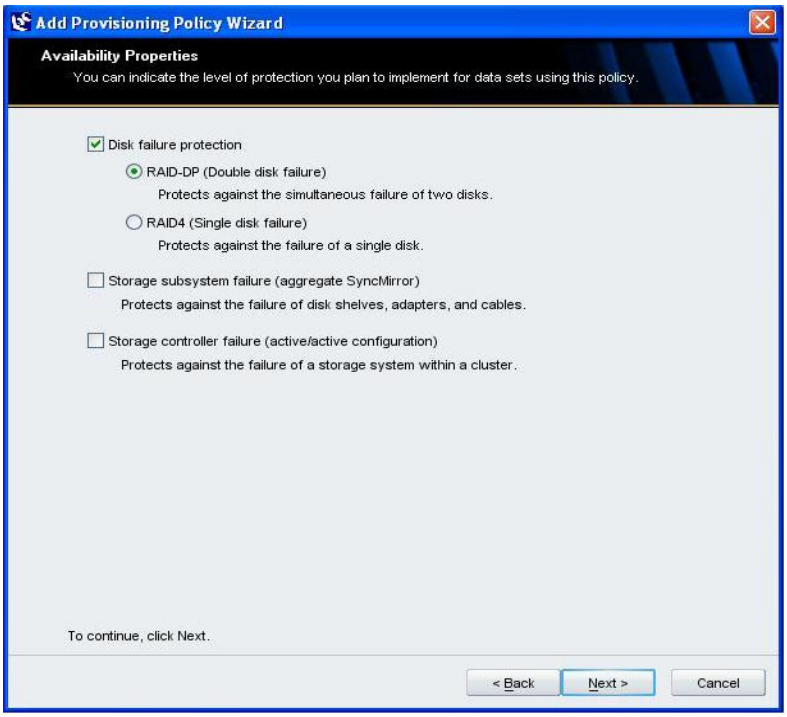

Figure 2) Availability properties in a provisioning policy.

As show in the figure, the storage administrator can select one or more of RAID-DP®, RAID 4, aggregate SyncMirror, or active/active for availability options. During actual provisioning, Provisioning Manager automatically chooses the resources that meet the provisioning policy availability criterion.

As a best practice NetApp recommends selection of RAID-DP option for disk failure protection.

DATASET CREATION

Dataset creation involves the following steps:

- **Provisioning policy:** Associate the provisioning policy
- **Export settings:** Associate the export settings for FCP/iSCSI. This is a list of host initiator IDs to which the LUNs in the dataset are mapped after provisioning.
- **Resource pools:** Associate resource pools
- **vFiler units**: Optionally, associate a vFiler™ unit if provisioned storage is to be exported through a vFiler unit

The following figure depicts a typical export setting for a SAN dataset.

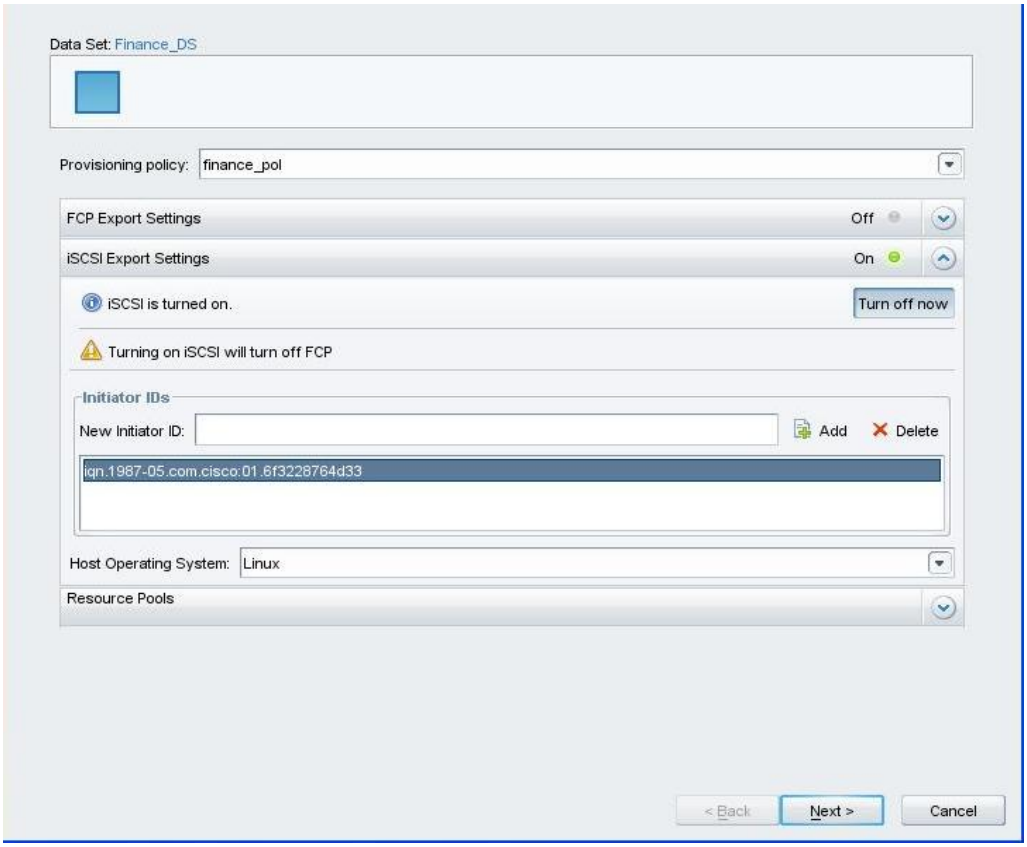

Figure 3) SAN export settings in a dataset.

In the above example:

- User has associated policy **finance_pol** to dataset **Finance_DS.**
- Enabled iSCSI and associated iSCSI initiator ID. All the LUNs provisioned in to the Finance_DS will be automatically mapped to the specified iSCSI initiator.
- Host operating system is Linux®: The os-type of all the LUNs provisioned into this dataset will be Linux.

STORAGE PROVISIONING

Once the resource pool, provisioning policy, and dataset are configured, then storage can be provisioned and reprovisioned. Dataset creation facilitates a simple step to provision multiple members, without the need to specify all parameters.

Once the resource pool is properly configured, Provisioning Manager will intelligently select the proper resource for provisioning or reprovisioning requests.

Provisioning Manager will select storage system and aggregate such that:

- It caters to requirements of provisioning request.
- It caters to all the requirements of the provisioning policy.

- If provisioning on a resource fails, for some reason, then it will look for the next available resource in the resource pool which satisfies all the requirements.

Following are some of the checks done by Provisioning Manager as a part of its resource selection algorithm during provisioning:

- Current health of resource (whether storage system is down or it is heavily loaded, etc.). If a storage system is heavily loaded, then Provisioning Manager tries to do proper load balancing by looking for another suitable resource in resource pool. Provisioning Manager currently takes into account CPU and disk utilization of storage system.
- Storage resiliency parameters like RAID-DP, RAID 4, SyncMirror, active/active pair
- Data ONTAP versions
- Space and aggregate overcommit thresholds
- Required licenses
- Protocol service status

The storage administrator need not be bothered about the resource selection once the admin has properly configured the resource pool. After all the available resources in the resource pool have been tried and no suitable resource exists, only then Provisioning Manager will fail the provisioning request with appropriate error messages and suggestions. Based on the suggestions, the storage administrator can take required remedial actions and retry the provisioning request.

6 SAN VOLUME CONFIGURATIONS

Provisioning Manager facilitates provisioning of four SAN volume configurations with different characteristics.

The following table depicts details of each of these configurations.

Table 1) SAN configurations in Provisioning Manager.

Configuration	Volume Options	Thin Provisioning	Data ONTAP Version	Comments	Limitations
1. NetApp recommends this configuration as the best practice configuration	Guarantee =volume, fractional reserve=0, autosize= on, autodelete= on, commitmen t=disrupt	Partial thin provisioning. LUN space is allocated upfront and Snapshot space is taken on demand.	7.2.4 or later	In this configuration: • Data space is thickly provisioned. • Overwrite reserve not used. • Snapshot space is consumed on demand using autosize. • LUN writes are guaranteed due to autodelete. • Commitment=disrupt makes sure any Snapshot copy can be deleted, if required. • SnapMirror® Snapshot copies are	LUN clone, FlexClone® Snapshot copies cannot be deleted.

				autodeleted only after all other Snapshot copies are deleted. • Requires (X+delta) space. delta is consumed on demand using autosize	
2	Guarantee =file, fractional reserve =100	Partial thin provisioning. LUN space and overwrite space are allocated upfront. Snapshot space is taken on demand.	ANY	In this configuration: • Data space and overwrite reserve are thickly provisioned. • Snapshot space is thinly provisioned. • This configuration requires (2X) space. • LUN writes are guaranteed.	
3	Guarantee =none	Complete thin provisioning. No space is allocated upfront.	ANY	Writes are not guaranteed.	
4	Guarantee =volume, fractional reserve =100	LUN space, overwrite reserve and Snapshot space are allocated upfront.	ANY	This configuration uses (2X+delta) space	

The parameter “X” in the above table denotes the LUN size.

7 SPACE MANAGEMENT

The job of storage administrator does not end in provisioning. The admin has to periodically monitor the space usage and take appropriate actions if there are some error conditions.

Provisioning Manager provides administrators comprehensive visualization of current space usage as well as storage usage trends. It also depicts error conditions and suggestive actions for rectifying these error conditions.

In a typical SAN provisioning scenario with autosize enabled:

- The dataset application starts utilizing space from the provisioned storage for their daily needs.
- Over time the storage usage grows, and Provisioning Manager alerts the storage administrator of an error condition.
- The admin opens the space management page from Provisioning Manager and gets to see all the details of data usage in a space breakout graph.
- The admin notices that space status is reported as “Error” and space usage threshold is breached.

The following diagram illustrates an example of space breakout in error scenario.

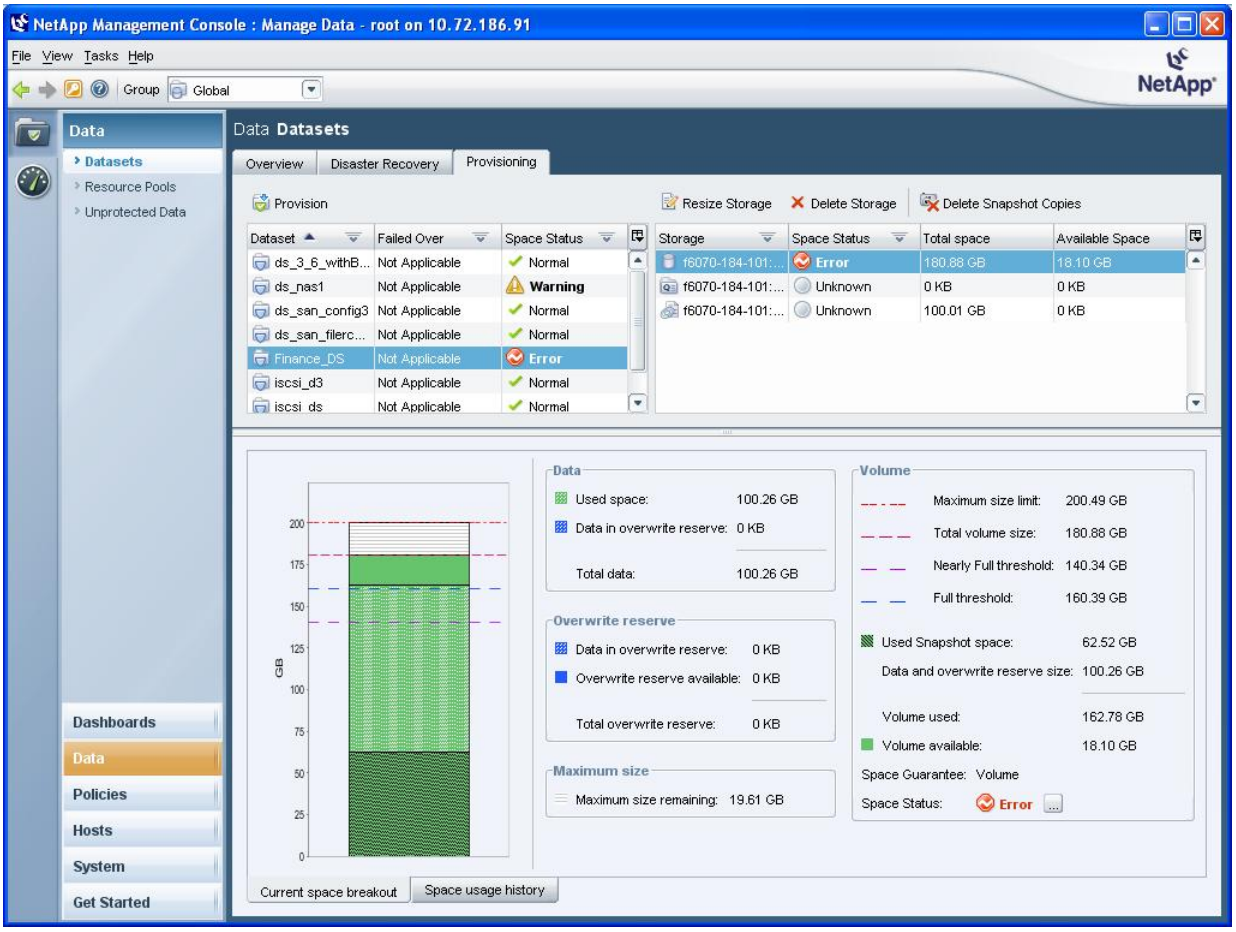

Figure 4) Error condition in space breakout page.

In the example above:

- LUN was provisioned at size 100GB inside a volume.
- Autosize limit of the volume was set to 200GB.
- Volume becomes full and its size has increased due to autosize being enabled.
- Space consumed in the volume is around 163GB.
- The “Volume Full Threshold,” which is set to 80% (160GB), is breached.
- Space of around 63GB is used by Snapshot copies.

The administrator clicks the button near the space status at the bottom of the window. A dialog box opens up which lists all the error conditions and their possible remedial actions and suggestions.

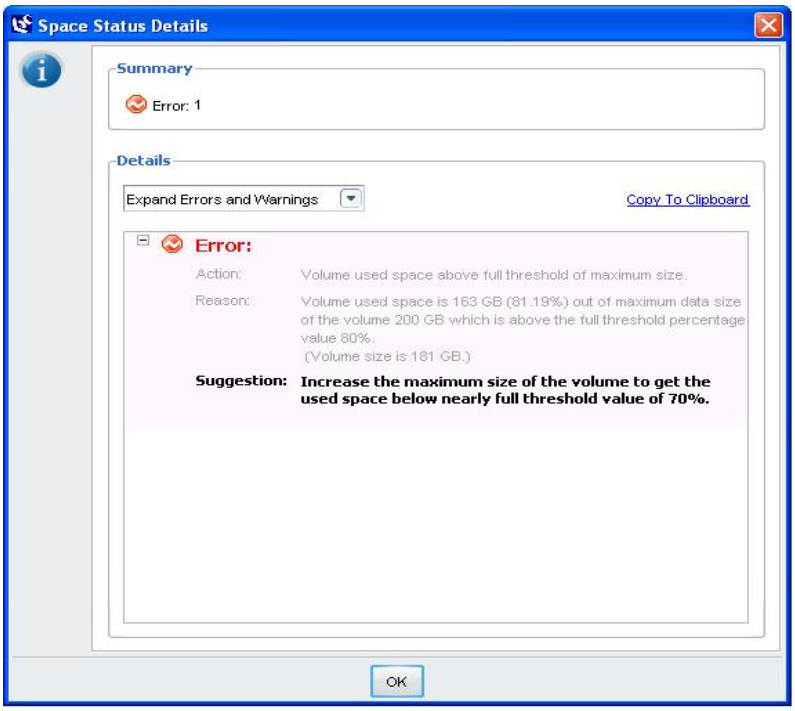

Figure 5) Error details.

Using this information the admin comes to know that:

- Volume used space is above the maximum threshold size, and the admin has to increase the volume size.

The next step for the storage administrator is to rectify the error conditions. The admin decides to resize the storage. The following figure shows the screen for resizing storage.

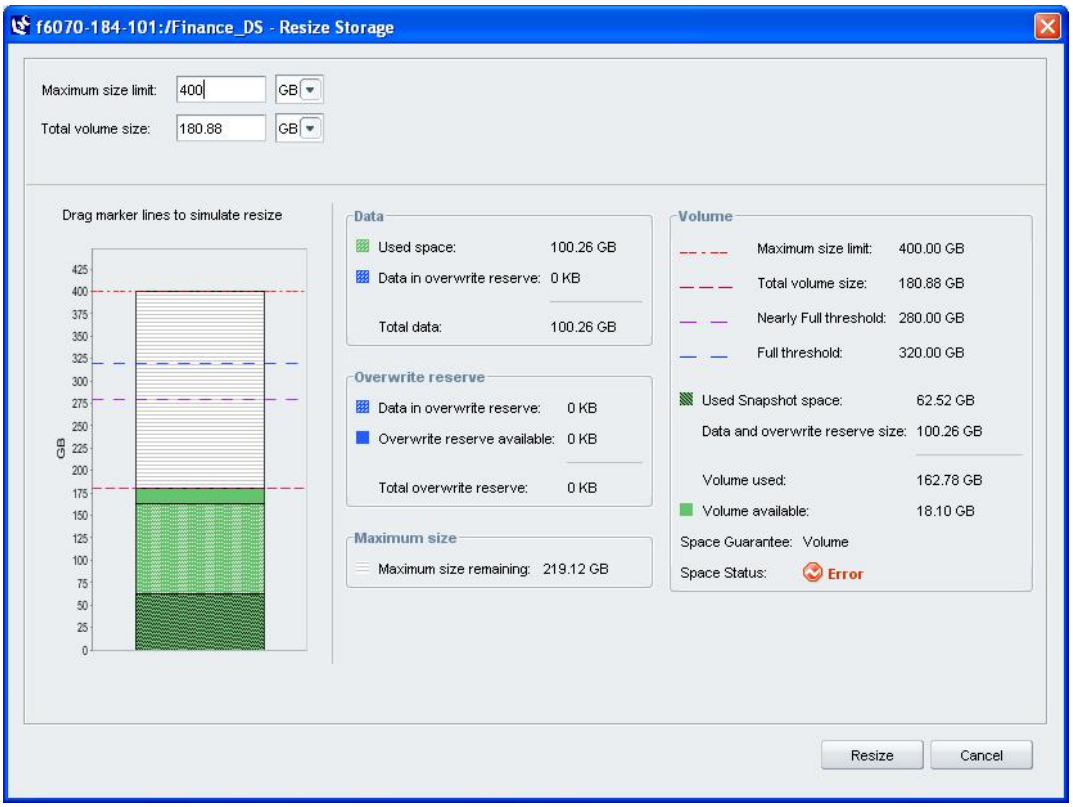

Figure 6) Resizing storage.

The resize storage operation allows simulation of the resize operation before actually resizing the volume. For example, in the above scenario an administrator simulated volume max-size change to 400GB. The space breakout and space components are simulated to reflect the change. Once the administrator finalizes the required changes, the admin presses the Resize button to commit the changes.

8 PROVISIONING POLICY CONFORMANCE

The datasets provisioned are periodically monitored to check if they conform to the provisioning policy: that is, the dataset members have the characteristics specified in the provisioning policy. In case of any violation, Provisioning Manager generates tasks to fix these conformance violations.

For example, the storage administrator provisions a LUN using Provisioning Manager with following characteristics:

- Enabling autosize: provisioning policy requirement.
- Disabling automatic Snapshot schedules: Best practice for SAN volumes. Automatically enforced by Provisioning Manager.
- Setting snap reserve to zero: Best practice for SAN volumes. Automatically enforced by Provisioning Manager.

Suppose, later on these characteristics of the volume are changed on the storage system due to a manual error. The conformance monitor of Provisioning Manager runs periodically to monitor such violations. It detects these violations and makes the dataset nonconformant.

The storage administrator is alerted about the dataset going to nonconformant state. The admin goes to the dataset status and observes the policy violations.

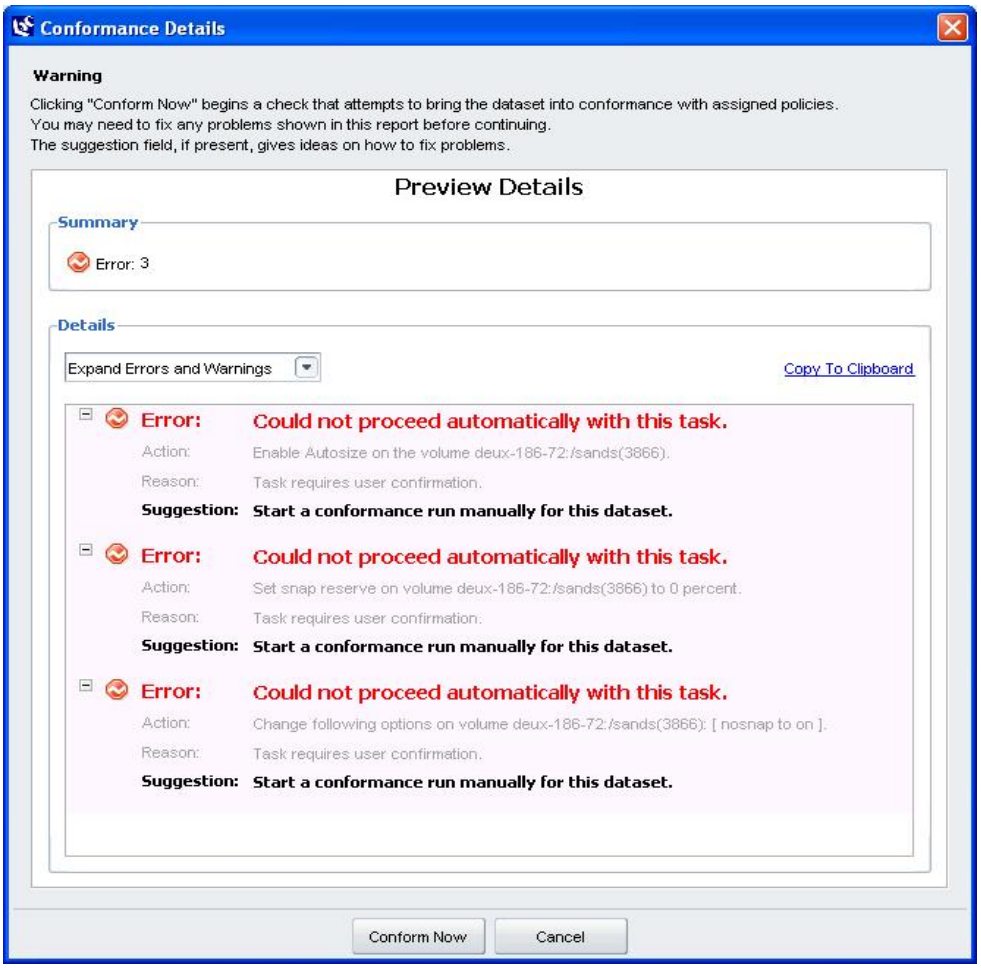

Figure 7) Provisioning policy conformance check.

From the above figure the administrator can see that the following properties have been changed:

- Autosize is disabled.
- Snap reserve has been set to some value other than 0.
- Automatic Snapshot schedule has been enabled on the volume.

These aspects are in violation with policy settings and SAN best practices. The admin clicks the “Conform Now” button, and Provisioning Manager will take actions to bring back the dataset to conformant state.

9 NGV BANK: A PROVISIONING CASE STUDY

This section will give an overview of a provisioning case study. The case study tries to capture the provisioning and space management scenarios encountered in various enterprise companies.

The objective of this case study is to showcase how NetApp Provisioning Manager eases the task of provisioning storage and space management for various SAN environments. The scenario for the case study is illustrated by the following figure.

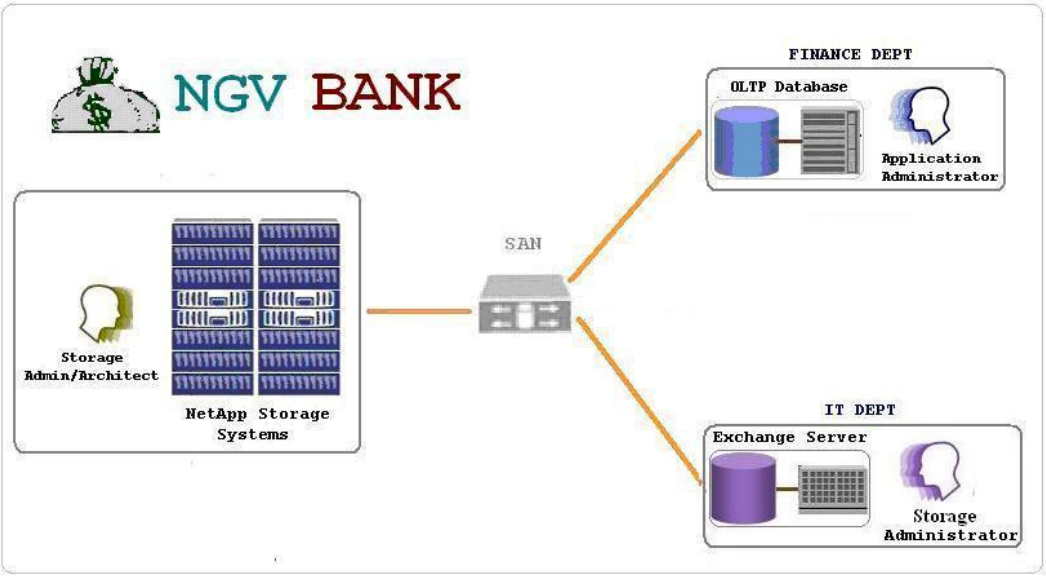

Figure 8) NGV Bank case study.

"NGV bank" is an established bank which is facing challenges in storage provisioning for its applications in various departments.

This bank has a single person accomplishing the role of storage administrator' and application administrator. This person has been assigned the job of provisioning storage for the following departments.

These departments are:

- Finance
- IT

NGV learned about NetApp storage and was impressed by the power, flexibility, and simplicity of the features which these storage systems offered.

This bank then purchased NetApp storage for reorganizing its storage infrastructure.

The storage administrator is given the following responsibilities:

- Set up a storage network using FC SAN
- Provision and manage storage including space utilization for the various departments
- Analyze the usage patterns for better space efficiency and utilization

The requirements for various departments are as follows:

FINANCE DEPARTMENT

- The data for the finance department is critical and should be available at all times.
- The storage should be able to house a high-capacity OLTP database.
- Systems should be available at all times. There is almost negligible margin for downtime as any downtime or any failure in operations will lead to financial loss which is not acceptable.

IT DEPARTMENT

- For server consolidation, space savings, and power savings. IT department has decided to use VMware®.
- Bases on NetApp Best Practices for VMware (VMware Technical Report 3428), decision has been taken to use complete thin provisioning configuration.

The storage administrator has a challenging job at hand as the admin needs to provision storage which should fulfill varied requirements for the various departments.

The storage admin looks for suitable single point software that would ease the job of provisioning and managing the storage provisioned.

The storage admin comes to know of NetApp Provisioning Manager and then gets trained on this software. The admin comes to know of the features provided by this software and decides to use it.

The solutions adopted by the storage architect/administrator to meet the provisioning requirements for various departments are discussed in the sections to follow.

9.1 FINANCE DEPARTMENT PROVISIONING

The storage administrator goes though the storage requirements for the Finance department.

The admin utilizes knowledge of NetApp Provisioning Manager concepts and utilizes them for provisioning storage for Finance department, which satisfies the storage requirements specified.

RESOURCE POOL CREATION

The storage container which would contain the OLTP database for the financial application should be:

- Reliable
- Available
- High speed
- High capacity

To meet the needs of the storage, the storage administrator configures storage systems as follows:

- Selects high-end and high-performing storage systems
- Configures SAN-specific setup
- Configures the storage systems for active/active configuration (this will take care of storage controller failure and will protect data against the failure of a storage system)

The admin then creates aggregates on these storage systems which are:

- RAID-DP enabled (this will protect against simultaneous failure of two disks)

A resource pool named **Finance_RP** is created, and the above storage systems are added.

POLICY CREATION

The storage administrator creates a storage provisioning policy named **Finance_Pol** which would meet the department provisioning goals.

For storage availability the administrator selects the following options in the policy:

- RAID-DP (this will protect against simultaneous failure of two disks)
- Storage controller failure (this will protect against failure of storage system within an active/active configuration)

For space management, the policy settings are set as shown in the following diagram:

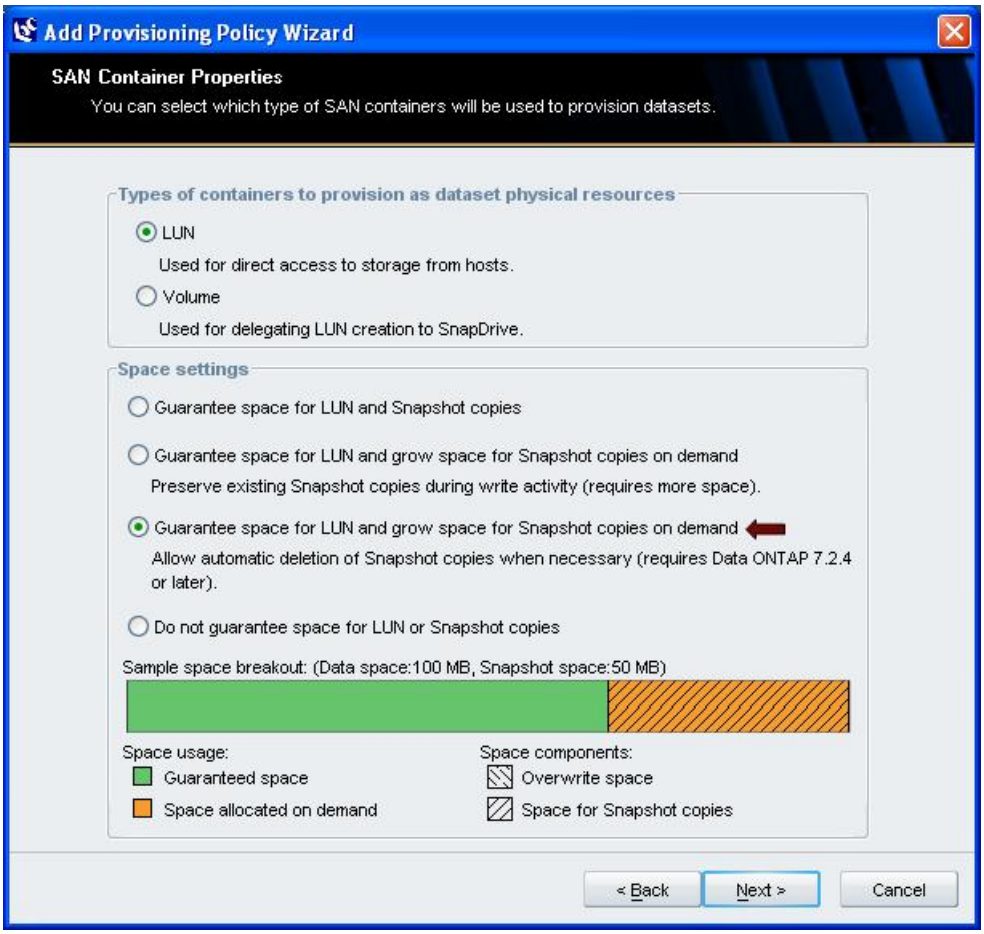

Figure 9) Finance department provisioning policy: SAN container properties.

From the above screen,

- When the admin selects the option “Guarantee space for LUN and grow space for Snapshot copies on demand,” the admin gets a depiction of sample space breakout at the bottom of the policy page.
- The admin sees that this will provide the following advantages:
  - LUN space will be consumed upfront
  - Snapshot space will be consumed using autosize
  - Overwrite reserve is not used in this configuration
  - Autodelete is enabled

As can be seen above Provisioning Manager hides all the inside complexities of how actually storage would be provisioned. By providing the options in a very simple way and by visually depicting how the storage would be provisioned, it provides ease of use and flexibility to the storage administrator.

DATASET CREATION

The storage administrator proceeds to create the dataset called **Finance_DS** which would utilize the services of the resource pool and provisioning policy created above.

As a part of dataset creation the admin specifies the following:

- Associate resource pool **Finance_RP** and provisioning policy **Finance_Pol** with the dataset.
- Turns on iSCSI export settings.

- Specifies the os-type of the SAN host for LUN mapping.
- Specified the iSCSI initiator ID of the SAN host.

STORAGE PROVISIONING

The storage administrator now starts providing details of the storage that is to be provisioned. The admin enters the following information:

- Name of LUN that will be provisioned
- LUN size
- Maximum size for Snapshot copies

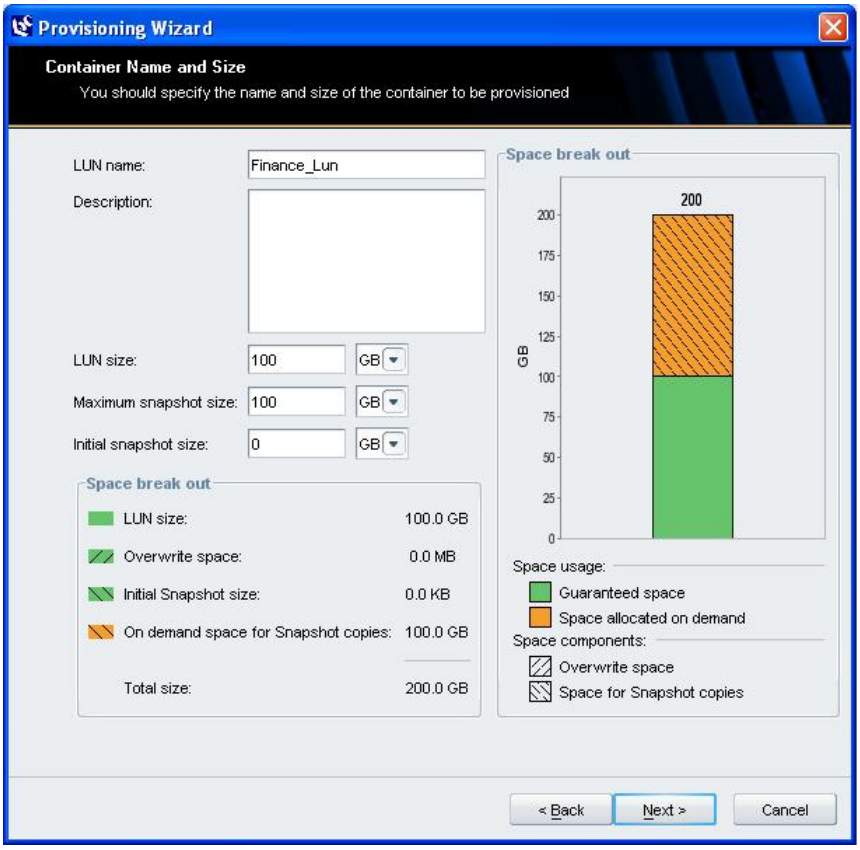

Figure 10) Finance department storage provisioning.

After entering the size, Provisioning Manager displays the actual space breakout of provisioned storage. It also provides a detailed illustration of what the actual storage provisioned would look like.

For this scenario the following information has been provided:

- LUN size: 100GB
- Maximum space for Snapshot copies: 100GB

Provisioning Manager will perform the following:

- Provision a volume of size 100GB
- Enable volume autosize and set maximum autosize limit of the volume to 200GB

After verifying the details on this screen, the storage administrator proceeds to finish the provisioning task.

Before Provisioning Manager actually does the provisioning, it displays the preview of actions that would be taken to provision storage. This gives the administrator clear picture of configurations and settings that would be done for the provisioning task.

If there are some problems in provisioning, then these errors and corresponding suggestive actions will be provided in the preview results.

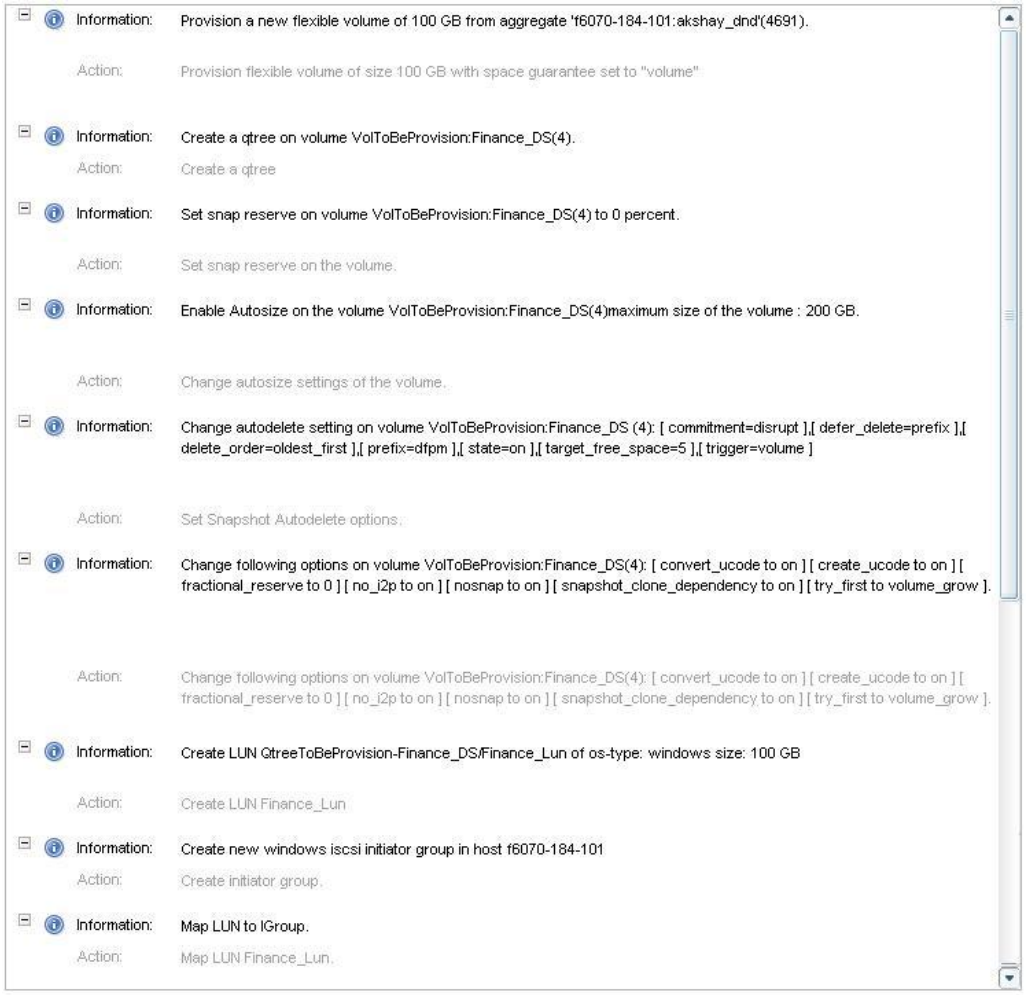

Figure 11) Finance department storage provisioning preview details.

As shown above the following actions are taken:

- Volume is provisioned with enough space to host the LUN.
- LUN is provisioned in the volume.
- There is no overwrite reserve allocation in this volume.
- Autosize and autodelete are enabled on the volume.
- All SAN best practice options are set on the provisioned volume.
- Initiator group is created.

- LUN is mapped to the initiator group.

For each provisioning task, a job is created. This job ID can be used to track the job progress. In cases of failure, job details provide reasons for failure.

The storage administrator wants to see a detailed report of all actions that are taken as a part of provisioning. Using the job ID, the admin goes to the “Jobs” section and gets the details of each provisioning step.

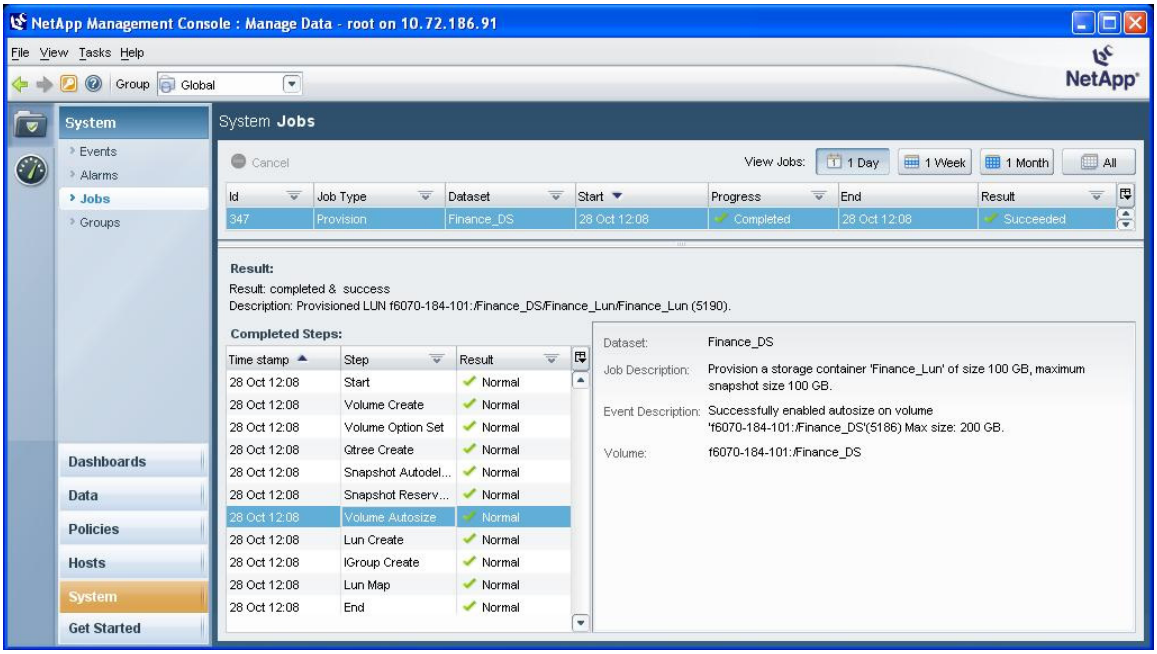

Figure 12) Finance department storage provisioning job details.

The above figure shows a provisioning job and details of all individual steps performed as a part of provisioning.

As demonstrated above, Provisioning Manager hides all the provisioning complexities and provides an easy and simplistic approach for provisioning.

9.2 IT DEPARTMENT PROVISIONING

The storage administrator performs the following steps for IT department provisioning.

RESOURCE POOL CREATION

The storage container selected for provisioning should have the following characteristics:

- Reliable
- Available
- High speed

To meet the needs of the storage, the storage administrator configures storage systems as follows:

- Selects high-end and high-performing storage systems
- Configures iSCSI specific setup
- Configures the storage systems for active/active configuration

The admin then creates aggregates on these storage systems which are:

- RAID-DP enabled

A resource pool named **IT_RP** is created, and the above storage systems are added.

POLICY CREATION

The storage administrator creates a storage provisioning policy named **IT_Pol** which would meet the department provisioning goals.

For storage availability the administrator selects the following in the policy:

- RAID-DP
- Storage controller failure

For space management:

- Administrator selects the complete thin provisioning configuration as per NetApp VMware best practices.

DATASET CREATION

Storage administrator proceeds to create the dataset called **IT_DS** which would utilize the services of the resource pool and provisioning policy created above.

As a part of dataset creation the admin specifies the following:

- Associate resource pool **IT_RP** and provisioning policy **IT_Pol** with the dataset
- Turns on iSCSI export settings
- Specifies the host type as **VMware** for LUN mapping
- Specified the Initiator IDs of all ESX servers in VMware cluster

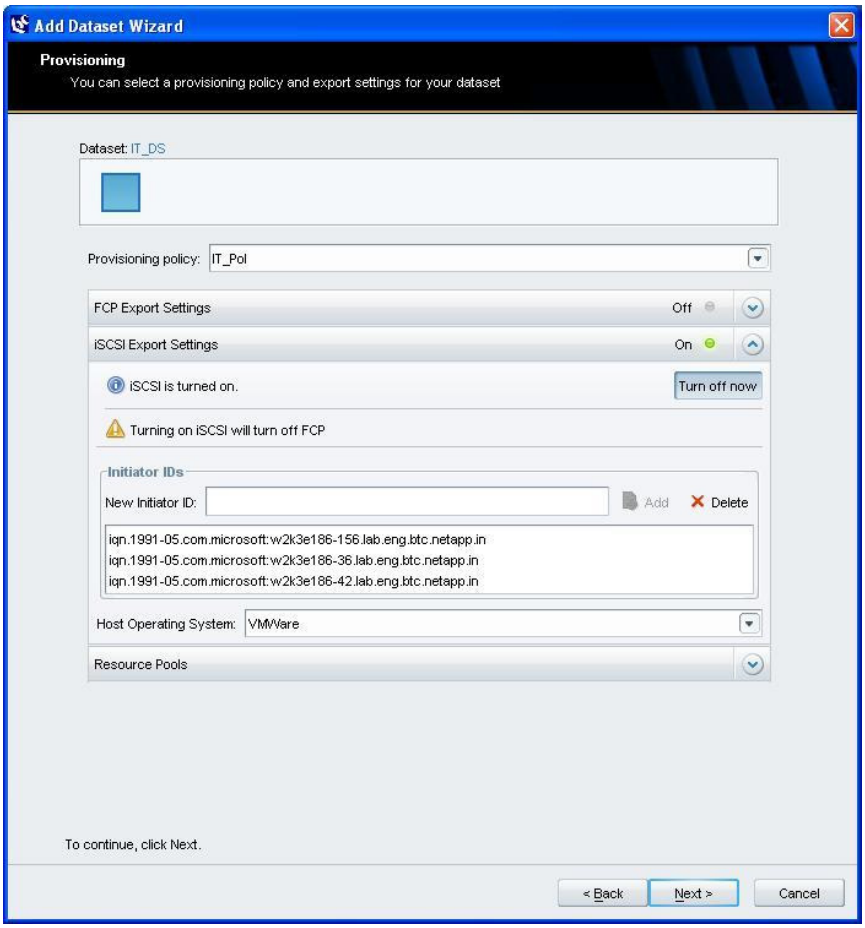

Figure 13) IT department dataset settings.

With this Provisioning Manager will make sure that:

- An initiator group is provisioned with all specified initiator IDs
- The LUN is mapped to the initiator group
- This makes sure that the provisioned data store is visible to all ESX hosts in the VMware cluster. This is a requirement for some VMware feature like VMware VMotion®.

STORAGE PROVISIONING

The storage administrator now starts providing details of the storage that is to be provisioned. The admin enters the following information:

- Name of LUN that will be provisioned
- LUN size
- Size for Snapshot copies

After entering the size, Provisioning Manager displays the actual space breakout of provisioned storage. It also provides a detailed illustration of what the actual storage provisioned would look like.

Provisioning Manager will perform the following:

- Provision a volume of required size with space guarantee as “none.”
- LUN is provisioned inside the volume with LUN space reservation disabled.

- Initiator group is created.
- LUN is mapped to the initiator group.

10 INTEGRATION WITH SNAPMANAGER PRODUCTS

Many enterprise applications already support some form of thin provisioning and autosize feature. Specifically, Microsoft® Exchange, Microsoft SQL Server® 2005, and Oracle® support the following options:

- Options to provision storage without initialization (that is, without zero-fill)
- Option to autosize storage for on-demand space consumption

The thin provisioning configuration described in Table 1 aligns with the above features. Also, the NetApp SnapManager® products for these applications (SnapManager for Oracle, SnapManager for SQL Server, SnapManager for Exchange) can seamlessly handle backup and restore of datasets when using this configuration.

11 CONCLUSION

Based on the discussions of the use cases in the above sections, it can be seen that NetApp Provisioning Manager provides a simplistic, automated, and an efficient approach to meet the storage provisioning challenges.

To summarize, following are the benefits offered by NetApp Provisioning Manager:

- Reducing provisioning complexities by using automated policy-based provisioning for NetApp storage systems.
- Automated policy-driven provisioning of new storage containers and improved capacity management of existing storage containers. These processes are faster than doing the job by hand, easier to maintain than scripts, and help minimize the risk of data loss due to misconfigured storage.
- Maximizing storage resources by allocating storage more efficiently across resource pools. This frees administrators from the headache of searching for available space to provision, freeing up time to meet other strategic challenges.
- Improves productivity and reduces the risk of human errors.
- Periodic detection and automatic correction of policy and dataset conformance violations.
- Provides an at-a-glance dashboard for monitoring a variety of metrics, including capacity utilization, policy compliance, and space management statistics.